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Cheap talk in bargaining experiments: lying and threats in ultimatum games

Rachel Croson [a,*], Terry Boles [b], J. Keith Murnighan [c]

[a] *The Wharton School, University of Pennsylvania, Philadelphia, PA 19104-6366, USA*
[b] *Henry B. Tippie College of Business, University of Iowa, Iowa City, IA, USA*
[c] *Kellogg Graduate School of Management, Northwestern University, Evanston, IL, USA*

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Abstract

In most models of bargaining, costless and unverifiable lies about private information and incredible threats about future actions are considered cheap talk and do not impact outcomes. In practice, however, this type of talk is often an integral part of bargaining. This experiment examines the impact of cheap talk in an ultimatum bargaining setting with two-sided imperfect information. In contrast to previous work, the experiment provides an opportunity for deceptions to be revealed and punished. Results show that lies about private information and (incredible) threats of future actions do influence bargaining outcomes (offers and responses) in both the short- and long-term.

JEL classification: C9: laboratory experiments; C72: non-cooperative games

Keywords: Experimental bargaining; Ultimatum games; Cheap talk

1. Introduction

Economic models of bargaining behavior and actual bargaining behavior are often at variance with one another. In most models of bargaining, costless and unverifiable statements about private information and incredible threats about future actions are modeled as cheap talk and are only expected to affect beliefs and outcomes in specific situations. And, while cheap talk has been shown to be effective in coordination and coordination-like games (see Farrell and Rabin, 1996 for a review), in models of bargaining its impact on outcomes is limited to situations where the game is infinitely repeated

* Corresponding author. Tel.: +1-215-898-3025; fax: +1-215-898-3664.
E-mail address: crosonr@wharton.upenn.edu (R. Croson).

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(Kim, 1996) or when satisfactory talk is a necessary prelude to negotiations, which essentially transforms bargaining into a coordination game like chicken (Farrell and Gibbons, 1989).

In practice, however, cheap talk is often an integral part of bargaining. Many bargainers engage in cheap talk to give themselves an advantage. For instance, claims about other options or one's willingness to walk away are common bargaining tactics (Lewicki et al., 1994). Other experiments also suggest that cheap talk may matter in other, non-coordination settings (Bottom et al., 2000; Brandts and Charness, 1999). In this paper, we experimentally investigate the impact of cheap talk (especially lying and threats) in ultimatum bargaining games.

Lies and threats generally fall into the category of deception (Lewicki et al., 1994; Murnighan, 1991). Previous literature on the consequences of deception in bargaining is sparse, focusing primarily on Nash bargaining with asymmetric information (Roth and Murnighan, 1982, 1983; Schweitzer and Croson, 1999). In the current experiment, participants played a non-cooperative ultimatum bargaining game, with two-sided imperfect information. The procedure gave participants the opportunity to misrepresent their private information via cheap talk. We find that threats and undiscovered lies significantly affect offers and responses in these games. This paper focuses on the impact of cheap talk, particularly deceptive cheap talk, on bargaining outcomes. A companion paper, Boles et al. (2000) presents additional, psychologically-oriented results on the impact of cheap talk on the negotiating process.

The remainder of this paper is organized as follows. Section 2 reviews previous experiments, on ultimatum and cheap talk games, respectively. Section 3 presents our experimental design and implementation. A brief review of alternative models of behavior and their implications in this setting is found in Section 4, along with hypotheses for our experiment. Section 5 presents the results and Section 6 concludes.

2. Prior experiments

Most of the previous experiments on the effects of cheap talk have focused on its impact in coordination games (see Crawford, 1998 for an excellent review). Section 2.2 reviews experimental results from the limited number of cheap talk bargaining experiments. Section 2.1 discusses experimental results from ultimatum bargaining games like ours.

2.1. Ultimatum games

2.1.1. Perfect information

An ultimatum game involves two players, the proposer and responder, and a known amount of some resource (the pie) that they divide. Typically, the pie is a sum of money. The proposer moves first by proposing a division of the pie to the responder. The responder then accepts or rejects the proposer's offer. If the offer is accepted, the pie is divided as the proposer suggested. If the offer is rejected, neither player receives anything. Either outcome ends the game. The traditional ultimatum game has a continuum of Nash equilibria and a

unique subgame perfect equilibrium (Selten, 1975) with proposers offering the smallest amount possible (ε) and responders accepting.[1]

This outcome is rarely observed in the laboratory. In most ultimatum game experiments, offers are much larger than predicted and not all offers are accepted. Typically, offers out of US$ 10 pies average US$ 3–4 and offers under US$ 3 are often rejected.[2] A number of models have been developed to explain and organize these results. Some focus on participants' concerns for their own and other's payoffs (Bolton, 1991; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), others incorporate the counterpart's intentions into the payoffs of the bargainer (Rabin, 1993; Falk and Fischbacher, 1999; Segal and Sobel, 1999; Charness and Rabin, 2000).

Several previous experiments have extended the ultimatum game by providing one of the bargainers with an outside option that they receive if an offer is rejected. Buchan et al. (1998), who used international subjects, gave proposers an outside option if their offers were rejected (set to approximately US$ 3 out of 10 rather than zero). The availability of an outside option to the proposer does not change the subgame perfect equilibrium in this game; it remains for the proposer to offer ε and for the responder to accept. Yet, in the United States, the existence of the proposer's outside option decreased proposers' offers and responders' demands, while this effect was reversed in Japan.

In contrast, Kahn and Murnighan (1993) investigated an alternating-offer game with an outside option for responders. Responders received their outside option if they rejected an offer and opted out of the bargaining or if the probabilistic termination mechanism ended the game. In this game, responder's outside options do change the equilibrium predictions: when the outside option is 10 percent of the pie the subgame perfect equilibrium suggests that the proposer offer 10 percent $+ \varepsilon$ and the responder accept. The data showed, however, that players did not react to their counterpart's outside options as predicted. Instead, proposers in weak positions offered amounts that did not fully reflect their relative lack of power, i.e. they offered less than expected to powerful responders.

2.1.2. Imperfect information

In addition to giving responders outside options, our experiment deviates from the traditional ultimatum game by incorporating two-sided imperfect information. A number of previous experiments have examined ultimatum games with one-sided incomplete information, primarily by making the size of the pie unknown to the responder (e.g. Mitzkewitz and Nagel, 1993; Kagel et al., 1996; Straub and Murnighan, 1995; Croson, 1996a; Rapoport et al., 1996; Rapoport and Sundali, 1996). These studies consistently show that proposers make (and responders accept) significantly lower offers when responders do not know the size of the pie and when this lack of information is common knowledge.

One previous study (Pillutla and Murnighan, 1996) examined the effect of incomplete information about the pie size in the presence of (known) outside options. They investigated

[1] If the responder accepts when indifferent, the subgame perfect equilibrium becomes $\varepsilon = 0$.

[2] These results are not an artifact of the size of the pie. In Hoffman et al. (1996) ultimatums played with US$ 100 pies led to similar results. Ultimatum games played with large pies in Slovakia (Slonim and Roth, 1998) and Indonesia (Cameron, 1999) also identified similar outcomes. Davis and Holt (1993) and Roth (1995) provide excellent reviews of ultimatum game experiments.

responders' choices to accept or reject small offers. Responders had either a small outside option (US$ 1 or 2) or no option; they all received offers of US$ 1 or 2 from a known or unknown pie of US$ 20. Rejections were frequent and, controlling for the size of the offer, increased with responders' information about the size of the pie.

Our study extends this previous experimental research in several ways. First, we describe outcomes in ultimatum bargaining with two-sided incomplete information. We compare conditions where the pie size is known or unknown and the outside option size is known or unknown. Second, and the main focus of the study, we give participants the opportunity to engage in cheap talk and make claims about their private information. We focus primarily on the short- and long-term consequences of deceptive (untrue) claims.

2.2. Cheap talk bargaining experiments

Most previous experiments on cheap talk have focused on its impact in coordination games (Crawford, 1998). Two previous experimental papers, however, explicitly look at the impact of cheap talk on bargaining outcomes.

Forsythe et al. (1991) ran a bargaining game with incomplete information. The size of the pie could be either large or small; one bargainer was informed of its size and the other knew only the probability distribution. They compare an experimental design with no cheap talk (each subject sends an offer/demand describing how much the uninformed player will get, one of which is chosen randomly to be implemented), to one with cheap talk (both subjects can send messages including offers/demands; if one is accepted before time runs out then this division occurs, but otherwise both players receive nothing). This paper finds no significant effect of communication via cheap talk. Neither the divisions of the pie nor the disagreement probabilities (in the first treatment, when offers $<$ demands) differed between the two treatments.

In contrast, Valley et al. (1998) find that cheap talk helps bargainers. They examined a bargaining game of asymmetric information based on the "acquiring a company" exercise (Bazerman and Samuelson, 1983). They compared negotiated outcomes when bargainers communicated face-to-face, by phone, or in writing, and found many agreements, in contrast to the equilibrium prediction of no agreements. They also found more beneficial agreements for both parties as communication opportunities increased, suggesting that rather than using talk deceptively, bargainers used the opportunity for communication to create gains from trade where none would otherwise exist.

Both of these papers investigated the impact of the *existence* of cheap talk communication on bargaining outcomes, but neither examined the relationship between the *content* of the talk and outcomes. Our research explicitly investigates this relationship.

3. Experimental design and parameters, procedures and measures

Our experimental design uses a finitely repeated ultimatum game with an outside option for the responder and two-sided asymmetric information (about that outside option for the proposer and about the size of the pie for the responder). Proposers and responders have the opportunity to send (costless) messages to each other, making claims about their private

information and their future actions. Our analysis focuses on the impact of the content of these claims on bargaining outcomes.

3.1. Experimental design and parameters

In this experiment, responders received outside options in the case of rejection but proposers did not (as in Pillutla and Murnighan, 1996; Kahn and Murnighan, 1993). Thus, if responders rejected an offer, the proposers received zero and responders received their option. If responders accepted an offer, they received what they were offered and proposers received the remainder of the pie.

Proposers and responders bargained with each other four times without changes in their roles or their partners. The pie and the outside option amounts varied in the following way across rounds.

	Pie amount (US$)	Outside option amount (US$)
Round 1	27	2
Round 2	47	3
Round 3	25	5
Round 4	13	1

The parties had either known or unknown information about the amounts to be divided (the pie) and the amounts of the outside options. In the known conditions, proposers knew the values of the outside options and responders knew the pie sizes. In the unknown conditions, the proposer was the only party informed of the pie size and the responder was the only one informed of the outside option amount, or both. When responders did not know the size of the pie, they knew that it could range from US$ 10 to 50; when proposers did not know the size of the outside option, they knew that it could range from US$ 1 to 8. Each party had common knowledge about the other party's information and these distributions; no one was uncertain about what their counterparts knew or did not know.

All participants were told that they would play two games with the same partner. After the second game, they were offered the opportunity to play two more games. This manipulation was modeled on the experiment presented in Andreoni (1988) and replicated in Croson (1996b) where subjects in a public goods game were unexpectedly offered the opportunity to play again with the same partners. Subjects in those experiments and in this one were never explicitly told anything that was untrue. In this experiment, they did indeed play two games with the same partner as the instructions described. And, had they preferred, they could have chosen to end the session then. As in previous research, however, subjects unanimously chose to continue with another two games.

When information was unknown (three treatments), there was one additional variation. After the first two games, but before the last two, all previously private information was unexpectedly revealed to half of the participants. The other half never learned this private information.

The experiment, then, included seven experimental treatments. In the known treatment, both pie size and outside options were known by both parties. In the unknown pie treatment, both parties knew the size of the outside option, but only the proposer knew the

size of the pie and that information was never revealed. In the unknown outside option treatment, both parties knew the size of the pie, but only the responder knew the size of the outside option and that information was never revealed. In the both unknown treatment, both types of information were private and never revealed. In three additional treatments, unknown pie revealed, unknown outside option revealed, unknown both revealed the actual pie or outside options sizes or both from rounds 1 and 2 were revealed to all parties after round 2. In rounds 3 and 4, in all three of these conditions, information about pie sizes, outside options, or both was not revealed until after the experiment was completed.

In addition to two-sided incomplete information, the experimental design extends previous ultimatum game studies by allowing cheap talk. Responders sent a written message to their proposer before receiving an offer, allowing them to make threats, claims about their outside option, or other demands. Proposers could respond with a message of their own, in conjunction with their offer, allowing them to make claims about the size of the pie, the fairness of their offer, to call threats, or to respond to responders' threats. After receiving the offer, responders could accept or reject it. Fig. 1 depicts the timeline of actions in the experiment.

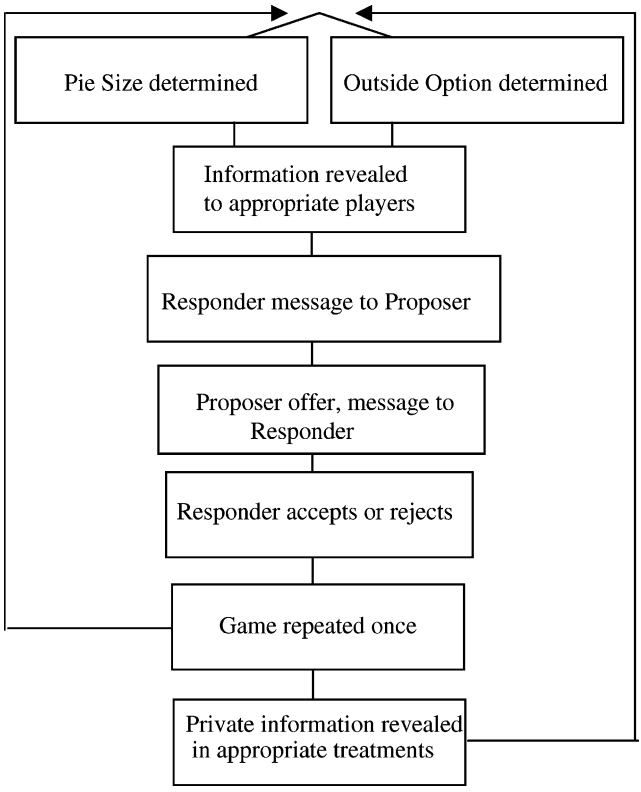

Fig. 1. Experimental timeline.

3.2. Experimental procedures

Participants were 220 undergraduate business students (111 male, 109 female) at a large Midwestern University who volunteered and received cash payments for their participation. Participants' ages ranged from 19 to 47 with a mean of 21.

Experimental sessions lasted 90 min and included from 8 to 18 participants. Participants came to a networked computer laboratory and were randomly assigned to stations that had physical barriers in front and on both sides. Each pair of linked terminals, one for the proposer and one for the responder, was associated with a different experimental condition.

Participants received an oral and written overview of the experimental procedure. They were told that they would be participating with the same partner in two negotiations, that their interactions would be conducted via computer, that the other person would remain anonymous to them, that they would be randomly assigned to the roles of proposer or responder, and that one of their two negotiations would be randomly selected to be paid. Participants played the same role (proposer or responder) in the same information treatment for all negotiations. All participants were aware that pie sizes could range from US$ 10 to 50 and outside options could range from US$ 1 to 8. Where appropriate, participants saw the true values of the pie, the outside option, or both on their screens and were told that their partners had (or had not) seen those same values.

We randomly selected one of the first two bargaining games in each experimental session to be paid for real money. After being notified of this result, participants in the revealed conditions were told the pie sizes and/or outside options for the first two negotiations. Then all participants completed a short questionnaire. To participants, this appeared to be the end of the experiment. However, the experimenter then noted that time remained and two more rounds of negotiation could be played with the same partner (the same restart manipulation as had been used in Andreoni, 1988; Croson, 1996b). The procedures were the same as before and one of the next two negotiations was also paid. All participants faced the same information conditions (were in the same treatment) with the same partners, playing the same roles in the second set of two games. Although participants did not know any of these details in advance, they all willingly agreed to participate for two more rounds.[3]

The same procedures were used for the second pair of negotiations. Another roll of the die determined which of the final two negotiations would be paid, pie and outside amounts were again revealed in the appropriate conditions, and another questionnaire was administered.

Average payments were US$ 27.37 (S.D. = US$ 10.91) to proposers and US$ 21.26 (S.D. = US$ 7.84) to responders for a 90 minute experiment. To protect their anonymity, participants were paid individually, in a separate cubicle at the end of each session. Questions were invited and all received a thorough debrief after the completion of the experiment.

3.3. Experimental measures

In addition to the traditional measures of interest in ultimatum games (amounts offered, accept/reject decisions), we recorded the proposers' and responders' messages. While

[3] This surprise restart appeared to be effective. The experiments were conducted over a short time-frame and subjects agreed not to share the details of the experiment with anyone, signing a non-disclosure form in exchange for receiving their payment. No subject indicated that they had expected the opportunity to play again.

theoretically, these statements are all cheap talk, we were particularly interested in whether they had real (payoff-relevant) consequences. Thus, we coded the transcripts for the following variables.

Responder or proposer deceit: A 0 was assigned if a message included no lying or deception; a 1 for deception (either misrepresenting the relative size of the outside option or pie and/or the fairness of the offer) or for an outright lie (saying the outside offer or the pie was a specific incorrect amount).

Responder threats: A 0 was assigned if responders made no threat; a 1 for a threat, either mild (e.g. the responder reminds the proposer that if they reject the proposer's offer the proposer will receive nothing) or direct (e.g. "if you don't offer me X, I'll reject your offer").

Calling threats: A 1 was assigned if the proposer offered an amount less than a responder demanded. A 0 was assigned otherwise. Threats could only be called if responders had demanded a specific amount.

Two raters independently coded the negotiations of the first 30 dyads (120 negotiations). The correlation of their ratings was 0.95 (Cronbach's alpha). After discussion, reliability increased to 0.98. One rater then coded the remaining 320 negotiations.

4. Models of behavior and hypotheses

4.1. Traditional equilibrium models

Traditional equilibrium analysis of these games suggests that when the responder's outside option is known, proposers should offer responders that outside option plus a small amount ε. When the outside option is unknown, however, and uniformly distributed between 0 and US$ 8, as in our experiment, and when responders accept all offers strictly above their outside option, the probability that an offer of US$ Y will be accepted is $Y/8$ (the probability that the responder's outside option is less than a given offer Y). Thus, the proposer's expected profit from an offer Y with a pie of size P is as follows:

$$(P - Y) \times \tfrac{1}{8} Y$$

The first term represents the amount that they will earn if their offer is accepted. The second term represents the probability that a given offer will be accepted.

To maximize expected profit (if proposers are risk-neutral), proposers should maximize the above expression, subject to two constraints. First, the probability of acceptance cannot exceed 1 ($Y/8 \leqslant 1$) and second, the amount offered must be less than the size of the pie ($Y \leqslant P$). Taking the first derivative and setting it equal to zero, we get $P/8 - 2Y/8 = 0$ and $Y = P/2$. Thus, the sub-game perfect equilibrium of this game is an offer of either half the pie or the highest possible outside option (US$ 8), whichever is smaller (the second constraint, that the offer be smaller than the pie size, does not bind).

For this experiment, equilibrium offers were US$ 6.50 when the pie was US$ 13 (round 4) and US$ 8 for all other pie sizes. Note that traditional equilibrium analysis can generate high offers in this incomplete information setting without the additional assumptions of either risk-averse proposers or responders who are concerned with relative payoffs. Traditional

equilibrium models assume, however, that cheap talk should not affect offers and responses, and thus, they should not be altered by claims about the pie size or the amount of the outside option.

4.2. Fairness and intentionality preferences

Several recent models of strategic behavior hypothesize preferences that incorporate fairness and intentions. However, even these models do not offer a role for cheap talk on bargaining outcomes. Models that focus on preferences for fairness, such as relative payoffs (e.g. Bolton, 1991; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), portray players as caring not only about their own payoffs, but also about their payoffs relative to other players. In these models, cheap talk might be thought to affect bargaining outcomes in two ways. First, and most straightforwardly, the players might engage in cheap talk about their private information. For example, the proposer might claim to have been given a small pie, making a small offer appear to the responder to be a more equal division of the pie than it actually is. For this cheap talk to be effective, the responder must be more likely to accept when it is present than when it is not. But if this talk increases acceptance rates (holding offers fixed), all proposers have an incentive to claim to have a small pie, and talk again reverts to being simply cheap. A parallel argument can be made for cheap talk by responders about outside options sizes.

Second, players might engage in cheap talk about their preferences. For example, responders might be tempted to signal their preference for fairness to proposers (perhaps using threats of rejection) and induce proposers to offer a larger amount. However, again, if these signals are effective in generating higher offers, all responders (even those who care only about their own payoffs) should imitate the fairness-loving responders, making their talk cheap. A parallel argument can be made for cheap talk by proposers about their preferences. When the size of the pie is unknown, claiming to be a fairness-loving type might suggest to the responder that the offer being made is fair. Yet, if this cheap talk is effective in inducing responders to accept lower offers, all rational proposers should engage in it.

Other models assume that the intentions of the other party impact utilities in bargaining. For example, Rabin (1993), Falk and Fischbacher (1999), Segal and Sobel (1999) and Charness and Rabin (2000) posit that bargainers make attributions about the intentions of their partners when deciding how to act. If a responder believes the proposer is treating her "unfairly," she might prefer to reject an offer. Again, one might imagine two types of cheap talk in these models. First, there is talk about the size of the pie or the outside option that is intended to lead counterparts to make more favorable attributions about the talker's intentions. However, if this kind of talk is effective, all proposers and responders should be motivated to use it, rendering it again cheap. Second, players might engage in cheap talk about their intentionality preferences, e.g. responders threatening to reject offers if they are not treated fairly. Again, the pooling problem remains; if these signals are effective at increasing offers, then participants who do not have intentionality preferences have an incentive to mimic those who do, erasing the effect of cheap talk on bargaining outcomes. Thus, in neither classical models nor fairness or intentions-based models does cheap talk affect bargaining outcomes.

4.3. When cheap talk matters in bargaining

As Farrell and Rabin (1996) point out, in some games—primarily games of coordination or with coordination-type structures—cheap talk can matter. For example, Farrell and Gibbons (1989) transform a bargaining game to one that resembles a coordination game (a game of chicken). Before bargaining each player simultaneously announces whether (s)he is interested in transacting at all. Only, if at least one party is interested does bargaining occur. The authors show conditions under which cheap talk in this pre-bargaining game (particularly, claiming not to want to trade when you actually do) can influence bargaining outcomes. Because the pre-bargaining communication we use is not of the same type as that used by Farrell and Gibbons (1989) their model cannot predict the impact of cheap talk on outcomes in this experiment.

While economic theories predict that cheap talk will have no effect on bargaining in this setting, psychological theories and other experimental research suggest that it might. The extensive literature on persuasion, for instance, is based on the notion that costless talk can be effective in moving people away from their own opinions and closer to a speaker's (e.g. Hovland et al., 1953; Eagly and Chaiken, 1992).

The literature on individual decision making also suggests that people can be influenced, even by others whom they think of as competitors. Most notable here may be the anchoring and insufficient adjustment bias (Tversky and Kahneman, 1973), which implies that even disregarded cheap talk can subtly influence an individual's decisions. The presentation of a number by a bargaining opponent, whether it be the list price of a car or a percentage of the pie that a responder demands, can lead counterparts to anchor on that number. Their decision (e.g. how much to offer) will be influenced by that anchor, even though they recognize the self-interest which prompted it and do not accept it as a reasonable suggestion.

More recently, two papers present experimental evidence of how cheap talk can influence outcomes in games more generally. In Brandts and Charness (1999), participants playing a normal-form game send a message about their intended actions before they play. After the outcome has been determined, the message-recipient has a costly opportunity to punish the message-sender. The results indicate that participants are willing to punish counterparts who send false messages. On a more positive note, Bottom et al. (2000) demonstrate the impact of cheap talk in prisoners' dilemma games. Participants who experienced an unexpected defection by their counterpart received one of several kinds of penance, including a simple apology (conceptualized as cheap talk) or an apology plus a substantive payment by the defector. The results show that cheap talk alone (the apology) increased the likelihood of future cooperation. While the apology was not as effective as the apology plus substantive penance, it was considerably better than nothing.

These findings suggest that people are relatively easily influenced by cheap talk. In the current context, this means that cheap talk may well have an impact on bargaining outcomes, even though economic models suggest that it will not.

4.4. Hypotheses

Our hypotheses about cheap talk are divided into the short- and long-term effects of cheap talk on bargaining outcomes.

4.4.1. Short-term effects of cheap talk

Our first set of hypotheses suggests that cheap talk (misrepresentation and threats) has an effect on bargaining outcomes (offers and responses) in the short-term.

Hypothesis 1. Responders who misrepresent the size of their outside option will receive higher offers than those who do not.

Hypothesis 2. Responders who threaten to reject low or unfair offers will receive higher offers and, controlling for offer size, will reject more offers than those who do not.

Hypothesis 3. Proposers who misrepresent the size of the pie will make lower offers and, controlling for offer size, be equally likely to have them accepted than those who do not.

We use data from the first two ultimatum games to test these hypotheses, before any private information or misrepresentations are revealed.

4.4.2. Long-term effects of cheap talk

If bargainers discover that their counterparts' statements were untrue, however, cheap talk may backfire. Bargainers who have been misled are often angry and spiteful (Pillutla and Murnighan, 1996). Furthermore, they may make attributions about their counterparts which will lead them to offer less or reject otherwise acceptable offers (Rabin, 1993).

Hypothesis 4. Responders who misrepresented the size of their outside option and whose misrepresentations were revealed will receive lower subsequent offers than those who did not.

Hypothesis 5. Responders who previously threatened to reject low offers and whose threats were called will receive lower subsequent offers and, controlling for offer size, will be more likely to accept them, than those who did not.

Hypothesis 6. Proposers who misrepresented the size of the pie and whose misrepresentations were revealed will subsequently make bigger offers and, controlling for offer size, will suffer more rejections than those who did not.

We use data from the last two ultimatum games to test these hypotheses after any private information and misrepresentations are revealed.

5. Results

5.1. Descriptive statistics

5.1.1. Outcomes

The outcome data in this study are consistent with those from other ultimatum bargaining games. Table 1 depicts offers and acceptance rates in each of the conditions, averaged across

Table 1
Average offers and acceptance rates, all rounds

Treatment (pie/outside option)	Average offer (US$/percent)	Acceptance rate (percent)
Known/known	11.46 / 41.5	90.0
Known/unknown	13.42 / 49.2	88.5
Known/unknown revealed	12.59 / 45.7	94.2
Unknown/known	12.15 / 43.9	90.4
Unknown/unknown	12.06 / 46.1	76.9
Unknown/unknown revealed	10.52 / 39.3	82.1
Unknown revealed/known	11.37 / 42.0	84.6
Unknown revealed/unknown	11.61 / 43.5	84.4
Unknown revealed/unknown revealed	12.96 / 48.4	91.7

participants and rounds. Offers and responses in the control condition (known pie/known outside option) are quite close to those found in previous ultimatum studies (Roth, 1995). Across conditions, proposers offered somewhat less than half the pie (44.7 percent) and most responders (87 percent) accepted.

The data also replicate comparative static results from previous studies. For example, offers increased as the pie increased: for pie sizes of (US$ 27, 47, 25, and 13), the mean offers were (US$ 11.22, 19.04, 13.04, and 6.54). The correlation between pie and offer sizes was significant and positive (0.78, $P < 0.01$).

The data also replicate previous findings for the effects of asymmetric information on offers. In rounds 1 and 2, when the size of the pie was unknown to the responders, proposers offered an average of US$ 14.71. When the size of the pie was known, they offered more (an average of US$ 16.00; $t = 1.94$, $P = 0.054$). In the first two rounds when the outside option was known, proposers' average offer was US$ 14.50; when the outside option was unknown, they offered more but not significantly more (an average of US$ 15.44; $t = 1.34$, $P = 0.182$). On the responder's side, less generous offers were rejected more often than more generous offers: the average accepted offer was US$ 12.35, the average rejected offer was US$ 10.35 ($t = 3.39$, $P < 0.01$).

5.1.2. Cheap talk

Many participants engaged in cheap talk. Table 2 describes the frequency of lying (by proposers and responders), threats (by responders), and called threats (by proposers).

Proposers and responders lied about equally often. They both lied more often in the first two rounds (before any revealing of the private information had occurred) than in the last

Table 2
Frequency of cheap talk behaviors, all treatments

	Round 1 (percent)	Round 2 (percent)	Round 3 (percent)	Round 4 (percent)	All (percent)
Proposer lies	15	19	11	9	14
Responder lies	22	15	5	14	14
Responder threats	55	53	46	42	49
Threats called	20	22	37	50	31

Table 3
The short-term effects of cheap talk on offers (US$) and accept/reject decisions (rounds 1 and 2)

	OLS regression			Logistic regression		
	1	2	3	4	5	6
Responder lie	0.76*	0.93*	0.88*	−0.09	−0.33	−0.43
Responder threat	0.45+	0.56+	0.52+	−0.42+	−0.61*	−0.78**
Proposer lie	−1.49**	−1.38**	−1.52**	0.13	0.03	0.09
Intercept	0.88	1.07	1.06	−0.44	−0.89	−0.23
Pie known		0.07			0.32	
Outside option known		−0.63*			0.66*	
Treatment dummies	No	No	Yes	No	No	Yes
Pie	0.39**	0.39**	0.39**	0.00	0.00	0.00
Offer (US$)				0.13*	0.17**	0.18**
R^2 (adjusted)	0.48	0.48	0.50	0.09	0.13	0.23
n	220	220	220	220	220	220

+ $P<0.10$.
* $P<0.05$.
** $P<0.01$.

two rounds. Responders threatened to reject small offers about half the time. Proposers called about 30 percent of those threats and made lower offers.

5.2. *Short-term effects of cheap talk*

We tested the first set of hypotheses with regression analyses. Table 3 presents the results of six regressions that vary the dependent variables and the exact specification of the controls. The first three regressions describe offers made and the second three, accept/reject responses to those offers.

Independent variables in all regressions include indicator variables for whether the proposer lied, whether the responder lied, whether the responder threatened, and the size of the pie. Regressions 2 and 5 add controls for whether the pie and outside option were known. Regressions 3 and 6 add controls in the form of dummy variables for each treatment, where pie size and outside options, originally unknown and then revealed is the excluded treatment. Additionally, the size of the offer is included as a further control in regressions on the accept/reject decision.

Overall the regressions are quite consistent, with only small parameter changes from one specification to the next. Results demonstrate that responder lies about their outside options significantly increased the offers they received, consistent with Hypothesis 1. Consistent with Hypothesis 2, responder threats (marginally) increased offers and significantly reduced the probability of acceptance.[4] Consistent with Hypothesis 3, proposer lies were accompanied by significantly lower offers with no change in the probability of acceptance.

[4] Notice that responders' rejection of an offer is not cheap, but costly. However, the verbal threat to reject an offer is itself not costly, but cheap (there is no cost to issuing the threat and proposers cannot tell, ex ante, whether a threatening responder will actually reject a low offer).

One interesting question goes beyond the main effect of deception to explore the interaction effect of deception. In particular, what happens when both proposers and responders lie? In our experiment, this could only occur in four of the seven treatments where both parties' private information is unknown. We restrict our analysis to those treatments and first look at the correlation between proposer lies and responder lies. This correlation is positive, but quite small and not statistically significant (0.1068, $P = 0.3002$). A further analysis replicates regressions 3 and 6 from Table 3 including the additional independent variable of the interaction of proposer lies and responder lies. These regressions show no significant impact of that interaction and are consistent with the results presented in Table 3.

Overall, our results demonstrate that in this setting cheap talk has real, short-term outcome consequences. Responder threats and lies increased the size of offers made, while proposer lies decreased them.

5.3. *Long-term effects of cheap talk*

Tests of the long-term effects of cheap talk, Hypotheses 4–6, used offers and responses in rounds 3 and 4. Table 4 presents the results of a series of regressions that are similar to those presented in Table 3, with the same controls as before. The variables of interest, however, are whether a bargainer lied in rounds 1 or 2, whether that lie was revealed (proposer lie revealed, responder lie revealed) and whether responders threatened and had their threats called in rounds 1 or 2.

Responder revealed lies led to smaller, but not significantly smaller offers, a result that is directionally consistent with Hypothesis 4. In contrast, proposer revealed lies led to significantly larger offers in rounds 3 and 4, and lying proposers' offers (controlling for size) were also rejected significantly more, both consistent with Hypothesis 6. The data provide no support for the impact of called threats on subsequent offers or responses (Hypothesis 5).

Table 4
The long-term effects of cheap talk on offers (US$) and accept/reject decisions (rounds 3 and 4)

	OLS regression			Logistic regression		
	1	2	3	4	5	6
Responder lie revealed	−0.02	−0.07	−0.11	0.34	0.33	0.80^{+}
Responder threat called	0.04	0.02	0.01	−0.36	−0.38^{+}	−0.37
Proposer lie revealed	0.35*	0.42*	0.40*	−0.93**	−0.86**	−1.28**
Intercept	1.49*	1.48*	1.56*	−2.01**	−2.15**	−1.54*
Pie known		0.12			0.18	
Outside option known		−0.17			0.05	
Treatment dummies	No	No	Yes	No	No	Yes
Pie	0.41**	0.41**	0.41**	0.13	0.13	0.13
Offer (US$)				0.11**	0.18**	0.10**
R^2 (adjusted)	0.55	0.55	0.57	0.11	0.12	0.14
n	220	220	220	220	220	220

$^{+}$ $P<0.10$.
* $P<0.05$.
** $P<0.01$.

Cheap talk had a significant impact on offers and accept/reject decisions in these games. In particular, when proposer lies were revealed they both made higher subsequent offers and were less likely to have these subsequent offers accepted. Little or no effects were found for responder lies, likely due to the small size of outside options relative to the possible gains from trade.

6. Conclusions and discussion

In models of bargaining, costless and unverifiable lies about private information and incredible threats about future actions are considered cheap talk. In theory, cheap talk is only rarely expected to be effective in bargaining situations, i.e. when the game is infinitely repeated (Kim, 1996) or when satisfactory talk is a necessary prelude to negotiations, transforming the bargaining game into a coordination-like game (Farrell and Gibbons, 1989).

In contrast, the current experimental results document a new and important impact of cheap talk in bargaining. In particular, lies about private information and (incredible) threats of future actions influenced both short- and long-term bargaining outcomes. In the short-term, misrepresentations significantly affected offers made (proposer lies led to lower offers, responder lies led to higher offers and responder threats led to somewhat higher offers) and responses (responder threats led to more rejections, controlling for the offer received). In the long-term, misrepresentations that were revealed also significantly impacted outcomes (discovered proposers' lies both increased offers and decreased acceptances, controlling for offers).

The procedures we used in this experiment may be directly analogous to interactions on the Internet, particularly bargaining between anonymous parties who must guard against potential exploitation. At least one on-line auction house gives bidders and sellers each other's e-mail addresses so that they can exchange (supposedly private) information. Moreover, they also provide a forum for rating the honesty or integrity of prior bargaining partners, so that future partners have some sense of who can and who cannot be trusted. Like the setting in this research, misrepresentations about private information may hurt bargainers in the long run, if the misrepresentation is discovered and communicated to future bargaining partners (Glick and Croson, 2000).

Our results suggest that cheap talk influences bargaining more than would be expected by current theoretical models. First, cheap talk influences the decisions of one's bargaining counterpart. For example, responders who misrepresented the size of their outside option or threatened to reject low offers received higher offers than those who did not. This result suggests that bargainers may be less suspicious of cheap talk than models suggest they should be. This result, however, may be specific to inexperienced bargainers because our experiment only included inexperienced subjects. It is possible that as bargainers gain experience, cheap talk will once again become cheap.

Second, deceptive cheap talk that is discovered has a negative impact on one's future outcomes. This result suggests that bargainers who respond to cheap talk by changing their behavior are willing to punish deceivers, even though administering that punishment may be costly. This punishment provides some support for intentionality models (e.g. Rabin, 1993) and suggests that the perceived intentions of others have an impact on bargainer behavior.

They also suggest the possibility that anger over perceived unjust treatment may interfere with the attainment of economic benefit (Pillutla and Murnighan, 1996). New models that incorporate these and other factors could augment our understanding of the impact of cheap talk and the general dynamics of bargaining.

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References

Andreoni, J., 1988. Why free ride? Strategies and learning in public goods experiments. Journal of Public Economics 37, 291–304.

Bazerman, M., Samuelson, W., 1983. I won the auction but don't want the prize. Journal of Conflict Resolution 27, 618–634.

Boles, T., Croson, R., Murnighan, J.K., 2000. Deception and retribution in repeated ultimatum bargaining. Organizational Behavior and Human Decision Processes 83, 235–259.

Bolton, G., 1991. A comparative model of bargaining: theory and evidence. American Economic Review 81, 1096–1136.

Bolton, G., Ockenfels, A., 2000. ERC: a theory of equity, reciprocity, and competition. American Economic Review 90, 166–193.

Bottom, W., Daniels, S., Gibson, K., Murnighan, J.K., 2000. Resurrecting cooperation: the effects of explanations, penance, and relationships. Unpublished manuscript.

Brandts, J., Charness, G., 1999. Retribution in a cheap talk experiment. Universitat Pompeu Fabra Working Paper 437.

Buchan, N., Croson, R., Johnson, E., 1998. Understanding what's fair: contrasting perceptions of fairness in ultimatum bargaining in Japan and the United States. OPIM Working Paper 97-03-10. The Wharton School, University of Pennsylvania.

Cameron, L., 1999. Raising the stakes in the ultimatum game: experimental evidence from Indonesia. Economic Inquiry 37, 47–59.

Charness, G., Rabin, M., 2000. Social preferences: some simple tests and a new model. Universitat Pompeu Fabra Working Paper 441.

Crawford, V., 1998. A survey of experiments on communication via cheap talk. Journal of Economic Theory 78, 286–298.

Croson, R., 1996a. Information in ultimatum games: an experimental study. Journal of Economic Behavior & Organization 30, 197–213.

Croson, R., 1996b. Partners and strangers revisited. Economics Letters 53, 25–32.

Davis, D., Holt, C., 1993. Experimental Economics. Princeton University Press, Princeton.

Eagly, A., Chaiken, S., 1992. The Psychology of Attitudes. Harcourt Brace Jovanovich, San Diego.

Falk, A., Fischbacher, U., 1999. A theory of reciprocity. Working Paper 6. Institute for empirical Research in Economics, University of Zurich.

Farrell, J., Gibbons, R., 1989. Cheap talk can matter in bargaining. Journal of Economic Theory 48, 221–237.

Farrell, J., Rabin, M., 1996. Cheap talk. Journal of Economic Perspectives 10 (3), 103–118.
Fehr, E., Schmidt, K., 1999. A theory of fairness, competition, and cooperation. The Quarterly Journal of Economics 114, 817–868.
Forsythe, R., Kennan, J., Sopher, B., 1991. An experimental analysis of strikes in bargaining games with one-sided private information. American Economic Review 81, 253–278.
Glick, S., Croson, R., 2000. The existence and effect of reputations on negotiations. OPIM Working Paper 99-06-07. The Wharton School, University of Pennsylvania.
Hoffman, E., McCabe, K., Smith, V., 1996. On expectations and the monetary stakes in ultimatum games. International Journal of Game Theory 25, 289–301.
Hovland, C., Janis, I., Kelley, H., 1953. Communication and Persuasion: Psychological Studies of Opinion Change. Yale University Press, New Haven.
Kagel, J., Kim, C., Moser, D., 1996. Fairness in ultimatum games with asymmetric information and asymmetric payoffs. Games & Economic Behavior 13, 100–110.
Kahn, L., Murnighan, J.K., 1993. A general experiment on bargaining in demand games with outside options. American Economic Review 83, 1260–1280.
Kim, J.-Y., 1996. Cheap talk and reputation in repeated pretrial negotiation. Rand Journal of Economics 27, 787–802.
Lewicki, R., Litterer, J., Minton, J., Saunders, D., 1994. Negotiation. Irwin, Boston.
Mitzkewitz, M., Nagel, R., 1993. Experimental results on ultimatum games with incomplete information. International Journal of Game Theory 22, 171–198.
Murnighan, J.K., 1991. The Dynamics of Bargaining Games. Prentice-Hall, Englewood Cliffs, NJ.
Pillutla, M., Murnighan, J.K., 1996. Unfairness, anger, and spite: emotional rejections of ultimatum offers. Organizational Behavior & Human Decision Processes 68, 208–224.
Rabin, M., 1993. Incorporating fairness into game theory and economics. American Economic Review 83, 1281–1302.
Rapoport, A., Sundali, J., Seale, D., 1996. Ultimatums in two-person bargaining with one-sided uncertainty: demand games. Journal of Economic Behavior & Organization 30, 173–196.
Rapoport, A., Sundali, J., 1996. Ultimatums in two-person bargaining with one-sided uncertainty: offer games. International Journal of Game Theory 25, 475–494.
Roth, A., 1995. Bargaining experiments. In: Kagel, J., Roth, A. (Eds.), The Handbook of Experimental Economics. Princeton University Press, Princeton, pp. 253–348.
Roth, A., Murnighan, J.K., 1982. The role of information in bargaining: an experimental study. Econometrica 50, 1123–1142.
Roth, A., Murnighan, J.K., 1983. Information and aspirations in two-person bargaining. In: Tietz, R. (Ed.), Aspiration Levels in Bargaining and Economic Decision Making. Springer, New York, pp. 91–103.
Schweitzer, M., Croson, R., 1999. Curtailing deception: the impact of direct questions on lies and omissions. International Journal of Conflict Management 10, 225–248.
Selten, R., 1975. Reexamination of the perfectness concept for equilibrium points in extensive games. International Journal of Game Theory 4, 25–55.
Slonim, R., Roth, A., 1998. Learning in high stakes ultimatum games: an experiment in the Slovak Republic. Econometrica 66, 569–596.
Segal, U., Sobel, J., 1999. Tit for tat: foundations for preferences for reciprocity in strategic settings. Discussion Paper 99-10. University of California, San Diego.
Straub, P., Murnighan, J.K., 1995. An experimental investigation of ultimatum games: information, fairness, expectations, and lowest acceptable offers. Journal of Economic Behavior & Organization 27, 345–364.
Tversky, A., Kahneman, D., 1973. Availability: a heuristic for judging frequency and probability. Cognitive Psychology 5, 207–232.
Valley, K., Moag, J., Bazerman, M., 1998. A matter of trust: effects of communication on the efficiency and distribution of outcomes. Journal of Economic Behavior & Organization 34, 211–238.