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Partner Selection and the Division of Surplus: Evidence from Ultimatum and Dictator Experiments

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Abstract: We study ultimatum and dictator environments with one-way, unenforceable pre-play communication from the proposer to the recipient, semantically framed as a promise. After observing this promise regarding how much the proposer will offer if selected, in our treatment conditions, recipients choose whether or not to select a particular proposer. We find that offers can increase in the ultimatum game both with non-competitive selection with a single potential proposer, and more so with competition, where the recipient chooses one of two potential proposers, as compared to the no selection baseline. Furthermore, the offer is rejected with higher probability if the promisemade by the selected proposer is higher than the eventual offer. Our dictator environment does not give the power to reject offers, thus selection power carries no benefits in the dictator game. Finally, independent of the game institution or proposer selection mechanism, promises provide credible signals for offers.

Keywords: dictator and ultimatum games; non-binding communication with intent; partner selection; competing promises; credibility and credulity

JEL Classification codes: C78; C91; D03

1. Introduction

Analysis of bargaining usually proceeds on the assumption that a partnership has been formed. Sometimes, however, agents can choose whether to enter into a partnership, or whom to select as partner. In any bargaining situation, or productive enterprise where a partner is necessary, one would imagine that an economic agent would be careful about with whom to enter into partnership. This is especially so if the agent were the ex post weaker party. Yet the choice often has to be made on the basis of little more than non-binding assurances or promises regarding action consequent upon entering the partnership. Selecting a partner under such conditions may thus become an issue of concern. Indeed, determining what an agent believes when she hears promises, or how she selects upon hearing one or more promises, or whether such selection power is valuable, are of importance in understanding the partnership-formation process and the division of the resultant gains from trade.

For example, think of a homeowner wishing to engage a contractor to remodel her home. Many appear suitable given price, reputation and technical capacity. In this situation, she may have to choose one on the basis of promises regarding the possibilities of delays, cost-overruns, and substandard work, knowing that these are not binding, and also that it is difficult to change contractors mid-way. Think of a supplier of intermediate goods, for example, who is thinking of entering into a relationship with a producer of final goods. There are sunk costs of reorienting production lines, making it difficult to change partnerships once one has been entered into. No matter how reputed the

producer, the supplier will have to bear in mind at the time of deciding that promises regarding the likelihood of various hold-up problems that may arise in the future can be broken.

How does an agent decide in such situations, *i.e.*, what does she infer about intent on receiving a promise? Are partnerships preferred with those who promise more? Does the power to select a partner actually benefit the agent? Do such benefits, if any, depend on the mode of selection? What about promissors: do they display tendencies to keep promises once selected as partner?

In this paper, we report results from asymmetric bilateral bargaining experiments, using ultimatum and dictator games, designed to address these questions. Specifically, we analyze the impact of allowing the weaker party or recipient to select her partner or proposer on the division of surplus in the ultimatum and also the dictator game. Selection in our treatment conditions is done on the basis of pre-play communication: any potential proposer sends a promise about how much he will offer to the recipient if selected, *i.e.*, if given the right to propose. It is common knowledge that promises are not binding.

In our baseline ultimatum condition, there is a single potential proposer who sends a promise but faces no selection pressure, *i.e.*, the recipient is bound to award him the right to propose. Our two treatment conditions allow two different modes of selection. In the first, selection is non-competitive. There is a single potential proposer who sends a promise, and the recipient decides after obtaining the promise whether to select or refuse him, with the game ending and both parties getting nothing in the event of refusal. In the second, selection is competitive. There are two potential proposers each of whom sends a promise. The recipient decides after obtaining the promises which one of them to select.

Given that promises are not binding, the subgame perfect equilibrium outcome is invariant across the conditions and is the same as in the standard ultimatum game without communication: the (selected) proposer offers a minimal amount, and the recipient accepts. This leads to the hypothesis that introduction of selection power should make no difference to offers.

Alternate hypotheses may be entertained if players are behavioral. Since a proposer obtains the right to propose through a process of selection, this may endow him with ownership over the surplus, with the claim being larger if selection is competitive, since a comparison with another agent is involved. This leads to the hypothesis that offers should be lower with selection power, especially with competitive selection.

On the other hand, the award of the right to propose arises through a decision on the part of the recipient, which she bases on communication received. This may lead her to use prior communication as a factor when deciding acceptance or rejection of the offer, which in turn can trigger better selection, and upward selection pressure on promises, especially in the competitive setting. This leads to the hypothesis that offers should be higher with selection power, especially with competitive selection.

Our data support the third hypothesis. We find that allowing the recipient to select her proposer increases offers made, with competitive selection having a larger impact. Specifically, compared to the baseline, non-competitive situation, selection increases offers by about 20 percent, with the difference weakly significant, while competitive selection increases offers by nearly 50 percent, with the difference strongly significant. Further, competitive selection increases offers by almost 25 percent compared to non-competitive selection, with the difference strongly significant.

Investigation of the decision to accept or reject offers yields a key to understand the channels through which communication-based selection power produces benefits for the recipient. We find in our treatment conditions that recipients use all information accrued on the path of play—offer as well as promise(s)—to determine their rejection decisions. Particularly, the likelihood of an offer being rejected is positively related to the promise made by the selected proposer, *ceteris paribus*. No such relationship is obtained however in the baseline condition where, in the absence of selection, promises hold little meaning. Overall, anticipation of recipients' rejection behavior causes proposers to issue credible promises, *i.e.*, make offers consonant with prior promise, in the treatments, but not in the

baseline[1]. Together with recipients' power to select therefore, which creates upward pressure on promises, proposers are forced to make larger offers in the treatment conditions compared to the baseline, especially in the competitive setting. Thus, the impact of selection power is driven by the recipients' use at the final decision stage of information that is payoff-irrelevant at that stage but decision-relevant at an earlier stage.

The argument outlined above suggests that selection power can only deliver positive impact to a recipient when coupled with her power to reject offers. This implies that allowing promise-based selection in the dictator game, which is the ultimatum game with the recipient stripped of rejection power, should not have any discernible impact on offers made. Further, it should not lead to credible promises or credulity on the part of recipients. To confirm this intuition, we conducted three dictator conditions, one corresponding to each ultimatum condition. We found that promises were indeed not credible in the treatment conditions, higher promises were not necessarily selected with higher probability, and also that selection power did not lead to larger offers compared to the baseline.

The rest of the paper is organized as follows. We discuss related literature in the next section. Section 3 describes our treatments and procedure in detail, and lays out our empirical methodology and hypotheses. Section 4 contains results. Section 5 concludes. Appendix A and Appendix B, respectively, contain instruction and response sheets.

2. Related Literature

A large amount of literature exists on ultimatum and dictator games. Our paper is linked to three strands of the literature. To our knowledge, however, no prior paper has allowed the recipient to select whether she wishes to play or who becomes her proposer.

Whether a potential proposer actually obtains the right to propose is endogenously determined in our treatment conditions. Hence, our paper is connected to the literature studying whether how a player becomes the proposer affects outcomes: see, e.g., Hoffman, McCabe, Shachat and Smith [1]. The central difference is that the right is awarded through recipient decision, which is based on communication, in our environment, while prior literature has not explored direct selection power on the part of the recipient, with or without communication. It has not therefore explored how selection, offer and rejection may simultaneously depend on the content of prior communication. The closest paper in this strand is Navarro and Veszteg [2]. They study two-player interactions where an ultimatum game is preceded by a bidding stage, with the higher bidder becoming the proposer and the lower the recipient. They find that such bidding benefits the recipient at the expense of the proposer. Apart from the recipient having no selection power in their design, an additional difference is that the equilibrium outcome is the same in all our conditions, while the outcome in their treatment conditions is different from that in their control condition[2].

The proposer(s) in our treatment conditions are subjected to selection pressure. This connects our essay with the literature investigating whether outcomes are affected by the recipient facing multiple proposals (which changes the equilibrium outcome): see, e.g., Roth, Prasnikar, Okuno-Fujiwara and Zamir [4] and Cox [5]. The key difference is that our recipients face at most a single proposal, but they may face one or more potential proposers, at most one of whom will obtain the right to propose. Further, the equilibrium outcome in our case does not vary across conditions.

Since non-binding communication is present in all our conditions, and is used as the basis for selection in our treatment conditions, our article is linked to the emerging literature analyzing

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[1] This suggests that recipients should select higher promises with greater likelihood, *i.e.*, be credulous. We indeed found such a relationship in the competitive treatment but not in the non-competitive treatment, where the paucity of refusals prevented us from estimating a selection function.

[2] Navarro and Veszteg [2] also find, supporting the conclusions of Gale, Binmore and Samuelson [3], that there is considerable learning, with the process not necessarily leading to a Nash equilibrium.

the impact of communication in asymmetric bargaining games[3]. To our knowledge, the effect of promise-communication has not been discussed in ultimatum environments[4]. There is also a paucity of work on the impact of promise-communication in dictator environments. An exception is Vanberg [8], who finds dictators may have a preference for truth-telling.

Our paper is also connected to the literature studying partnership formation. Despite the centralityof partnership activity, partnership formation has received relatively limited experimental investigation. Prior papers have usually studied partner selection based on the history of play, with players interacting repeatedly, and the experimenter making the initial match: see for example Tullock [9], Coricelli, Fehr and Fellner [10] and Brandts, Cooper and Weber [11]. None of these have allowed for communication. Our article is closer to the nascent line scrutinizing partnership formation and performancein situations where partner selection is on the basis of non-binding communication: see Dulleck, Kerschbamer and Sutter [12], Beck, Kerschbamer, Qiu and Sutter [13], both on credence goods, and Goeree and Zhang [14], who examine principal-agent interactions in hidden information environments[5].

3. Design, Procedure, Methodology and Hypotheses

We first describe our experimental conditions in detail. The two control conditions are Dictator Baseline (DB) and Ultimatum Baseline (UB). DB is a standard dictator game (Forsythe, Horowitz, Savin and Sefton [15]) augmented with a prior promise stage. There is a proposer and a recipient, and a divisible surplus of 100 units. In the first stage, the proposer sends a (non-binding) promise about how much he will actually offer to the recipient out of 100 (a message of the form: I promise to give you x, with x belonging to {0,1,...,100}). The second stage then ensues where the proposer makes an offer (y belonging to {0,1,...,100}). The recipient is passive throughout and has to accept the offer. She gets the offered amount, and the proposer keeps the difference. Similarly, UB is a standard ultimatum game (Güth, Schmittberger and Schwarze [16]) augmented with a prior promise stage. Once again, there is a proposer and a recipient and a surplus of size 100. The proposer sends a promise in the first stage about how much he will actually offer, and then makes an offer in the second stage. The recipient chooses whether to accept or reject the offer in the third stage. If the offer is accepted, the recipient gets the offered amount and the proposer keeps the difference, while, if it is rejected, both get 0.

Our first set of treatment conditions are DS and US (S for selection). These are identical to DB and UB respectively, except that there is another stage, the selection stage, in between the promise and offer stages. Specifically, in DS, after hearing the promise (a message of the form: I promise to give you x if you select me), the recipient can decide to refuse the proposer, in which case the game ends and both parties get 0. However, if she selects the proposer, the game moves to a third stage where the proposer makes a binding offer. Similarly, in US, the recipient decides, after hearing the promise, whether to select or refuse the proposer. The game ends if there is refusal, with both parties getting 0, while it moves to the offer stage if there is selection.

Our second set of treatment conditions are DC and UC (C for competition). These are similar to DS and US respectively, except there are three players, two (potential) proposers and one recipient, and the game necessarily moves to the offer stage. In either environment, both potential proposers send promises in the first stage. The recipient then chooses one of them as the actual proposer or partner in the selection stage, whereupon the offer stage ensues, with the chosen proposer offering a division of the surplus.

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[3] (It is additionally affiliated to the limited research on how choices in promise-communication conditions depend on the presence of punishment options: see, for example, Bochet and Putterman [6], who examine public goods problems. No paper we are aware of in this strand examines bargaining problems.)

[4] Although the game used by Ellingsen and Johannesson [7] is a trust game extended to include an ultimatum game element.

[5] Goeree and Zhang [14] find, in their communication treatments (2CNDR, 2CWDR and 3CWDR), that introducing competition, where the principal faces two agents, rather than one, lowers employment, efficiency and credibility of agent choice (see Figures 2 and 3, and Tables 2 and 3).

3.1. Procedure

The choice in the first stage in all our conditions is a number interpreted as a promise. Any promise is transmitted to the recipient embedded in a message with a fixed semantic form (using the term "promise")[6]. Prior research shows that interactive, multi-round, or free-form communication is usually more effective in promoting positive outcomes in laboratory environments compared to communication which is unilateral, single-instance, fixed-form and numerical. We chose the latter mode for our experimental procedure precisely for this purpose, as we had an interest in examining credibility (the tendency to make an offer consonant with prior promise) and credulity (the tendency to believe that a higher promise will yield a higher offer)in situations unlikely to promote them.

A single play of DB yields as data a promise in the first stage, and an offer in the second. A single play of DS yields a promise in the first stage, a selection choice in the second, and, if there is selection, an offer in the third. A single play of DC yields two promises in the first stage, a selection choice in the second, and an offer in the third. Single plays of UB, US and UC yield the same data as DB, DS and DC respectively, except for an additional acceptance/rejection decision in the final stage.

We ran one session for each of our conditions. Each session was hand run with a maximum time limit of two hours. Subjects were first assembled together, and instructions were read out[7]. After instructions were repeated and doubts clarified, subjects were split up. For DC and UC, one-third were assigned the role of recipients randomly, and moved to another room. After this, subjects were allotted identification numbers, and the experiment commenced. Roles remained fixed for the duration of the experiment. The other conditions proceeded similarly, except that half were assigned the role of recipients, and the other half proposers. In all conditions, subjects were given a reward based on payoff received. Subjects received between INR 100 and 500, a reasonable rate[8]. Payment was made at the end of the session in private.

We ran each condition for a few rounds to increase the amount of data collected in order to facilitate statistical analysis. For DC and UC, at the beginning of each round, the experimenter randomly matched each recipient subject ID with two proposer subject IDs, creating as many anonymous 3-member groups consisting of one recipient and two proposers, as the number of recipients[9]. This stranger matching was dissolved at the end of the round. The other conditions proceeded similarly, except that every matching was between one proposer subject and one recipient subject.

All sessions were run at Jadavpur University in Kolkata. Table 1 presents the number of rounds and subjects per condition.

Table 1. Session/condition details.

Session/Condition	Number of Proposer Subjects	Number of Recipient Subjects	Number of Rounds
UB	16	16	6
DB	16	16	6
US	17	17	6
DS	18	18	6
UC	60	30	4
DC	50	25	5

[6] The term promise was given semantic focus because promises are distinct and familiar. Additionally, they seem to be somewhat special: evidence suggests that if free-form communication is allowed, messages regularly get coded explicitly as promises (see, for example, Ellingsen and Johanesson [7]).

[7] Instructions and response sheets can respectively be found in Appendices A and B.

[8] The purchasing power parity exchange rate between the Indian Rupee and the US Dollar for 2009 was 15 rupees to a dollar according to the Penn World Tables (Heston, Summers and Aten [17]).

[9] Every proposer subject was matched to a single recipient subject.

3.2. Empirical Methodology

The unit of observation in our analysis is the individual decision-maker. Since every subject made decisions over multiple rounds, our observations do not satisfy independence. We therefore adopt a cluster-adjusted regression approach uniformly throughout the paper, with clustering on the individual. Clustering offers a correction for deflation of standard errors which could result in overstated levels of significance. All regressions reported in this paper also use gender and round dummies as additional regressors. However, we do not report coefficients on these variables, as these were rarely significant.

3.3. Hypotheses

We lay out our four main null hypotheses for the ultimatum and dictator game experiments. Using game theoretic reasoning, we should not expect to see any impact of promise or competitive selection on offers. Following the subgame perfect Nash equilibrium, offers in our dictator treatments and offers and probability of acceptance in our ultimatum treatments should not diverge from the baseline for these games.

Our first null hypothesis (H1) is that selection power, with or without competition, has no effect on offers made, *i.e.*,—UC = US = UB in terms of average offer. Similarly, for the dictator game, average offers made across conditions should not be statistically different.

Our second hypothesis (H2) relates to the notion of credibility. We conjecture that proposers will not issue credible promises (observed offers will not be positively related to promise) in the treatments or the baseline for either the ultimatum game or the dictator game.

Our third hypothesis (H3) relates to the notion of credulity. We conjecture that non-credulous recipients will not believe that higher promises will yield enhanced offers, and not select these with greater probability in either the ultimatum or the dictator environment.

Our fourth hypothesis (H4) is connected to how the recipient decides whether to accept or reject an offer in the ultimatum game. We conjecture that recipients in our selection treatments do not ceteris paribus take into account the promise associated with it, when deciding whether or not to reject an offer.

4. Results

Our results mainly focus on the ultimatum game, using the dictator conditions as controls. Section 4.1 explores H1 (treatment effects) and H2 (credibility) and compares our findings with those that are relevant in the extant literature. Section 4.2 examines H3 (credulity) and studies how recipients select promissors. Finally, Section 4.3 explores H4, *i.e.*,—the acceptance decision made by the recipient in the second stage of the ultimatum game.

4.1. Promises, Offers and Credibility

Findings from two surveys (Bearden [18], a large-scale review and Oosterbeek, Sloof and van de Kuilen [19], a meta-analysis based review of 37 papers) indicate that mean offer in the ultimatum game is most often between 40 and 50, and modal offer is 50. Means of offer and promise from both our ultimatum and our dictator conditions are shown in Table 2. The modal offer (not reported in Table 2) in all ultimatum conditions are 50, and mean offer for US is within this range. The mean offer for UC is just above the upper edge of this range, while mean offer for UB is somewhat lower than the lower edge of the range.

For our dictator experiments, our DB subjects promised to give about 31 percent on average to recipients, whereas the actual average amount given in DB is 16.5 which is well below the give rate of 27 percent found in a meta-study of dictator games by Engel [20] that references 616 treatments from 129 published papers.

Table 2. Mean offers and promises by treatment.

Treatment	Mean Offer	Mean Promise
UB	35.7 (96)	50.3 (96)
US †	42.9 (42.1) (100)	50 (102)
UC	52.6 (120)	68.9 (240)
DB	16.5 (96)	31.1 (96)
DS **	20.8 (19.5) (101)	51.4 (108)
DC	18.4 (125)	60.1 (250)

Total number of observations in parentheses; † For US, two promises were refused. Average offer and promise are reported from the set of selected promises. The mean for all 102 observations is given in square-braces; ** For DS, seven promises were refused. Summary statistics are reported from the set of selected promises. The mean for all 108 observations is given in square-braces.

To test H1, we need to compare averages across experimental conditions. Instead of comparing the simple averages given in Table 2 that are constructed from several rounds of the treatment and baseline conditions, we regress offers and promises on (i) game-treatment interaction dummies (with DB as the base category); (ii) gender dummy and (iii) round dummies (these regressions are not reported here for the sake of brevity). This allows us to compare the conditional means of promises and offers between the different treatment conditions using a Wald test. For the ultimatum conditions, mean offer in US is greater from that in UB with marginal significance (F-test p-value = 0.0875). Mean offers for UC is significantly greater than that in UB (F-test p-value = 0.0003). Furthermore, mean offers in UC exceeds that in US (F-test p-value = 0.0034). Thus, selection power, especially with competitive selection, gave the recipient an advantage in the ultimatum *vis-à-vis* the dictator environment.

Adding in promise as a regressor along with treatment, gender and round dummies, results in the former explaining a significant amount of the variation in offers. This is presented in Table 3 below.

Table 3. Offer regression.

Variable	Dep. Var. = Offer
promise	0.27*** (0.08)
UB	14.55*** (4.85)
DS	−1.09 (5.58)
US	21.92*** (4.33)
DC	−5.88 (5.35)
UC	25.02*** (6.16)
constant	3.07 (3.19)
R^2	0.44
No. of obs.	638

Standard errors are in parentheses. "*", "**" and "***" respectively denote significance at the 10%, 5% and 1% levels.

Now, the mean offers in the treatments (US and UC) differ from that at baseline (UB) only at the 10 percent level of significance (US *vs.* UB, F-test p-value = 0.0923, UC *vs.* UB, F-test p-value = 0.0645). Moreover, mean offer in UC is not statistically distinguishable from the mean offer in US(F-test p-value = 0.4025).

In the dictator game, we found mean offers for the three conditions to be statistically indistinguishable, as hypothesized. Thus, selection power gave the recipient no advantage in the dictator environment. Thus, H1 is rejected in the ultimatum environment but cannot be rejected in the dictator environment. Thus, selection power can only deliver positive impact to a recipient when coupled with her power to reject offers. Furthermore, the dictator conditions, which manipulate the method of promise selection for recipients but give no ability to recipients to reject unfavourable offers, provide control conditions to test the effect of the presence of this veto power. Wald tests for

conditional mean offers, finds the ultimatum conditions (UB, US, UC) to have significantly higher offers as compared to the corresponding dictator conditions (DB, DS, DC) at the one percent level[10].

For average promises in ultimatum games, the Wald tests indicate that UC is greater than UB (F-test p-value = 0.0008), US is not statistically different from UB (F-test p-value = 0.9773), and UC is greater than US (F-test p-value = 0.0000). For the dictator treatments, average promise in DC is greater than in DB (F-test p-value = 0.0000), DS is greater than DB (F-test p-value = 0.0056) and DC is marginally significantly greater than DS (F-test p-value = 0.0996). Thus, competitive selection generates an upward pressure on promises. Wald tests for conditional mean promises show that the average promises in UB and UC are higher than in the corresponding DB and DC conditions at the one percent level, though the average promised amount in US is not significantly different from DS. The most important Wald test comparisons of average offers and promises from the ultimatum and dictator treatments and have been summarized in Table 4. In summary, competitive selection significantly increases promises made in both the dictator and the ultimatum environments, but offers are somewhat higher with competitive selection only in the ultimatum environment. Furthermore, the presence of veto power (ultimatum game) generates significantly higher promises and offers *vis-à-vis* a situation with no veto power (dictator game).

Table 4. Wald Test results for ultimatum and dictator treatments.

Comparison	Ultimatum	Comparison	Ultimatum *vs.* Dictator
US *vs.* UB	Promise (US) ≈ Promise (UB) † Offer (US) > Offer (UB) *	US *vs.* DS	Promise (US) ≈ Promise (DS) Offer (US) > Offer (DS) ***
UC *vs.* UB	Promise (UC) > Promise (UB) *** Offer (UC) > Offer (UB) *	UC *vs.* DC	Promise (UC) > Promise (DC) *** Offer (UC) > Offer (DC) ***
UC *vs.* US	Promise (UC) > Promise (US) *** Offer (UC) ≈ Offer (US)	UB *vs.* DB	Promise (UB) > Promise (DB) *** Offer (UB) > Offer (DB) ***

† "≈" denotes that the difference of the two averages is not statistically different from zero; ">" denotes that the difference of the two averages is statistically greater than zero. Standard errors are in parentheses. "*", "**" and "***" respectively denote significance at the 10%, 5% and 1% levels.

From the regression in Table 3, we find significant evidence for credibility, *i.e.*, a significant linear and positive relationship between promise and offer, independent of treatment conditions. This is confirmed by the coefficient on promise being significant at the one percent level. This credibility is also independent of the game institution (dictator, ultimatum) and also the selection procedure (non-competitive, competitive). Thus, we can conclude that an aggregate offer–promise relationship exists that is independent of veto power and proposer selection and accordingly H2 is rejected. More specifically, a unit increase in promise, ceteris paribus results in a 0.27 unit increase in offer. This regression also shows that controlling for promise, the ultimatum conditions (UB, US and UC) have significantly higher offers than the dictator baseline (DB), though offers on the dictator treatments (DS, DC) do not significantly differ from the baseline (DB).

We further examine credibility (a positive relationship between promise and offer) by plotting offer against promise to determine whether any visual relationship can be observed. Scatter plots are given in Figure 1. From these, it does seem like there is a positive relationship, between offer and promise, which is more sharply defined for the ultimatum plots. This positive visual relationship is statistically confirmed by the positive and significant coefficient on promise in the regression on offers reported in Table 3.

In addition to identifying an offer–promise relationship in the aggregate, we also estimated offer promise relationships separately for all our conditions. In these regressions, not reported here, we find

[10] Specifically, mean offers in UB is greater than that in DB (F-test, p-value = 0.0002), mean offers in US is greater than that in DS (F-test, p-value = 0.0000) and mean offers in UC is greater than mean offers in DC (F-test, p-value = 0.0000).

that offers are positively affected by promise at the five percent level for US and UC but no significant offer promise relationship for UB. Interestingly, the results from the dictator games are exactly in the opposite direction and the DB condition displays credibility at the one percent level, whereas there is no significant offer promise relationship in DS and DC[11].

Figure 1. Scatterplots of offer on promise for all treatments.

4.2. Credulity

We next explore the notion of credulity, *i.e.*,—recipients believe that a higher promise carries the intent of a higher offer and select the proposer who promises a higher amount.

Table 5 shows the averages of selected and refused promises in US, UC, DS and DC. The last columns 3 and 6 show the proportion of cases where the higher promise was selected, for UC and DC respectively[12]. Notice that, for our ultimatum treatments, the mean selected promise is greater than the mean refused promise, whereas forour dictator treatments, the selected promise is lower than the mean refused promise. To test whether this relationship holds statistically, we conducted an Ordinary Least Squares (OLS) regression for either condition of either game, of promise on a dummy variable which takes values 0 or 1, depending on whether the promise was refused or selected respectively. For the ultimatum game, the coefficient on this dummy showed that the selected promises were higher than the refused ones (p-value < 0.01 for both US and UC). For the dictator game, the reverse relationship was observed albeit with weaker statistical significance (p-value = 0.073 for DS, p-value = 0.05 for DC).

Table 5. Mean selected and refused promises.

	Ultimatum			**Dictator**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Selection	50.4 (100)	29 (2)	–	50.5 (101)	64.7 (7)	–
Competition	73.1 (120)	64.7 (120)	0.71 (111)	58 (125)	62.1 (125)	0.41 (119)

(1) mean selected promise (ultimatum); (2) mean refused promise (ultimatum); (3) proportion of high promise selection (ultimatum); (4) mean selected promise (dictator); (5) mean refused promise (dictator); (6) proportion of high promise selection (dictator); Number of observations are given in parentheses.

[11] Why did credibility emerge in DB? One possibility is that the absolute power enjoyed by proposers in this condition paradoxically led to a manifestation of the preference for truth-telling, as in Vanberg [8], and thereby caused them to issue offers consonant with promises made, even if it did not actually lead to increased offers.

[12] Selectors in UC faced equal promises in 7.5 percent of cases while selectors in DC faced equal promises in 4.8 percent of cases.

In either of our ultimatum treatment conditions, we can ask what the probability of any particular promise will be selected is, *i.e.*, estimate a selection function. This mapping gives the probability a promise will be selected as a function of the promise itself. We investigate credulity by means of these functions, the aim also being to explore what the recipients infer about intent on receiving a promise.

For our estimation, we conducted a set of probit regressions where the value of the dependent variable was 0 or 1, depending on whether the promise was refused or selected, respectively. We suspected significant non-linearities in the data, and so used promise as well as promise exponentiated (up to the fourth degree) as independent variables. Likelihood ratio test results and the use of Akaike and Bayesian information criteria showed that the linear specification gives the best fit for UC. We found no estimable model for US, as very few promises were refused. The first column of Table 6 gives the constant and the coefficient on promise from the probit regressions using the linear specification for UC.

For the dictator games, the linear and cubic specifications respectively gave the best fits for DS and DC. The second and third column of Table 6 gives the constants and the coefficients on promise, promise squared and promise cubed, from the regressions using the appropriate specification for each condition. The selection function is not monotone increasing for DC. It is monotone decreasing for DS, with the caveat that the link between selection probability and promise is weak.

Table 6. Selection functions.

	UC (Linear)	**DS (Linear)**	**DC (Cubic)**
constant	−1.16 *** (0.42)	2.28 *** (0.75)	−7.55 *** (2.57)
promise	0.01 *** (0.005)	−0.02 * (0.009)	0.40 *** (0.14)
$Promise^2$		–	−0.006 *** (0.002)
$Promise^3$		–	0.00003 *** (0.00001)
Pseudo R^2	0.03	0.09	0.04
No. of obs.	240	90	250

Standard errors are in parentheses. "*", "**" and "***" respectively denote significance at the 10%, 5% and 1% levels.

The plot of selection probability (dependent variable) against promise (independent variable) can be derived using the estimated selection function above. Figure 2 depicts the selection function for UC which is monotonically increasing, *i.e.*, higher promises have greater likelihood of being selected. We could not, however, derive any such function for US. We thus find that for UC, hypothesis H3 is rejected, whereas, for DS, it cannot be rejected at the five percent level[13].

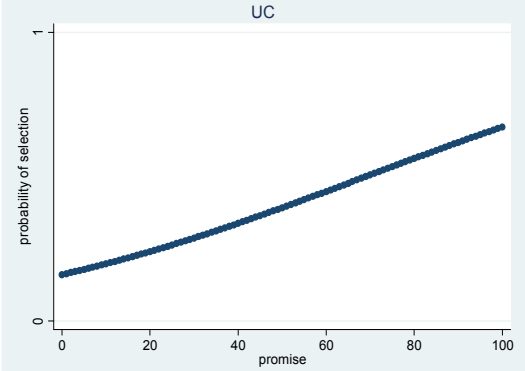

Figure 2. Selection function for UC.

[13] In the DS regression, 18 observations corresponding to those from round 1 were dropped as they predicted selection perfectly.

4.3. Offer Rejection

Now, we turn to the issue of offer acceptance and rejection in the ultimatum game. Bearden [18] suggests a rejection rate of between 5 and 10 percent, while Oosterbeek *et al.* [19] arrive at a figure of 17 percent. While the literature analyzing rejection decisions is relatively scarce, available evidence suggests low offers, particularly those below 20 percent, are frequently rejected (see Camerer and Thaler [21]. We are specifically interested to see if H3 is rejected, *i.e.*,—recipients take into account not just offers but also prior promises, when making a decision to accept or reject an offer. Similar to earlier studies our data from UB, US and UC respectively show rejection rates of 13.5, 9 and 12.5 percent. We conducted probit regressions (not reported) on data pooled from condition pairs where the dependent variable is a dummy which takes values 0 or 1, depending on whether the offer was rejected or accepted respectively. The regressor was the relevant condition dummy. We found no difference in rejection rates across conditions[14]. The power on the part of the recipient to select her proposer hence induced no difference in the aggregate rate of rejection of offers.

No offer below 20 was recorded in UC. 23 percent of offers (22/96) were below 20 in UB. Of these, 40 percent (9/22) were rejected[15].By contrast, only five percent of the offers equaling or exceeding 20 (4/74) were rejected. For US, two percent of offers (2/100) were below 20. Both were rejected. On the other hand, only 7.1 percent of the offers equaling or exceeding 20 (7/98) were rejected. Results from UB and US thus mirror prior findings.

Average accepted offer in UB was 39.1, while average rejected offer was 13.5. The corresponding figures for US were 44.5 and 27.1 respectively. In UC, average accepted and rejected offers were respectively 53.7 and 37.1. For each condition, we conducted an OLS regression (not reported here) of offer on a dummy variable which takes values 0 or 1, depending on whether the offer was rejected or accepted respectively. The coefficient on the dummy was positive in each case (p-values less than one percent for every case). Hence, average accepted offer was greater than the average rejected offer, lending support to the contention that lower offers have a higher probability of rejection.

To determine what determines offer acceptance, we estimated acceptance functions which give the probability an offer will be accepted. We conducted probit regressions, one for each condition, where the dependent variable is a dummy which takes values 0 or 1, depending on whether the offer was rejected or accepted respectively. Apart from offer, the regressors were promise received for US, promise selected for UB, and promises selected and refused for UC. Results are given in Table 7[16,17].

We find, in line with usual findings, that offer is always used to determine acceptance, and that higher offers have lower chance of being rejected. Further, it is the only determinant in UB. Thus, prior promise is not used, in the absence of any selection, to decide rejection. Prior promise is used, however, in US, where offer and promise are both of importance in guiding the decision. Moreover, a higher promise, *ceteris paribus*, increases the probability of rejection.

Offer is the main determinant in UC. Both prior promises are additional determinants, with the likelihood of rejection rising in the prior selected promise, as in US, and falling in the prior refused one. A key finding is thus that recipients in US and UC reject an offer (and hence bear the cost of punishment) with greater likelihood if the prior attendant promise (on the basis of which the proposer was selected) is higher, while they do not in UB. Thus, H4 is rejected for environments with selection (US and UC) and offers that come from promissors that have a relatively high prior promise (independent of the offer made) face a higher probability of rejection.

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[14] The number of observations was 196, 216 and 220 for comparisons UB *vs.* US, UB *vs.* UC and US *vs.* UC respectively.

[15] One offer equaled 0 and was rejected.

[16] In the US, regression of 32 observations corresponding to those from rounds 1 and 4 were dropped as they predicted acceptance perfectly.

[17] We also ran probit regressions where we regressed offer on the gap between offer and promise (*i.e.*, offer–promise). The results from these regressions (not reported here) are in line with those in Table 7 confirming that the probability of acceptance of an offer is positively related to the gap between offer and promise, so, for example, if promise is higher than the eventual offer, then the gap is negative and the probability of acceptance becomes lower.

Table 7. Probit regression coefficients for the acceptance functions.

	UB	US	UC
offer	0.05 *** (0.01)	0.08 ** (0.03)	0.22 *** (0.05)
promise	−0.002 (0.004)	−0.02 ** (0.009)	−0.04 *** (0.01)
promise refused	–	–	0.03 ** (0.01)
constant	0.06 (0.67)	0.32 (0.94)	−7.57 *** (2.32)
Pseudo R^2	0.30	0.14	0.39
No. of obs.	96	68	120

Standard errors are in parentheses. "*", "**" and "***" respectively denote significance at the 10%, 5% and 1% levels.

5. Conclusions

The fact that the probability of the acceptance of an offer *ceteris paribus* decreases with an increase in the promised amount may be a primary driver of some of our other key results, namely, (i) why the selection function is monotone increasing in UC (credulity); (ii) why promises are credible in US and UC and not in UB; and (iii) why offers in US and UC are higher than in UB.

Our argument is as follows. The fear that an offer will be rejected if it is too low relative to promise made makes selected proposers choose offers consonant with promises, lending credibility to promises in US and UC. For UC, this assures recipients that higher promises are more likely to translate into higher offers, *i.e.*, makes them credulous, and thus renders higher promises more likely to be selected, and the selection function monotone. It is likely that a similar mechanism works in US as well, given results from Table 5; however, the paucity of refusal data does not permit us to statistically address the issue. In turn, this credulousness leads to promises being inflated due to selection pressure. Consequently offers are raised as well, due to credibility. In short, the use of prior promise as a factor in decision making at the offer rejection stage induces selected proposers to make offers close to the original promise, which causes recipients to select higher promises on average, which, in turn, generates selection pressure tending to inflate promises and thus offers.

Moreover, an offer is more likely to be accepted in UC if the promise the selector had refused earlier was higher. One plausible explanation for this rests on two premises: one, the use of the rejected promise as a statistic for the value of opportunity lost at the offer acceptance stage, and two, the evaluation of the value of the opportunity or offer in hand correlated with the one foregone. That is, promise refused earlier is used at the offer acceptance stage by the recipient as a signal of the offer that would have accrued if that alternative had been selected. Hence, the refused promise provides the value of foregone opportunity, and perhaps a reflection of regret (see, e.g., Bell [22] and Loomes and Sugden [23]. At the same time, the recipient correlates her evaluation of the offer in hand with her evaluation of the opportunity lost. Hence, a higher (lower) value of promise refused increases (reduces) the value of the opportunity foregone to her, and, thereby, raises (lowers) the value of the offer in hand, thus increasing (reducing) the likelihood of acceptance.

As far as the comparison of offers between US and UC is concerned, it is possible that competition is the main driving factor. The presence of a competing promise causes each potential proposer to raise his promise, and this in turn raises offers in UC, relative to US, due to credibility of promises. Additionally, the fact that refused promise is used in UC to guide the rejection decision may contribute to offers being higher in UC because it provides the recipient with an extra instrument which implicitly raises her bargaining power vis-à-vis that of the proposer. No such relationship is obtained, however, in the baseline condition UB where, in the absence of selection, promises hold little meaning. This finding is consistent with their being a conditional preference for hearing truth, as expressed through rejection behavior, the condition being that any such preference is triggered only when promise was used earlier as the basis for selection.

In conclusion, the power to select her partner on the basis of promise can generate benefits to the recipient in the ultimatum game, tilting the division of surplus in her favor, especially with

competitive selection. This is because recipients reject an offer with greater likelihood when the prior promise associated with it is higher, *ceteris paribus*. This behavior, which could be a reflection of some form of a preference for hearing truth, endogenously induces credibility with respect to promise and credulity with respect to offer. The absence of rejection power in the dictator game severs the link between punishment and promise, and thereby does not impact offers, and fails to produce credibility or credulity.

Our findings may contribute to the larger inquiry into how non-binding communication can convey intent, or how communication can be credible in social dilemmas, dating back at least to Loomis [24]. Casual empiricism suggests partner choice usually exists, recourse is often accessible and partnerships are regularly entered into on the basis of promises, sometimes with successful consummation. It seems reasonable to then suppose that communication is delivering some intent. In such contexts, our findings point to the possibility that outcome may be linked to communication's capacity to convey intent, and, moreover, such capacity may be endogenously activated if recipients use its content as a factor when deciding on the posterior recourse, given it has been used for the prior selection decision. In other words, the use of communication when deciding on prior partner selection endows it with hysteresis, and renders it relevant for posterior decisions as well, thereby enabling it to convey intent.

This essay's explorations were confined to ultimatum and dictator environments, and to selection based on communication. Examining connections between promises and partnership formation and performance in other incentive domains such as trust games, prisoners' dilemma and public good games, or coordination games, and selection through alternate means such as contests are left for future research. Another possible avenue for further study is whether the communicational hysteresis identified above extends to wider settings.

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Appendix A: Instructions

Instruction for DB

Today, you will play several rounds of a game.In each round, the entire set of students will be divided into many groups, each group consisting of one *proposer* and one *recipient*. Each group plays within itself during a round, and has no interaction with any other group.

The selection of groups is done randomly by the experimenter. At the end of any round, all groups are broken up and new groups are formed for the next round by randomly rematching the participants. The interaction in any round is anonymous.

There are two stages: the *promise* stage, and the *offer* stage.

The proposer makes a promise in the first stage.

In the second stage, the proposer has a cake with him of size 100. He decides how much to give to the recipient (integer between and including 0 and 100). That amount is the recipient's payoff for that round. The amount the proposer keeps back (100—amount given) is his payoff for that round.

In the first stage, the proposer sends a promise (integer between and including 0 and 100), interpreted as how much the proposer will give in the second stage. However, promise is not binding: the proposer is free to give more or less than his promise.

Total payoff at the end is the sum of payoffs over rounds. Cash compensation will be higher if total payoff is higher. You can earn between 100 and 500.

Instruction for UB

Today, you will play several rounds of a game. In each round, the entire set of students will be divided into many groups, each group consisting of one *proposer* and one *recipient*. Each group plays within itself during a round, and has no interaction with any other group.

The selection of groups is done randomly by the experimenter. At the end of any round, all groups are broken up and new groups are formed for the next round by randomly rematching the participants. The interaction in any round is anonymous.

There are three stages: the *promise* stage, the *offer* stage, and the *decision* stage.

The proposer makes a promise in the first stage.

In the second stage, the proposer has a cake with him of size 100. He decides how much to offer to the recipient (integer between and including 0 and 100).

The recipient can reject in the third stage. If she rejects, both parties get 0 payoff. If she accepts in the third stage, the amount offered is the recipient's payoff for that round. The amount the proposer keeps back (100—amount offered) is his payoff for that round.

In the first stage, the proposer sends a promise (integer between and including 0 and 100), interpreted as how much the proposer will offer in the second stage. But promise is not binding: the proposer is free to offer more or less than his promise.

Total payoff at the end is sum of payoffs over rounds. Cash compensation will be higher if total payoff is higher. You can earn between 100 and 500.

Instruction for DS

Today you will play several rounds of a game. In each round, the entire set of students will be divided into many groups, each group consisting of one *proposer* and one *recipient*. Each group plays within itself during a round and has no interaction with any other group.

The selection of groups is done randomly by the experimenter. At the end of any round, all groups are broken up and new groups are formed for the next round by randomly rematching the participants. The interaction in any round is anonymous.

There are three stages: the *promise* stage, the *selection* stage, and the *offer* stage.

The proposer makes a promise in the first stage.

The recipient decides whether to select or refuse in the second stage. The game goes to the third stage if there is selection in the second stage.

In the third stage, the proposer has a cake with him of size 100. He decides how much to give to the recipient (integer between and including 0 and 100). That amount is the recipient's payoff for that round. The amount the proposer keeps back (100—amount given) is his payoff for that round.

The game may not go to the third stage—if the recipient refuses in the second stage. In that case, both parties get 0 payoff. Selection/Refusal is on the basis of a promise.

In the first stage, the proposer sends a promise (integer between and including 0 and 100), interpreted as how much the proposer will give in the third stage if selected. However, promise is not binding: once selected, the proposer is free to give more or less than his promise.

Total payoff at the end is sum of payoffs over rounds. Cash compensation will be higher if total payoff is higher. You can earn between 100 and 500.

Instruction for US

Today, you will play several rounds of a game.In each round the entire set of students will be divided into many groups, each group consisting of one *proposer* and one *recipient*. Each group plays within itself during a round, and has no interaction with any other group.

The selection of groups is done randomly by the experimenter. At the end of any round, all groups are broken up and new groups are formed for the next round by randomly rematching the participants. The interaction in any round is anonymous.

There are four stages: the *promise* stage, the *selection* stage, the *offer* stage, and the *decision* stage.

The proposer makes a promise in the first stage.

The recipient decides whether to select or refuse in the second stage. The game goes to the third stage if there is selection in the second stage.

In the third stage, the proposer has a cake with him of size 100. He decides how much to offer to the recipient (integer between and including 0 and 100).

The recipient can reject in the fourth stage. If she rejects, both parties get 0 payoff. If she accepts in the fourth stage, the amount offered is the recipient's payoff for that round. The amount the proposer keeps back (100—amount offered) is his payoff for that round.

The game may not go to the third stage—if the recipient refuses in the second stage. In that case, both parties get 0 payoff. Selection/Refusal is on the basis of a promise.

In the first stage, the proposer sends a promise (integer between and including 0 and 100), interpreted as how much the proposer will offer in the third stage if selected. However, promise is not binding: once selected, the proposer is free to offer more or less than his promise.

Total payoff at the end is sum of payoffs over rounds. Cash compensation will be higher if total payoff is higher. You can earn between 100 and 500.

Instruction for DC

Today, you will play several rounds of a game. In each round the entire set of students will be divided into many groups, each group consisting of two *proposers* and one *recipient*. Each group plays within itself during a round, and has no interaction with any other group.

The selection of groups is done randomly by the experimenter. At the end of any round, all groups are broken up and new groups are formed for the next round by randomly rematching the participants. The interaction in any round is anonymous.

There are three stages: the *promise* stage, the *selection* stage, and the *offer* stage.

The proposers each make a promise in the first stage.

The recipient decides which one to select in the second stage. The other is refused.

In the third stage, the selected proposer has a cake with him of size 100. He decides how much to give to the recipient (integer between and including 0 and 100). That amount is the recipient's payoff for that round. The amount the proposer keeps back (100—amount given) is his payoff for that round.

Selection/Refusal in the second stage is on the basis of a promise.

In the first stage, each proposer sends a promise (integer between and including 0 and 100), interpreted as how much the proposer will give in the third stage if selected. But promise is not binding: once selected, the proposer is free to give more or less than his promise.

Total payoff at the end is sum of payoffs over rounds. Cash compensation will be higher if total payoff is higher. You can earn between 100 and 500.

Instruction for UC

Today, you will play several rounds of a game. In each round, the entire set of students will be divided into many groups, each group consisting of two *proposers* and one *recipient*. Each group plays within itself during a round, and has no interaction with any other group.

The selection of groups is done randomly by the experimenter. At the end of any round, all groups are broken up and new groups are formed for the next round by randomly rematching the participants. The interaction in any round is anonymous.

There are four stages: the *promise* stage, the *selection* stage, the *offer* stage, and the *decision* stage.

The proposers each make a promise in the first stage.

The recipient decides which one to select in the second stage. The other is refused.

In the third stage, the selected proposer has a cake with him of size 100. He decides how much to offer to the recipient (integer between and including 0 and 100).

The recipient can reject in the fourth stage. If she rejects, both parties get 0 payoff. If she accepts in the fourth stage, the amount offered is the recipient's payoff for that round. The amount the proposer keeps back (100—amount offered) is his payoff for that round.

Selection/Refusal in the second stage is on the basis of a promise.

In the first stage, each proposer sends a promise (integer between and including 0 and 100), interpreted as how much the proposer will offer in the third stage if selected. But promise is not binding: once selected, the proposer is free to offer more or less than his promise.

Total payoff at the end is sum of payoffs over rounds. Cash compensation will be higher if total payoff is higher. You can earn between 100 and 500.

Appendix B: Response Sheets

Response Sheet for DB

Round #:
Stage I:
Proposer's Subject No.: _____
Promised amount: _____
Stage II:
Proposer's actual offer: _____

Response Sheet for UB

Round #:
Stage I:
Proposer's Subject No.: _____
Promised amount: _____
Stage II:
Proposer's actual offer: _____
Stage III:
Recipient's decision:Accept/Reject

Response Sheet for DS

Round #:
Stage I:
Proposer's Subject No.: _____
Promised amount: _____
Stage II:
Recipient's decision:Select/Refuse
Stage III:
Proposer's actual offer: _____

Response Sheet for US

Round #:
Stage I:
Proposer's Subject No.: _____
Promised amount: _____
Stage II:
Recipient's decision:Select/Refuse
Stage III:
Proposer's actual offer: _____

Stage IV:
Recipient's decision:Accept/Reject

Response Sheet for DC

Round #:
Stage I:
Proposer's Subject No.: _____
Promised amount: _____
Stage II:
Recipient's Subject No.: _____
Response:Select/Refuse
Stage III:
Proposer's actual offer: _____

Response Sheet for UC

Round #:
Stage I:
Proposer's Subject No.: _____
Promised amount: _____
Stage II:
Recipient's Subject No.: _____
Response:Select/Refuse
Stage III:
Proposer's actual offer: _____
Stage IV:
Recipient's decision:Accept/Reject

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