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Strategic delegation: An experiment

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We examine the effects of strategic delegation in a simple ultimatum game experiment. We show that when the proposer uses a delegate, her share increases both when the delegate is optional or mandatory. This is true despite the fact that the delegate cannot be used as a commitment device. We also show that unobserved delegation by the responder reduces her share, as her delegate is perceived to be more willing to accept tough offers.

1. Introduction

■ In many types of games, players prefer to send agents who play the game on their behalf. Why do players use agents to play games? There are several possible explanations for this phenomenon. First, in some games, players choose agents who have special skills that make them better players. For example, players may send lawyers to negotiate on their behalf if knowledge of the law may yield an advantage in the negotiation. Second, players may send agents when they are under the impression that these agents are more intelligent or more experienced than themselves and therefore may play the game better. This explanation, however, relies on a bounded rationality argument in which some players are more able than others (they can think faster, calculate all the possible contingencies, think about creative alternatives, etc.) and these abilities are important for playing the game. Third, delegation may serve as a commitment device. That is, the mere possibility of using an agent may give the player an advantage in the game, as it allows him to commit to a certain behavior. The role of delegates as a commitment device has been termed *strategic delegation* in the literature and has been discussed extensively since Schelling (1960).[1]

The main structure of a delegation game entails an additional primary stage in which players may hire delegates and either give them instructions on how to play or sign compensation scheme contracts that reward the delegates according to their performance. The compensation scheme may or may not be publicly observable. The possibility of observing a delegate's compensation scheme may drastically affect the outcome of the game. When the agent's compensation scheme is observable and irreversible, it serves as a commitment device manipulating the agent's strategic

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[1] For the different aspects of strategic delegation, see Caillaud, Jullien, and Picard (1995), Fershtman and Judd (1987), Fershtman, Judd, and Kalai (1991), Fershtman and Kalai (1997), Gal-Or (1996), Green (1990), and Katz (1991).

behavior and thus the outcome of the game. The observability assumption has drawn harsh criticism in the literature. Critics have claimed that when the compensation schemes are not observable, delegation cannot serve as a commitment device (see Katz, 1991).[2] Although the intuition behind this claim may be convincing, the formal analysis is not obvious. In a recent article, Fershtman and Kalai (1997) analyzed a simple ultimatum game with unobserved delegation and showed the conditions under which delegation, even when unobservable, may affect the outcome of the game.

In this article we examine the effects of strategic delegation in a simple ultimatum game experiment. Our main concern was to examine the effect of delegation on how players perceive and play the game. The role of agency in bargaining games was also considered by Schotter, Zheng, and Snyder (2000). The main issue in that article was the effect of agency on the efficiency of the bargaining, that is, whether one can expect a greater breakdown of the bargaining process when it is executed by agents rather than the original players. We therefore extend the discussion on delegation and consider the possibility that the use of delegates may in itself affect the way players perceive the game and consequently the game's outcome.

The standard ultimatum game is a two-player game. At the first stage, one player, the proposer, proposes a division of a given pie between himself and the other player. At the second stage, the other player, the responder, either "accepts" or "rejects" the offer. Acceptance is followed by executing the division, while rejection implies that both players get no share of the pie (for recent surveys of ultimatum games, see Camerer and Thaler (1995), Guth (1995), and Roth (1995)). While theory implies that, at equilibrium, the proposer gets all (or almost all) of the pie, experiments show that most divisions are not so extreme and that the average offer is typically between 30% and 50%, with many 50:50 splits. Moreover, low offers (20% or less) are frequently rejected.

Into the above ultimatum game setup we introduced agents who represented either the responder or the proposer. We let the players provide compensation schemes (observable or unobservable) for the agents and then examined how the game was played and how it differed from the ultimatum game without delegation.

Using a messenger to deliver bad messages (or, in our case, low offers) is a commonly observed practice. Would a responder react identically to the same offers made by the proposer directly and by the proposer's messenger? This is not a simple issue. In doing ultimatum game experiments, the outcome usually differs from theoretical subgame-perfect equilibrium. Arguments with "a taste for fair division,"[3] "norms of behavior," etc., are commonly used to explain deviation from theoretical predictions (see the surveys by Camerer and Thaler (1995), Guth (1995), and Roth (1995)). That is, the proposer refrains from making an "unfair" offer because he is afraid that such an offer will be rejected simply for being unfair. However, the same responder may be willing to accept the same offer from an agent if he knows that it is not the agent who benefits from the unfair division and, moreover, that in punishing the proposer for an unfair offer the agent will also be punished. Similarly, would an agent who represents the responder be as sensitive as the responder himself to "unfair" offers? After all, there is no reason for the agent to take such offers "personally," as it is the responder who is treated unfairly.

Our experiment indeed indicated that the proposers' payoffs are significantly higher when they use delegates. Note that in such a game the proposer himself has the ability to make "take-it-or-leave-it" offers.[4] Thus the advantage of using an agent is not that he acts as a commitment device but simply that his participation in the game induces different behavior from the responder. There are several possible explanations for this phenomenon. One is that the delegate's offer is accepted more easily by the responder because it is not made directly by the proposer but by a

[2] See also Dewatripont (1988) for a discussion on the role of delegation as a commitment device when the compensation scheme can be renegotiated.

[3] The meaning of "fair" and "unfair" is usually exogenously given and determined by the norm of behavior in society. It may vary across societies, groups, gender, etc.

[4] Indeed, the use of a delegate by the proposer has no effect on the equilibrium division of the pie.

third party. Another is that the responder may be less keen to punish the proposer because by doing so he also punishes the delegate. Given such behavior, the proposer optimally provides incentives to his agent to make tough offers. To test this hypothesis, we conducted an additional experiment in which the role of the third player as a "hostage" was transparent. This experiment was a regular ultimatum game but with a third player who got a fixed reward if the proposal was accepted and nothing otherwise. In this experiment the third player was not an agent of the original player. Nevertheless, our results indicate that the mere existence of such a "third player" changes the outcome considerably. The proposals in this game were significantly tougher, and the proposer managed to capture a larger portion of the pie for himself.

The use of a delegate by the responder may also dramatically alter the outcome of the game. When the compensation schemes are observable, the use of delegates serves as a commitment device. In such a case, theory suggests that at equilibrium it is the responder who gets all the pie. Our experiment indeed indicated such an effect. The contracts provided by the responder induced the agent to be tough (50% of the contracts were such that the agent received the full 20 points only when he said "yes" to an offer of at least 80% of the pie). As a result, the proposers indeed made far more generous offers. Therefore, in this case, the outcome of the experiment coincides with the basic game theory intuition.

On the other hand, our experiment indicates that when the responder hires an agent but the compensation scheme is unobservable, the responder himself gets a *smaller* share of the pie. A possible explanation of this phenomenon is that the responders' agents are perceived to be more willing to accept tough offers. That is, the delegate's willingness to punish the proposer for an "unfair" proposal made to a third party (the responder) is less than the responder's willingness to punish for a direct unfair proposal. Since the proposer figures out this effect in advance, he concludes that he can make a more greedy proposal with a lower risk of being rejected. Note that in such a case the outcome of our experiment is closer to the game theory equilibrium of the ultimatum game.[5] To test this possible explanation we conducted yet another experiment, a variation of the ultimatum game. In this variation the proposer proposed a division of the pie, but instead of the responder it was a third player who said "yes" or "no." If an offer was accepted it was carried out, and the third player got a fixed compensation. Rejection implied zero compensation to all players. The main finding of this treatment was that the proposer benefited from the existence of a third player, and the proposals he made were tougher than in the original ultimatum game.

In an interesting article, Blount (1995) examines the effect of attributions on trading off absolute and comparative payoffs in the ultimatum game. Her experiment consists of three treatments. The first is a regular ultimatum game. The second is an ultimatum game in which a third party who does not have any stake in the game makes the offers. In the third treatment, offers arise randomly from a machine. The three treatments are different with respect to the self-interest and the intentions of the proposers. Blount showed that the responders care about intention and self-interest; they would aggressively reject low offers made by self-interested human players, and be more accommodating when offers were made by a machine. Blount concludes that differences in causal attributions regarding the source of the proposal affect the behavior of responders. Note that in our delegation experiment, both self-interest and intention were present. Nevertheless, intuitively, the delegate's self-interest is not necessarily as strong as the proposer's.

The basic setup we studied was such that the use of delegates was mandatory. Either the proposer or the responder, in their turn, had to use the delegate. In real life, however, delegation is sometimes optional. Players may decide to play the game themselves or to delegate it to an agent. Basic economic intuition suggests that once the outcome of the game with mandatory delegations is known, the players' choice whether to delegate or not follows immediately. This is, however, a simplistic view of the option to delegate. Consider for example the case in which it is the proposer who uses a delegate. As we have observed, in this game the delegate is used as a

[5] It is interesting to compare the outcome of our RN game with the experimental results from the dictator game (see Forsythe et al., 1994). To make this comparison we ran the dictator game with similar instructions. Our main finding was that even with the RN game, the offers in the dictator game are significantly lower than in the ultimatum game.

hostage, since the responder cannot punish the proposer without punishing the delegate. But if the responder knows that the proposer had the choice of whether or not to use the agent as a hostage, this information may affect his willingness to punish the proposer even at the cost of punishing the agent. To examine this issue, we conducted a further experiment in which we studied the case of observable delegation by the proposer but with an optional delegation. Almost 75% of the proposers in this treatment recognized the advantage of delegation and chose this option rather than making a direct proposal. However, the fact that delegation was optional (not mandatory, as in the game with observable delegation by the proposer) did *not* affect the game's outcome. There was no significant statistical difference between the proposals and the payoffs in the treatment with optional and mandatory delegation.

2. Setup and design of the delegation game

■ We conducted four experimental sessions, administered in writing and held in regular classrooms. In sessions 1 through 4 we had 60, 42, 51, and 39 participants, respectively (192 altogether). Participants were mostly first-year economics students recruited voluntarily in their classes. They were informed that the experiment would consist of two parts, and that they would be given the instructions for the second part only after completing the first.

Part I in all sessions was a simple ultimatum game. In this game, 100 "points" were to be divided between two players, a "proposer" and a "responder."[6] At the first stage of the game, the proposer proposed a division of the 100 points.[7] If the responder accepted the division, then both players got their shares. If the responder rejected the offer, then both players received zero. (The instructions for part I are given in the Appendix.)

Part II of the experiment examined the following four variations of ultimatum games with delegation: delegates could be used by the proposer or by the responder, and the delegation contract could be observable or unobservable.

Clearly, in a two-part experiment some degree of learning may take place. For example, Guth, Schmittberger, and Schwarze (1982) studied an ultimatum game played by players twice and found some difference between the two plays (see also Roth, 1995). Although most of our conclusions were derived from comparing the second parts of the experiments, we also compared the outcome with the benchmark outcome from the first part.

To establish that we could make such a comparison, we ran a (twice) repeated ultimatum game with a simple setup as our main treatments. The instructions for part I of this treatment were the same as the instructions for part I of our main treatment. In part II players were asked to play the ultimatum game again. The average proposal in part I was 58.6, while in part II it was 59.3. This difference is not statistically significant. We cannot reject the hypothesis that the samples come from the same distribution ($z = .096$, prob $> |z|$ is .9238). Note that our setup was different from that reported by Guth, Schmittberger, and Schwarze (1982), as in our case participants did not receive any information about the outcome of part I before playing part II.

□ **Delegation by the proposer.** In the first session, hereafter called the PO game (observable delegation by the proposer), the proposer uses a delegate to make the proposal on his behalf. An extra 20 points are available to the proposer exclusively for use in providing an incentive scheme for the delegate. That is, if as part of the incentive scheme not all the 20 points are paid to the delegate, none of the original players may claim the remaining points. Under such rules, delegation is costless; the pie to be divided between the proposer and the responder remains the same size with or without delegation, which allows a simple comparison between the different scenarios that we investigate.

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[6] We used points instead of money in order to have a pie of 100. The conversion rate we used was 5 points = f 1. At the time of the experiment, September 1996, f 1.6 = $1.

[7] The possibility exists that both the proposer and the responder will employ agents, but we do not consider such a case in this article.

The procedure for part II of the first session is as follows. At the first stage, the proposer hires an agent and signs a publicly observed compensation contract that specifies the agent's fee as a function of the number of points the proposer will receive. At the second stage of the game, the agent proposes a division of the 100 points and the responder has to reply with "accept" or "reject." The final division is similar to the original ultimatum game (part I) wherein the delegate receives the points according to his compensation scheme, but only if the responder accepts the proposal (i.e., the payoff to the agent is also contingent on whether the proposal is accepted or rejected). The instructions for this part are given in the Appendix .

The second session of the experiment, hereafter called the PN game, is the same as the PO game but the delegate's compensation scheme in this case is *not* observed.

All subgame-perfect equilibria of the PO game have the following structure: The proposer provides the agent with the compensation scheme of paying him a points; $0 < a \leq 20$ if he proposes 99 points to him and 1 point to the responder; for any other proposal the delegate will receive b points; $0 < b < a$. The delegate indeed offers the division 99:1 and the responder accepts. The equilibrium of the PN game is the same as that of the PO game.[8]

Do we expect any strategic delegation in PO and PN games? According to the structure of the game itself, the proposer already has the power to make "take-it-or-leave-it" offers and so cannot benefit from using agents as a commitment device. Our first hypothesis is therefore that the outcome of the PO and PN games will be the same as the outcome in the regular ultimatum game.

The competing hypothesis is that the proposer may benefit from the use of a delegate. A possible rationale for such a hypothesis is that the proposer may use the delegate as a shield that allows him to give low offers indirectly. That is, if the proposer suggests a division in which he takes most of the pie, he runs the risk that the responder will "reject" the proposal to punish the proposer for an "unfair" offer. It is not clear that the responder will react the same way to an "unfair" offer made by a third party, particularly when punishing the original proposer implies automatically punishing the "innocent bystander" agent. We may accept the view that players may choose to punish proposers when they offer unfair divisions, even at some cost to them, but it is unclear whether they are willing to punish players who are not to be blamed.[9]

We do not have a specific hypothesis for the PN game, as the above "hostage" argument also holds for this case. The question is, of course, whether it is possible to use the agent as a hostage even when the contract with him is unobservable.

□ **Delegation by the responder.** In the third session of the experiment, hereafter called the RO game, the responder uses a delegate to respond to the offer made by the proposer. The responder may use the extra 20 points to provide the agent with an incentive scheme. The RO game proceeds as follows. At the outset of the game the responder signs a *publicly observed* contract with the delegate. At the second stage the proposer, after observing the delegate's compensation scheme, proposes a division of the 100 points. At the last stage, the delegate either accepts or rejects the offer. Regarding this game, we examine the hypothesis that the use of observable delegation provides an advantage to the proposer who uses the delegate as a commitment device.

The fourth session of the experiment, hereafter called the RN game, is the same as the RO game except that the delegate's compensation scheme is *unobserved*. The responder uses an agent, but the compensation scheme that he provides to this agent cannot be observed by the proposer.

In considering the role of observability we examine three competing hypotheses:

(i) Unobservable delegation is not effective, so the outcome of the RN game will not be significantly different from the outcome of the original ultimatum game. This hypothesis is in the spirit of Katz (1991), who argues that in the RN game, delegation does not affect the outcome of the game; in particular, the responder cannot benefit from strategic precommitment. The (rational

[8] One can also support the 100:0 division as a subgame-perfect equilibrium.

[9] We examine this explanation in a separate experiment, which is described in Section 4.

agent) equilibrium of this game, as suggested by Katz, is that the responder provides the compensation scheme: "I will give you 20 points as long as you accept any positive offer." The proposer then offers the division of 99 to himself and 1 to the responder and the delegate "accepts" such a proposal.

(ii) The responder may benefit from using an agent even when the incentive scheme is not publicly observed. This hypothesis is in the spirit of Fershtman and Kalai (1997), who showed that commitment via delegation might be beneficial even when the compensation scheme is unobservable. The potential for such benefits depends on the type of delegation (incentive versus instructive), the possibility of repetition, and the probability of observability.

(iii) The responder will be *worse off* through using an agent. Once the responder uses an agent and the incentive scheme is unobserved, the proposals, as well as his expected payoffs, will be lower. In such a case the responder is clearly better off not using an agent.[10]

3. Results

■ The basic question in each of the four types of delegation games is whether the use of a delegate changes the outcome of the game and under what circumstances a proposer (or responder) may expect to benefit (or suffer) from the use of a delegate. The outcome of our experiment is described in Table A2 in the Appendix, in which we present all the proposals that were made in each of the four games, including proposals that were rejected. In Table 1 we present the average proposal and the average payoffs (taking into account the rejections) for each part of our four games.

In the first part of Table 1, we present the results for part I of the experiment, in which players played the ultimatum game without delegation. In the second part of the table we present the average proposal and payoffs (to both the proposer and the responder) in the four delegation games that we studied. Before elaborating on these results, it will be useful to describe the distribution of the proposals made in each variation of the delegation game. This is shown in Figures 1 through 4.

Before turning to a more formal testing of our results, we provide a pairwise comparison of the outcomes of the ultimatum experiments of the different games (see the Appendix). Our test indicates that there is no significant *ex ante* difference between the groups.

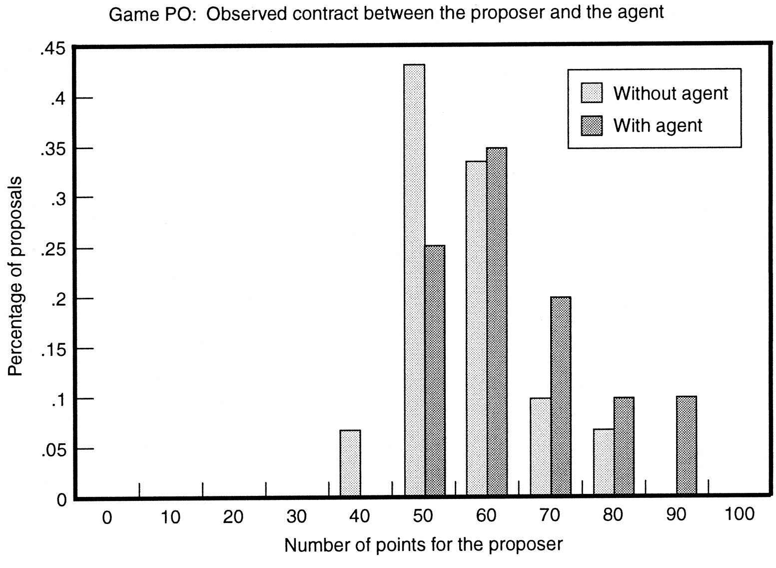
Now we turn to test our hypothesis regarding the different effects of delegation. To do so we compare, for each game, the outcomes of part I (the ultimatum game) with the outcomes of part II (the delegated game). For comparison, we use the Mann-Whitney U test. We report the test results in Table 2.

TABLE 1 The Average Proposal and the Average Payoffs in the Four Games

	PO Game	PN Game	RO Game	RN Game
Without agent:				
Average proposal	56.67	55.71	57.69	55.50
Average profit for proposer	47.67	49.52	49.23	48.00
Average profit for responder	38.96	40.96	39.23	42.00
With Agent:				
Average proposal	64.50	59.29	47.06	66.92
Average profit for proposer	60.50	52.86	39.41	57.69
Average profit for responder	36.50	40.00	48.82	26.93

[10] We discuss the game in which delegation is optional in Section 4.

FIGURE 1
DISTRIBUTION OF PROPOSALS MADE IN GAME PO



□ **The PO game.** When the proposer used an agent with an observable compensation scheme, the average proposal rose from 56.7 to 64.5 and the average payoffs to the proposer rose from 47.7 to 60.5 (see Table 1). From Table 2 it is evident that when using a delegate the proposers made significantly (at a .95 level of significance) higher proposals (a larger share for themselves and a lower share for the responder), and their profits were significantly higher as well.

□ **The PN game.** From Table 1 we see that when the proposer used an agent but the compensation scheme was unobserved, the average proposal rose from 55.7 to 59.3 and the proposer's payoffs increased from 49.5 to 52.9. These changes were in the same direction as in the PO game, but as indicated in Table 2, they were not significant.

FIGURE 2
DISTRIBUTION OF PROPOSALS MADE IN GAME PN

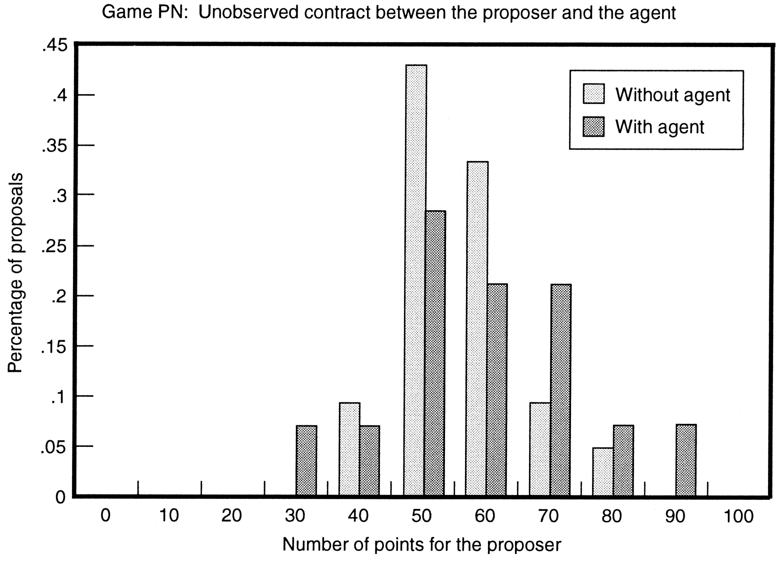
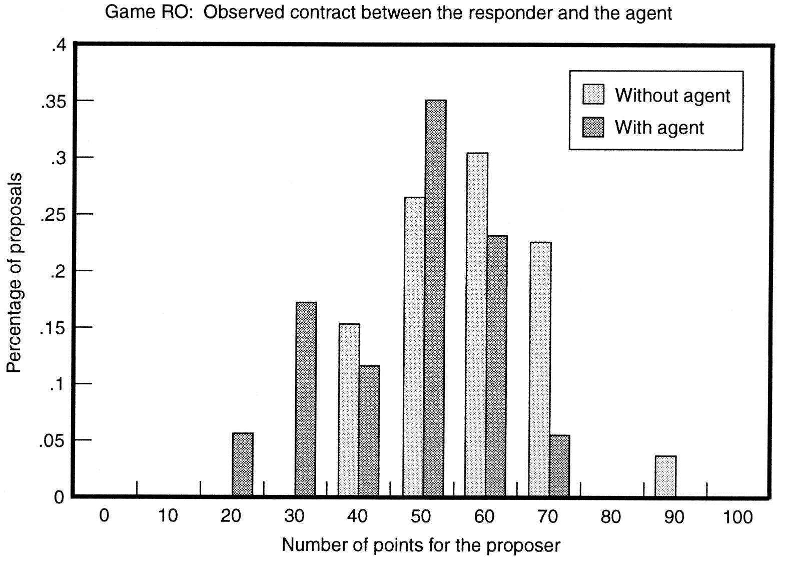


FIGURE 3
DISTRIBUTION OF PROPOSALS MADE IN GAME RO



□ **The RO game.** When the responder used an agent and the contract was observable, the average proposal *declined* from 57.7 to 47.1, the average payoffs of the proposer *declined* from 49.2 to 39.4, and the responder's average payoffs rose from 39.2 to 48.8. From Tables 1 and 2 we learn that the responder's use of a delegate significantly improved both the proposals he received and his payoffs, provided that the agency contract was observable.

□ **The RN game.** In the RN game the responder used an agent but the agency contract was unobserved. From Tables 1 and 2 we learn that the unobserved delegation induced significant changes in the offers made and the payoffs received by both players. The average proposal *increased* from 55.5 to 66.9, the proposer's average payoff *increased* from 48.0 to 57.7, and the

FIGURE 4
DISTRIBUTION OF PROPOSALS MADE IN GAME RN

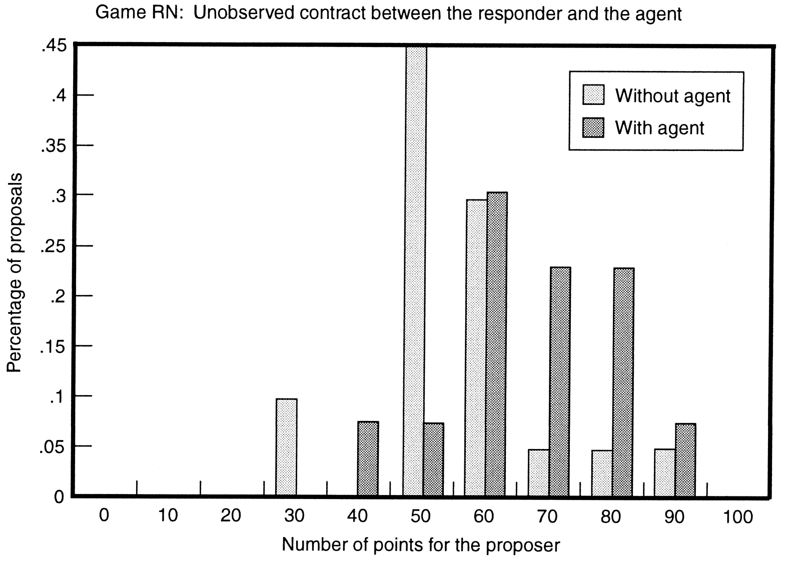


TABLE 2 **Mann-Whitney *U* Tests with Pairwise Comparisons of the Medians of Outcomes in Part I and Part II of Each Game**

	PO Game	PN Game	RO Game	RN Game
Profit: proposer	.0119	.5007	.0455	.0682
Profit: responder	.1273	.6616	.0483	.0326
Proposal	.0349	.4588	.0254	.0224

Notes: The numbers are the probability of a result larger than $|z|$, where z is the test statistic.

responder's average payoffs decreased from 42.0 to 26.9.[11] Surprisingly, the effect of unobserved delegation, in this case, was in the opposite direction to that in the RO case, in which the agency contract was observable. Thus, the use of an agent with unobserved contract made the responder *worse* off.

4. Discussion: the different effects of delegation

■ **The PO game.** In the regular ultimatum game the proposer has the power to make "take-it-or-leave-it" offers, so theory suggests that the proposer will receive the entire surplus. Clearly, in such a case there is no role for agency as a commitment device. Yet the results of our PO session indicate that the proposers' payoffs are significantly higher when they use agents.

A possible explanation for this result is that the existence of the agent may affect the responder's willingness to reject "unfair" offers. In such a game, the agent may be viewed as a "hostage" since when the responder punishes the proposer he automatically punishes the agent too. Because the proposer is aware of this effect, he induces his delegates to make tougher proposals. Note that in the PO session, 4 out of 30 proposals (i.e., 13%) were indeed rejected in the ultimatum game without delegation, but when the proposer used the agent only 1 out of the 20 offers (i.e. 5%) was rejected, even though the proposals were significantly worse for the responder.

To test this hypothesis we conducted an additional experiment in which the role of the agent as a hostage was transparent.[12] In this experiment the proposer made a proposal and the responder accepted or rejected it. There was also a third player with no specific role in the game. The third player got 20 points if the offer was accepted and zero points if it was rejected. In our experiment, the existence of this third player induced a significant change in the offers made by the proposer. The average proposal *increased* from 56.7 to 67.3 ($z = 2.195$, prob $> |z|$ is .0285). This experiment indeed implies that the mere existence of a third player, who may be affected by the responder's reaction, has a significant effect on the offers made and consequently may benefit the proposer.

The contracts given by the proposers to their agents are specified in Table A4 in the Appendix. It is interesting to note that 10 out of the 20 contracts were monotonic, while 9 contracts were single-pick contracts in which the proposer signalled clearly the kind of proposal he wanted the agent to make.[13] It is also evident that in most cases the agents had their own notion of fair division and did not behave entirely as payoff maximizers. For example, in cases 1, 2, and 3 the agents' proposed division was greater than the minimum share that gave them all of the 20 points. There was only one proposal (number 8) rejected in this treatment. The contract in this case was monotonic, such that the agent would have received 20 points had an offer greater than or equal

[11] One of the two rejections in part II of game RN is problematic. The proposer in this observation offered a division of 60:40; the responder offered the agent 20 points for accepting this offer (contract 6 in Table A7), yet the agent rejected the proposal. We report all our observations but note that the "spirit"' of the above discussion would not change even if we did not take this observation into account.

[12] The experiment was conducted in a similar way and with the same type of participants as our main experiment. The instructions for this part are available from the authors on request.

[13] Contract 18 was almost a single pick with a maximum payment in 50. The agents indeed made such an offer, which was also accepted by the responder.

to 70 been accepted. However, the agent in this case proposed 80. That is, the agent was even tougher than what the proposer wanted him to be. In such a case the responder was ready to punish the agent himself. It is interesting to compare this case to cases 12, 17, and 19, in which offers of 80 and 90 were given by the agent and accepted by the responder. In these three cases, however, the agents indeed responded to the delegation contracts and just chose the lower offers that would maximize their own payoffs.

□ **The PN game.** In the PN game we did not identify any significant effect of delegation. Casual observation of Figure 1 indicates an increase in the variance of the offers. However, we prefer not to draw any specific conclusion from this part of the experiment beyond the statement that the observability of the incentive contract changes the way players play the game. Note however that in this treatment, 10 of the 14 delegation contracts were monotonic, 3 were single-pick, and 1 was flat.

□ **The RO game.** In the RO game, the responder uses an agent. In such a case, the agent serves as a commitment device. At the first stage of the game the responder signs an observable compensation scheme with the agent, which allows him to commit not to accept certain offers. Our experiment indicated that the responder benefits from the delegation and his expected payoffs increase significantly. The delegation contracts for this treatment are specified in Table A6 in the Appendix. Note that 50% of the contracts are such that the agent gets the 20 points only when he accepts an offer that gives the responder at least 80% of the pie. Thus, as the basic theoretic intuition suggests, in the RO game the responders induced the agents to be tough, and as a result the proposers indeed made more generous offers.

□ **The RN game.** We find the outcome of the RN part of the experiment the most surprising. For this part we initially identified three competing hypotheses. The first was that RN delegation will not affect the game's outcome. The responder cannot use the agent as a commitment device because the incentive contract is not observable. The second hypothesis was that even without observability there is some commitment value in delegation; therefore, the responder will benefit from the use of agents. We learned that we can reject these two hypotheses and, to our surprise, that the responder may expect to end up *worse off* using an agent with unobserved contract.

The above result is in contrast to Katz (1991) and Fershtman and Kalai (1997). Katz argues that the use of a delegate with an unobserved contract will not influence the outcome of the game (i.e., the outcomes will be similar to those of the ultimatum game). Fershtman and Kalai predict that in many cases the use of a delegate influences the game even if the contract is unobserved, so the effect of unobserved delegation is in the direction of the RO prediction. Note that although our experiment examines a game with unobserved delegation, it cannot be viewed as an experiment evaluating the different claims of Katz and Fershtman and Kalai. It has already been well established that the outcome of ultimatum bargaining experiments differs from the theoretical subgame-perfect equilibrium of this game. Thus, a difference observed in the outcomes of the RO and RN games may be due to the frequently observed deviation of these experiments from the equilibrium prescribed by game theory rather than an indication of the theoretical role of unobserved delegation. In our opinion, the contribution of experiments comparing the outcomes of the RO and RN games with the original ultimatum game without delegation is to see how far the use of delegation is helpful, and whether players take advantage of strategic delegation even when it is unobservable.

Comparing the incentive contracts provided in the RO game and the RN game indicates that the responders in our experiment indeed understood the role of delegation as a commitment device. In the RO game the responders provide "aggressive" incentive contracts. The median value for which the responder gives all the 20 points to the agent is the amount of 80 to the responder. In the unobserved case, the responder realizes that the unobservability implies that delegation does not have a commitment value, and the median value for the agent to receive all 20 points decreases to 20 (see Tables A6 and A7 in the Appendix).

A possible explanation of the result in the RN game is that the delegate's willingness to punish the proposer for an "unfair" proposal *made to a third party* (the responder) is lower than the original responder's willingness to punish for a direct unfair proposal. The fact that the proposer figures out this effect in advance induces him to make a more greedy proposal with a lower risk of being rejected.

To test this explanation, we conducted an additional experiment in which there was a third player who responded to the proposer's offer.[14] This third player got a fixed compensation (20 points) when he accepted an offer and nothing when he rejected an offer. The division of the 100 points between the proposer and the responder was done in the same way as in the original ultimatum game. Letting the third player respond to proposals had a significant effect on the proposals made in the game. The average proposal indeed *increased* from 53.3 to 72.5 (z = 2.605, prob > $|z|$ is .0092).

□ **The PO game with optional delegation.** So far we have studied the ultimatum game with mandatory delegation assuming specifically that delegation is mandatory. In many real-life situations delegation is optional. Players may choose to play the game themselves or to use the delegation mechanism. Backward induction, however, suggests that once players understand the outcome of the game with mandatory delegation, when delegation is optional they will use this option in the PO and RO games but will refrain from using delegates in the RN game and play by themselves. While this may indeed be the players' behavior, the question is whether the fact that players have the option to use delegates changes the behavior of their game partners.

To examine the effect of optional delegation, we conducted an experiment in which we used the PO game as our benchmark but let the proposer choose whether to delegate or to play the game himself. The instruction of this treatment is similar to the instruction of the PO game, with an additional stage in which the proposers have to choose whether or not to delegate.[15] We had 57 students participating in this treatment. Among the 19 proposers, 14 (73%) chose to use the delegation option despite the fact that it introduced an additional level of complexity into their considerations. The average proposal made by the delegate in this treatment was 62.9, slightly lower than the average in the PO treatment with mandatory delegation. The average payoff of the proposers was also slightly lower, namely 57.9 (60.5 in the original PO game). However, there is no significant statistical difference between the outcomes of the treatment with optional delegation and the original PO treatment.

5. Concluding remarks

■ We described in this article an experiment designed to analyze the effect of delegation on the outcomes of ultimatum games. The main conclusion of the experiment is that delegation significantly changes the outcome of the game. Beyond the standard explanations of strategic delegation, our experiment suggests that the introduction of an additional player, the agent in our case, changes players' perceptions of the norm of behavior and what constitutes a fair division in the game they are playing. These suggestions may be extended beyond the scope of ultimatum games and delegation. There are many games in which the strategic interaction may determine the entrance of a new player into the game; an example is market games, in which entry deterrence is possible and the firms' actions may affect the possibility of entrance. In such cases, changes in the set of players may affect the players' perceptions of the (fair) norm of behavior or other behavioral rules that the players prefer to obey. Such perceptions affect the way in which these types of games are played, and therefore changing these perceptions should be discussed in a strategic context.

[14] The experiment was conducted in a similar way and with the same type of participants as our main experiment. The instructions for this part are available from the authors on request.

[15] The detailed instructions can be obtained from the authors on request.

Appendix

■ This Appendix contains the following: the introduction and instructions for parts I and II of the PO game, the outcome, a comparison of the population in the four games, and the incentive contracts of the four games.

□ **Introduction.** The instructions are simple, and if you follow them carefully you may earn a considerable amount of money that will be paid to you in cash at the end of the experiment. 60 students participate in this experiment. Each of you is about to get an envelope with a number. This is your registration number. Please look at it and then put it back in the envelope without letting anyone else see it. At the end of the experiment you will be asked to show the registration number you have in the envelope to the experimenter, and he will pay you according to your performance. Do not forget to write your registration number on all the forms that you will get.

The experiment consists of two parts:

□ **Instructions for part I.** In this part, 100 points are to be divided between two persons: the "proposer" and the "responder." At the end of the experiment, each of the two persons will get 20 cents for each point he will have.

A proposal about how to divide the 100 points between the two persons is made by the proposer. Upon receiving the proposal the responder is asked to respond by either accepting or rejecting it.

(i) If the responder accepts the proposal, both he and the proposer are paid according to the proposal.

(ii) If the responder rejects the proposal, both persons are paid 0 points.

The procedure for part I is as follows: 30 students will be selected randomly to play the role of the proposer in this part. Each proposer will get a form on which he is asked to indicate his proposal to the responder. The proposal must be in multiples of 10 (0, 10, 20, 30, etc.). For example, either 0 to the responder and 100 to the proposer, or 10 to the responder and 90 to the proposer, etc.

After the proposers make their choice we will collect all the forms in a box, and let each of the 30 responder student pick randomly one form out of the box. The responder will not be able to know what is written on the form before choosing it, and will never know the identity of the proposer with whom he was matched (he will only know the registration number of that person). The responder is asked to indicate on the form whether he accepts or rejects the proposal. We will collect the forms and write down the payment for each student for this part (using the registration numbers). Then part II will start. You will get the instructions for part II after part I is concluded.

□ **Instructions for part II.** This part is similar to part I, but this time the proposer cannot make the proposal himself. Instead, the proposer must hire an "Agent" to make the proposal on his behalf. First, each proposer will write a contract with an Agent. The Agent will see the contract before deciding how much to propose to the responder. After the Agent makes the proposal the responder will see *both* the proposal and the contract between the proposer and the Agent. Then the responder will be asked to decide whether to accept or reject the proposal.

To pay the Agent, the proposer gets 20 points (which he can use only to pay the Agent). If the proposer offers the Agent less than 20 points, the rest of the points are lost.

The procedure for part II is as follows: 20 students will be selected randomly to play the role of the proposer in this part. Each of them will get a form with the table shown in Table A1.

In each column the proposer is asked to write how much to pay the Agent if he gets for him the corresponding number of points, that is, if according to the Agent's proposal this amount of points is given to the proposer. For example, in the column of 90, the proposer is asked to write how much to pay the Agent if he gets for him 90 points, etc. After all the proposers fill out this table on the form, we will collect the forms in a box.

We will then select randomly 20 students out of the remaining 40 to play the role of the Agent. Each Agent will pick randomly one form out of the box, and observe that the proposer he is matched with has made. The Agent is now asked to make a proposal to the responder. The forms will be collected again in the box.

Each of the remaining 20 students will be a responder. Each will randomly pick one form out of the box and observe both the Agent's payment table and the proposal made by the Agent. Then he is asked to decide whether to accept or reject the proposal. The responder is asked to indicate his choice on the form.

To summarize, the procedure is shown in Figure A1.

Remarks. (i) The payment from the proposer to the Agent does not have to be in multiples of 10. (ii) If the proposal that the Agent makes is rejected, then all persons, including the Agent, get 0 points for part II.

We will then collect all the forms, find out how much money each of you earned in part I and part II, and pay each of you privately. This will end the experiment. If you have any questions please raise your hand and one of the experimenters will come to you.

TABLE A1 **Payment from the Proposer to the Agent**

Number of points for the proposer	0	10	20	30	40	50	60	70	80	90	100
Number of points to the agent											

FIGURE A1

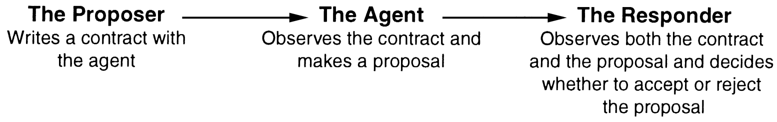


TABLE A2 **Proposals Made by Subjects**

	PO Game		PN Game		RO Game		RN Game	
Number	Without Agent	With Agent	Without Agent	With Agent	Without Agent	With Agent	Without Agent	With Agent
1	80*	90	80	90*	90*	70*	90*	90
2	80	90	70*	80	70*	60*	80	80
3	70*	80*	70	70	70	60	70	80
4	70	80	60*	70	70	60	60*	80
5	70	70	60	70	70	60	60	70
6	60*	70	60	60	70	50	60	70
7	60*	70	60	60	70	50	60	70
8	60	70	60	60	60*	50	60	60*
9	60	60	60	50	60	50	60	60*
10	60	60	60	50	60	50	50	60
11	60	60	50	50	60	50	50	60
12	60	60	50	50	60	40	50	50
13	60	60	50	40	60	40	50	40
14	60	60	50	30	60	30	50	
15	60	60	50		60	30	50	
16	50	50	50		50	30	50	
17	50	50	50		50	20	50	
18	50	50	50		50		50	
19	50	50	50		50		30	
20	50	50	40		50		30	
21	50		40		50			
22	50				50			
23	50				40			
24	50				40			
25	50				40			
26	50				40			
27	50							
28	50							
29	40							
30	40							
Average profit: proposer	47.67	60.5	49.52	52.86	49.23	39.41	48	57.69
Average profit: responder	38.96	34.5	40.96	40	39.23	48.82	42	26.93
Average proposal	56.67	64.5	55.71	59.29	57.69	47.06	55.5	66.92

Note: Rejected proposals are marked with an asterisk.

□ **Outcome.** The outcome of our experiment is described in Table A2.

□ **Comparing the population in the four games.** We use the nonparametric Mann-Whitney U test based on ranks to test whether the samples of the outcomes come from populations having the same median. This is the appropriate test because the distributions are not normal. We report the test results in Table A3.

From the table we learn that with a .95 level of significance (actually, even at a .5 level of significance) we cannot reject the hypothesis that each of the two samples compared are from populations with the same median.

□ **Incentive contracts.** The incentive contracts in the four games follow, in Tables A4 through A8.

TABLE A3 Mann-Whitney *U* Tests with Pairwise Comparisons of the Medians of Outcomes in the Ultimatum Game by Sessions

	Games 1 and 2	Games 1 and 3	Games 1 and 4	Games 2 and 3	Games 2 and 4	Games 3 and 4
Profit: proposer	.8934	.6873	.9526	.8139	.8449	.6657
Profit: responder	.7449	.8630	.9842	.6378	.7543	.8767
Proposal	.7814	.7116	.7215	.5562	.9169	.5062

Note: The numbers are the probability of a result larger than $|z|$, where z is the test statistic.

TABLE A4 The Contracts of the PO Game

		Contract (Amount for the Proposer)										
Number	Actual Proposal	0	10	20	30	40	50	60	70	80	90	100
1	50	0	10	20	20	20	20	20	20	20	20	20
2	60	0	5	10	15	20	20	20	20	20	20	20
3	50	0	0	10	15	20	20	20	15	15	10	10
4	50	0	5	10	15	18	20	18	0	0	0	0
5	50	0	0	0	5	10	20	15	10	5	0	0
6	60	0	0	0	0	0	15	20	10	0	0	0
7	60	0	0	5	5	10	10	20	10	0	0	0
8	80*	0	0	5	5	5	10	10	20	20	20	20
9	60	0	0	0	0	0	10	15	20	0	0	0
10	70	0	0	0	0	0	0	0	20	0	0	0
11	60	0	2	4	6	10	15	18	19	20	20	20
12	80	0	2	4	6	8	14	16	18	20	20	20
13	70	0	2	4	6	8	10	15	18	20	20	20
14	60	0	2	4	6	10	12	15	17	20	20	20
15	60	0	2	4	6	8	10	12	15	20	20	20
16	70	0	0	0	5	5	5	10	15	20	20	15
17	90	2	4	6	8	10	12	14	16	18	20	20
18	50	2	8	5	7	0	19	13	16	0	2	3
19	90	8	8	10	10	11	14	14	15	15	18	18
20	70	9	5	0	7	8	4	3	10	15	9	3

Notes: Column 1 presents the game number, column 2 the proposal in this game, and the rest of the columns the corresponding contracts. Rejected proposals are marked with an asterisk.

TABLE A5 The Contracts of the PN Game

Number	Actual Proposal	Contract (Amount for the Proposer)										
		0	10	20	30	40	50	60	70	80	90	100
1	30	20	20	20	20	20	20	20	20	20	20	20
2	40	0	5	10	15	20	20	20	20	20	20	20
3	50	0	3	9	15	20	20	20	20	20	20	20
4	50	0	8	10	12	18	20	20	20	20	20	20
5	50	0	4	8	12	16	20	16	12	8	4	0
6	60	0	0	5	5	15	18	20	5	5	0	0
7	70	0	5	8	10	12	15	20	20	20	20	20
8	60	0	0	0	0	5	10	20	20	20	20	20
9	70	0	3	7	10	13	15	19	20	20	20	20
10	70	0	0	0	8	10	15	18	20	10	10	10
11	50	0	0	5	5	10	10	15	20	20	20	20
12	60	0	0	0	0	5	10	15	20	20	20	20
13	80	0	2	4	5	6	8	10	15	20	20	20
14	90*	0	2	4	6	8	10	12	14	16	18	20

Notes: Column 1 presents the game number, column 2 the proposal in this game, and the rest of the columns the corresponding contracts. Rejected proposals are marked with an asterisk.

TABLE A6 The Contracts of the RO Game

Number	Actual Amount for Responder	Contract (Amount for the Responder)										
		0	10	20	30	40	50	60	70	80	90	100
1	50	5	10	15	20	10	5	10	15	0	10	20
2	50	0	5	10	15	18	20	20	20	20	20	20
3	50	0	5	10	10	15	15	20	20	20	20	20
4	60	0	0	0	0	0	0	20	20	20	20	20
5	40*	0	1	1	2	2	5	5	20	2	1	0
6	70	0	0	0	0	0	0	0	20	20	20	20
7	70	0	0	0	0	0	0	0	20	20	20	20
8	40	0	0	4	6	10	10	16	18	20	20	20
9	60	0	1	4	10	13	14	15	15	20	20	20
10	70	0	0	0	0	0	5	10	15	20	20	20
11	40	0	12	15	15	16	16	18	18	19	20	20
12	50	0	2	5	10	10	15	15	15	15	20	20
13	30*	0	3	4	5	11	12	14	17	18	19	20
14	50	0	2	4	6	8	10	12	14	16	18	20
15	50	0	2	4	6	8	10	12	14	16	18	20
16	40	0	15	15	15	15	15	15	15	15	15	20
17	80	1	1	1	1	1	1	2	5	10	15	20

Notes: Column 1 presents the game number, column 2 the amount proposed to the responder in this game, and the rest of the columns the corresponding contracts. Rejected proposals are marked with an asterisk.

TABLE A7 The Contracts of the RN Game

Number	Actual Amount for Responder	Contract (Amount for the Responder) 0	10	20	30	40	50	60	70	80	90	100
1	50	20	20	20	20	20	20	20	20	20	20	20
2	20	20	20	20	20	20	20	20	20	20	20	20
3	30	0	20	20	20	20	20	20	20	20	20	20
4	20	0	10	20	20	20	20	20	20	20	20	20
5	10	0	10	20	20	20	20	20	20	20	20	20
6	40	0	5	20	20	20	20	20	20	20	20	20
7	20	0	0	20	20	20	20	20	20	20	20	20
8	30	0	0	20	20	20	20	20	20	20	20	20
9	40*	0	0	0	0	0	20	0	0	0	0	0
10	60	0	11	12	13	14	15	16	17	18	19	20
11	30	0	2	4	16	18	19	12	14	16	18	20
12	40*	0	2	4	6	8	10	12	14	16	18	20
13	40	0	2	4	6	8	10	12	14	16	18	20

Notes: Column 1 presents the game number, column 2 the amount proposed to the responder in this game, and the rest of the columns the corresponding contracts. Rejected proposals are marked with an asterisk.

TABLE A8 The Contracts of the Game with Optional Delegation

Number	Actual Proposal	Contract (Amount for the Proposer) 0	10	20	30	40	50	60	70	80	90	100
1	50	0	0	0	10	15	20	15	15	15	15	20
2	50	0	0	0	0	10	20	20	20	10	0	0
3	60	0	0	0	0	0	0	20	20	20	20	20
4	60	3	6	9	12	15	18	20	20	20	20	20
5	60	0	0	0	0	0	0	20	0	0	0	0
6	70	0	0	5	5	10	10	15	20	20	20	20
7	70*	0	0	0	0	0	10	12	15	20	20	20
8	60	10	10	10	10	12	14	16	18	20	20	20
9	50	0	0	0	0	0	10	0	0	20	20	20
10	70	0	0	0	0	0	5	10	15	20	20	20
11	70	0	0	0	0	0	0	15	18	20	20	20
12	80	0	0	0	0	0	0	0	0	20	0	0
13	70	5	5	5	5	10	10	10	15	15	20	20
14	60	0	2	4	6	8	10	12	14	16	18	20

Notes: Column 1 presents the game number, column 2 the proposal in this game, and the rest of the columns the corresponding contracts. Rejected proposals are marked with an asterisk.

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