# Driving a Hard Bargain is a Balancing Act: The Importance of Reciprocal Intentions in Bargaining

## - Working Paper -

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**Abstract**

We investigate the role of reciprocity during the bargaining process. We show that communicating one's preference over the final outcome of the bargaining does impact the willingness of the other agent to strike a fair deal. In particular we find that adopting a too tough bargaining stance can lead to worse outcomes. We use a two-stage alternating-offer game where an initial proposition on how to split 10 by a player A can be accepted straight away by a player B or followed by a counter-offer which has to be accepted or rejected by player A. We find that player B's counter-offer is influenced by the initial proposition made by player A. Consistent with the reciprocity theory, player Bs act in line with their belief about player As' expectations (or even exceed them) for low initial requests. High requests over 6 are punished partly at own costs by counter-offering an amount which player Bs expect to be rejected or only just accepted by player A. The optimal first offer from player A is a request slightly above the equal payoff split.

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*Lest readers think erroneously that it's always wise to bargain tough.* Raiffa, The Art and Science of Negotiation

# 1 Introduction

Many agreements in everyday life are reached through a bargaining process. From business transactions, wage negotiations or international conflicts, a jointly owned surplus has to be divided between all interested parties. If an agreement cannot be reached nobody involved can enjoy any part of the surplus. But how should the surplus be divided? The crucial difficulty about negotiations is that they include elements of cooperation and competition. Rubinstein summarizes the problem as following: "Two individuals have before them several possible contractual agreements. Both have interests in reaching agreement but their interests are not entirely identical. What "will be" the agreed contract [...]?"

In this study we investigate the role of reciprocal preferences in a bargaining process. We argue that communication allows agents to signal their intentions about the final outcome. This in turn can influence the bargaining process by triggering positive or negative reciprocal behaviour in the other bargainer. In particular we argue that concerns for reciprocity explain why negotiators avoid adopting an extremely tough bargaining stance in a negotiation as it can come with the cost of a negative reaction from the other bargainer.

Economists have paid a lot of attention to how bargaining situations are solved. The cooperative game theoretic approach looked for principles upon which bargainers would agree to share the surplus. The most famous of solution from this approach is the Nash bargaining solution (Nash, 1950). The non-cooperative game theoretic approach on the other hand aims to model the bargaining process as a game of alternating-offers where players aim to maximise their outcome given the bargaining rules and the strength of their bargaining position (Ståhl, 1972; Rubinstein, 1982a). Generally, the presumed theoretical bargaining outcome depends on how parties capitalize on their relative impatience as well as on both bargainers' preferences. For similarly impatient and purely self-interested bargainers that have complete information, the subgame-perfect equilibrium predicts an immediate agreement on a bigger share for the party that makes the initial offer. This forecast contradicts the well-documented regularities in experiments of both a delay in agreement and a division that is more equal than the theory predicts (e.g. Bolton, 1991; Ochs & Roth, 1989; Weg & Zwick, 1999; Camerer, 2003).

The poor performance of game theoretic predictions in early bargaining experiments (e.g. Roth *et al.* , 1981) demonstrating that subjects tend to pursue a "fair" outcome in bargaining situations led Binmore *et al.* (1985) to ask whether people are playing as "fairmen" or "gamesmen". Güth & Tietz (1990) even stated that "considerations of distributive justice seriously destroy the prospects of exploiting strategic power" and that "the game-theoretic solution looses nearly all its predictive power if it induces payoff results which are socially unacceptable". In this spirit, Bolton (1991) tries to explain the puzzling experimental observations by incorporating distributional preferences as an additional explaining variable into bargainers' utility functions. In finite-horizon alternating-offer games, Bolton (1991)'s model can explain the qualitative regularities reported and predicts subjects' behaviour relatively well. In a recent study, De Bruyn & Bolton (2008) estimate distributional preferences[1] from the ultimatum game to forecast multi-round sequential bargaining games with

[1] De Bruyn & Bolton (2008) use preferences over relative payoffs (fairness) as well as absolute (pecuniary) payoffs. Bargainers' utility increases as their absolute payoff increases, but it diminishes as their relative payoff deviates from

various length, discount factors, pie sizes, and also levels of bargainers' experience. These results suggest that distributive preferences play a substantial role in the propensity of bargainers to accept a deal or not.

However, research in behavioural game theory suggests that another type of social preferences can play a role in bargaining: reciprocal preferences. A large body of research has shown that players prefer to be kind to kind players and unkind to unkind players. Such concerns for others' intentions have long been incorporated in game theoretic models. Using the framework of psychological game theory, Rabin (1993) and Dufwenberg & Kirchsteiger (2004) have proposed models of reciprocal preferences where players deduce the other players' kindness from their beliefs about the motivation of others' actions. More recently, Cox *et al.* (2008) proposed a revealed intention approach whereby a player's reaction to the previous players' move only depends on objective observable characteristics of these moves (and not beliefs). It is now well accepted that players do care about others' intentions. However, models with reciprocal concerns become complex for games with repeated interactions and this may explain why little work has been done on the importance of reciprocal concerns in multi-round bargaining processes. An exception is Miettinen (2010) who uses the framework of history-dependent preferences[2] by Fershtman & Seidmann (1993) and Li (2007) to incorporate reciprocal motivations in his model of an infinite alternating-offer game. Players' reciprociprocal preferences are embodied in aspirations which depend inversely on the kindness of the opponent's previous proposals. Each bargainer is then assumed to prefer to decline any offer below his aspired payoff.

The present study investigates the role of reciprocal concerns during a bargaining process. It asks whether the kindness and/or toughness of one player influences the other player's preferences over the possible agreements. To answer this question, we employ a double alternating-ultimatum game with two players. An initial request by player A can be accepted straight away by player B or followed by a counter-offer which in turn has to be accepted or rejected by player A. Formally this game is identical to an ultimatum game where B is the proposer and player A the responder who has the possibility to send a cheap talk suggestion of a split. Standard theory, assuming that players are rational and self-centred, would suggest that the proposition from A should not have any effect. If players have distributive preferences but do not care about others' intentions then B should propose some money to A but A's request should not affect B's offer. However, if B has reciprocal preferences, A's request may influence his offer in that it may signal his intentions.

Our main interest lies with the opening request of player A and whether it influences player B's subsequent counter-offer. Using the strategy method and eliciting not only choices but also beliefs about the other player's choices, we can disentangle the two channels through which player B's choice might be affected: Toughness (Strategic Considerations) and Kindness (Reciprocity). We find that the impact of these two channels are not constant but depends crucially on the size of player A's request. Our findings suggest that negative reciprocity (reaction to unkindness) plays a significant role and often outweights material concerns. Positive reciprocity (reaction to kindness), on the other hand, seems to affect subjects' decisions if anything marginally whereas there exist individualistic differences.

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the fair standard.

[2] In such a framework, the bargaining history itself influences the bargainers' preferences.

## 2 Related Literature

When seen as non-cooperative games, bargaining is difficult to study given the multiplicity of equilibria. For this reason the bargaining problem was considered as intrinsically indeterminate for a long time (Binmore, 2007). Rubinstein's contribution was to show that there is actually only one equilibrium to the bargaining problem, once bargaining is seen as a game of alternating offers and the subgame-perfect equilibrium refinement is applied (Rubinstein, 1982b). In his set-up, two players have to reach an agreement on the division of a pie. In turns, each bargainer makes a proposal as to how it should be divided. After one player has made his offer, the other must decide either to accept or to reject it. If the latter agrees, the bargaining terminates with the accepted division. Otherwise, players exchange their roles and start all over again. This continues until an agreement or, in finite games, the final stage is reached. Typically, the pie to divide diminishes each time an offer is refused. Based on this set-up, there have been many experimental studies on the subgame-perfect equilibrium prediction, assuming that players are only maximising their own payoffs (Roth, 1995). Possibly the most famous experimental design born from this literature is the ultimatum game (Güth *et al.* , 1982) which can be seen as a limit case of a two-stage alternating-offer bargaining game. Here, a "proposer" makes a proposition on how to split a given amount of money between himself and a "responder". The responder can only accept or reject the proposed division. If he accepts, both players will receive an amount according to the proposer's suggested partition. If the responder rejects, both players earn nothing. The pie to divide thus decreases by a factor of 100% if the first stage offer is refused by the responder. In such a case, assuming players only care about their own payoffs, the sub-game perfect Nash equilibrium is that the proposer offers $\varepsilon$ to the responder and keeps the rest for himself. The large literature on ultimatum games has shown that players systematically depart from this prediction with responders rejecting low offers and proposer offering substantial offers (Güth & Kocher, 2013). The large majority of proposers offer the responder between 40 and 50 percent of the available money. Moreover, 40 to 60 percent of responders reject offers below 20 percent of the available surplus (Fehr & Schmidt, 2006; Cooper & Kagel, 2009).

Other experiments implementing two-stage alternating-offer bargaining games have also found departures from the subgame-perfect equilibrium perfection. Based on data from Spiegel *et al.* (1994), Figure 1 displays the average requests in the first round as the $y$ coordinate and the prediction from the subgame-perfect equilibrium as the $x$ coordinate. The ultimatum game situation is at the right end of the scatterplot where proposers should claim all the pie in the first round. For discounting factors which are lower than 100%, the initial claim should decrease according to subgame-perfection. If subjects were behaving according to theory, all data points should lie on the 45°-line. However, Figure 1 clearly shows the mean demand is below the predicted one when the equilibrium claim is above 50% while it is above its prediction when the subgame-perfect claim is below 50%. This suggests that players are responsive to strategic considerations but they are not as responsive as predicted by the theory. The initial claim is instead biased towards an equal split (Davis, 1993).

All this suggest an importance of fairness. Participants do not play as if they only aim to maximise their own payoff. The robustness of these results has contributed to motivate outcome-based models of social preferences where players care about others' payoffs and how these compare to their own payoff (e.g. Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000; Charness & Rabin, 2002). This is true not only for the responders who refuse offers which are too small, but also for proposers. When stripping the second player from the ability to reject the offer (dictator game),

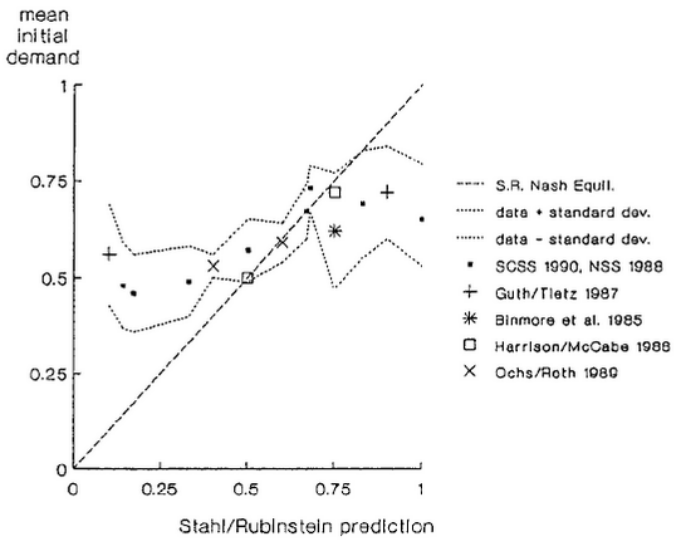


Figure 1: Mean initial demands in Alternating-Offer Bargaining Games with two rounds. Source: Figure taken from Davis (1993) using data from Spiegel *et al.* (1994).

many proposers still make positive offers also in the dictator game (on average between 10 and 25 percent (Fehr & Schmidt, 2006)) so that fairness considerations seem to be also influencing their behaviour. Moreover, respondents' concerns for others' payoffs may actually take the form of well behaved preferences. By giving the option to responders to shrink the pie by any percentage from 0% (acceptance) to 100% (rejection), Andreoni *et al.* (2003) found that the responders who decide to punish unequal offers often choose intermediate level of shrinkage in a way cthat is consistent with well behave preferences over distributions of payoffs.

Besides distributive concerns, it has also been suggested that players care about each others' intentions and that players react to the perceived kindness of other players. Blount (1995) and Offerman (2002) showed that when the first mover's "action" is actually determined by a random device, responders are more willing to accept smaller offers than when the offer is made intentionally by the first mover. More evidence for the importance of intentions on rejections can be found in Falk *et al.* (2003). They show that a 8-2 split in favour of the proposer is more likely to be accepted if the only other alternative was even more unfair (9-1) than if the only other alternative was equitable (5-5). Dickinson (2000) also found that the pattern of acceptance from the responder as a function of the offer is supportive of the reciprocal kindness theory from Rabin (1993).

The importance of fairness in bargaining process echoes the role it has been found to play in other economic activities such as firms' price setting decisions (Kahneman *et al.* , 1986), wage negotiations (Kahneman *et al.* , 1986; Campbell III & Kamlani, 1997), the contribution to public goods (Sugden, 1984) or contracts enforcement (Fehr *et al.* , 1997). It also fosters an interest in finding ways to find bargaining outcomes which are likely to be perceived as fair and therefore accepted by the participants (Carraro *et al.* , 2005). The importance of intentions suggests however that the success of a bargaining process is not only dependent on the final outcome proposed but also on the process itself in so much as it reveals the participants intentions towards each others.

Real world bargaining situation typically allow players to communicate in an unstructured way. Until now, economists have mostly neglected the relevance of soft skills in negotiation which can help in such a process. Though, questions such as what is a good first offer or how tough should a negotiator be in changing an initial offer are of practical importance. They are actually part of formal training in Negotiation in Business Schools. This communication phase contains declarations about desired outcomes and reservation values which are not verifiable. From a non-cooperative game theory point of view with self-centred bargainers, such communication is "cheap talk" (Crawford & Sobel, 1982) and therefore should not be expected to impact the end outcome of the bargaining process itself. [3]

However the importance of intentions would suggest that such a communication phase can play a substantial role in the determination of the bargaining outcome partly because bargainers can convey their intentions and in particular their kindness in this process. Models of reciprocal preferences typically have multiple equilibria depending on the first and second order beliefs of participants about each others' actions. In such a strategic setting, a communication phase can actually help select which equilibrium will be played.

# 3 Experiment

## 3.1 Experimental Design

For our experimental investigation, we design a two-stage alternating bargaining game with no shrinkage from the first to the second period. The absence of shrinkage makes the message (in the form of a split proposition) in the first round costless and therefore cheap talk. It also means that all the bargaining power relies in the hand of the second mover. One would therefore place this design at the far left of Figure 1: in equilibrium the first mover cannot credibly asking anything more than zero. This design has not attracted much interest certainly because, in the traditional alternating bargaining framework, the second mover should claim all the pie and the first mover should get nothing. As a consequence this game should be identical to an ultimatum game with the second mover being the proposer. The only study we know of which looked at such a type of design is from Rankin (2003). He studied whether giving a receiver in the ultimatum game the possibility to make a request had an effect on the proposer choice and found that it indeed had. He unexpectedly found that responders offered on average less in the treatment where receivers were making requests. While surprising at first sight, this pattern can be explained by our result on the effect of such a request on the proposer's choice.[4]

In our bargaining game, two players have to decide on how to divide a given amount of money (AUD 10) among themselves in several steps (see Figure 2). First, player A (he) proposes how he thinks the money should be divided between himself and player B. Player B (she) can then either "accept" player A's proposition. Or she "rejects" and makes a counter-offer. If she accepts,

[3] This is the case because players have competing interests in the bargaining process. In most games cheap talk should not have any effect on the equilibrium strategies of the players. In the case of double-auction bargaining, it has been shown that pre-play cheap talk can actually create new equilibrium outcomes Farrell & Gibbons (1989); Matthews & Postlewaite (1989) though it cannot enable players to increase their share of the surplus relative to the the situation without communication. Experiments have however shown that pre-communication play can improve the efficiency of the bargaining outcomes Radner & Schotter (1989); Valley *et al.* (2002).

[4] Outside of bargaining games, two studies on the dictator game have also found that making pre-play request can affect other players behaviour (Rankin, 2006; Andreoni & Rao, 2011). In each case, pre-play requests increased the amount received by the receiver, suggesting here too a potential role of appeal to the other player's kindness.

both players will receive an amount according to player A's suggested partition. If she rejects his proposition, player B makes a counter-offer regarding the split of the money between herself and player A. Player B's counter-offer is then either "accepted" or "rejected" by player A. If he accepts, both players will receive an amount according to player B's suggested partition. If player A rejects, both players earn nothing.

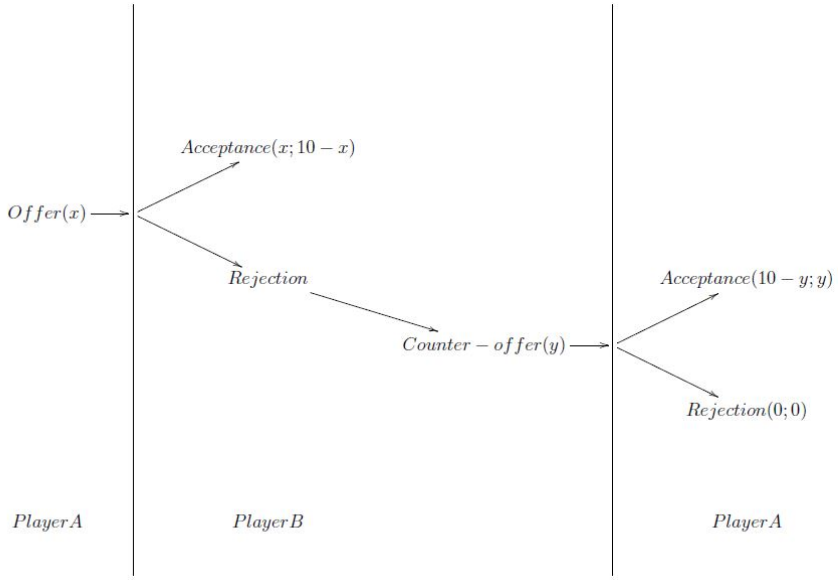


Figure 2: Game Tree Bargaining

The experiment was conducted between February and June 2014. There were ten experimental sessions with 14 to 18 subjects. It was conducted using the experimental software CORAL (Schaffner, 2013) with students from a large university in Australia, recruited via the ORSEE software (Greiner, 2004). At the beginning of the experiment, participants were randomly assigned the role of either player A or B and kept the role during the entire session. While the experiment consisted of two parts, subjects were only informed about the existence of a Part II (belief section) after they had answered all questions in the first part (choice section) of the experiment, and were told that this was the final one. After all answers were made, participants were randomly matched into pairs of one player A and one player B and payoffs were determined according to their choices and stated beliefs. At no time subjects were informed about the identity of their matched partner. Each session lasted approximately 45 minutes. All subjects received a fixed participation fee of AUD 3 and earned on average AUD 14.30. The full instructions can be found in Appendix B.

### 3.1.1 Part I - Elicitation of Choices

For our choice elicitation, we use the strategy method to obtain both players' decisions. The strategy method offers the benefit of making the responses in all decision nodes observable. While there are potential factors such as a reduction in incentives or a "hot" vs. "cold" effect that might affect

the participants' choices by using the strategy method (Zizzo, 2010), the experimental evidence reports no case in which a treatment effect is observed with the strategy method and not with the direct-response method (Brandts & Charness, 2011). In particular, the strategy method allows us to elicit player B's individual reaction to all possible propositions made by player A. We are therefore able to investigate if the initial proposition alters player B's subsequent counter-offer.

We elicit following choices from the two players: player A makes the decision about his initial proposition on how much of AUD 10 he wants to keep and how much he wants to offer to player B. In addition, he is asked about his minimum acceptable counter-offer (MAO), i.e. the smallest amount at which player A would just accept player B's counter-offer, in case player B will reject his initial offer. Player B makes his acceptance/rejection decision for every possible initial offer from player A. If je rejects, he makes a counter-offer as to how he thinks the AUD 10 should be divided.

#### 3.1.2 Part II - Elicitation of Beliefs

For our research question, it is not sufficient to analyse if player A's initial proposition alters player B's choices but in order to investigate the "why" behind a potential change in choices, we need to look at participants' beliefs. Beliefs can be explicitly measured by asking the participants to make certain guesses about other participants' choices or guesses, rewarding them for accuracy. We again use the strategy method. This allows us to capture if and how beliefs change as player A's proposition does. We elicit players' first and second order beliefs about the partners' choices. Doing so enables us to further disentangle two potential underlying forces if we observe that player A's initial request changes player B's counter-offer: 1) player B's fear of player A's rejection, which is reflected by player A's belief about player A's MAO; and 2) player B's appreciation of player A's fairness/kindness revealed by his initial offer.

From player A, we elicit beliefs to receive information about his expected payoff. Thus, we ask him to guess whether player B will accept or reject his initial proposition regarding the split of the AUD 10. We do so for all propositions that he could have made. In case he expects player B's rejection, we furthermore elicit player A's guess on how much player B will offer him in her counter-offer. For player B, we are interested in her belief about player A's expected payoff as well as in her belief about player A's toughness. To determine the former, we ask player B to guess how player A expects her to react to each of his potential partition propositions, i.e. whether player A expects her (player B) to accept or reject that particular proposition. If player B thinks player A expects a rejection, we additionally ask her to guess player A's belief of player B's potential counter-offer. Player B's belief about player A's toughness is conveyed by her belief about player A's minimum acceptable counter-offer (MAO), i.e. the smallest amount at which player A would just accept player B's counter-offer. This belief is elicited for all possible initial offers from player A.

As our incentivisation scheme for the belief elicitation, we reward the participant only if he correctly predicted an event. Although this procedure is not a "proper scoring rule", it suffice to elicit the mode of a discrete distribution and (Wilcox & Feltovich, 2000; Hurley & Shogren, 2005). Hurley & Shogren (2005) further show that this method is robust to deviations from expected utility maximization and risk neutrality. In addition, it is easy to understand. Participants earn additional money if their stated guesses match the actual answers given by the other player: They receive AUD 0.20 for every correct guess. Player A receives AUD 0.20 for each correct belief about player B's acceptance/rejection decision. If he correctly guesses that player B rejects his offer, player A earns extra AUD 0.20 if his guess about player B's counter-offer coincides with her actual offer. Player B

earns an additional AUD 0.20 for each correct guess of player A's smallest accepted counter-offer. Furthermore, player B receives additional money if her guess about player A's expectation of her reaction matches player A's actual expectation. Here, she can earn AUD 0.20 for each correct guess on whether player A expects her to accept his offer and in case of a correctly expected rejection player B receives AUD 0.20 for each correct guess about what he expects her to counter-offer to him.

## 3.2 Hypotheses

Non-cooperative game theory with self-centred agents would predict that the first stage of the game is just "cheap talk" and that the strategic structure of the game is identical to a simple ultimatum game where player B is the proposer, making a take-it or leave-it offer to player A, the responder.

In contrast with this prediction, we expect the initial suggestion from player A to influence B's behaviour. To study whether and how B may be influenced by A initial suggested split, we look at how it affect B's actions and beliefs. Specifically, we look at three curves, which are functions of player A's initial request $r$. First, the curve of player B's final offers (FO): *FO-Curve*

$$FO(r) = \begin{cases} r & \text{if player B accepted} \\ CO(r) & \text{if player B rejected,} \end{cases} \tag{1}$$

where $CO(r)$ is the counter-offer made by player B after rejecting $r$. Second, the curve of player B's belief about player A's minimum acceptable counteroffer (MAO): $MAO_B$*-Curve*

$$MAO_B(r) = \begin{cases} r & \text{if player B accepted} \\ MAO_B(r) & \text{if player B rejected,} \end{cases} \tag{2}$$

where $MAO_B(r)$ is B's belief about A's MAO if he rejected $r$. Third, the curve of player B's belief about player A's expected final offer: $EFO_B$*-Curve*

$$EFO_B(r) = \begin{cases} r & \text{if B believes A expects him to accept} \\ ECO_B(r) & \text{if B believes A expects him to reject,} \end{cases} \tag{3}$$

where $ECO_B(r)$ is B's belief about A's expected counter-offer. We make the following hypotheses about the effect of Player A's request ($r$) on these curves:

**Hypothesis 1 (As' requests influence Bs' final offer)**
*B's final offer*

*(i) depends on the level of A's request. Thus, the first stage is not cheap talk without any consequences.*

*(ii) will possibly increase for low requests but decrease for high requests from A.*

The latter two curves can be used to see how the shape of the *FO-Curve* can be related to the fear of rejection ($MAO_B$*-Curve*) and to fairness concerns reflected in the $EFO_B$*-Curve*.

**Hypothesis 2 (Requests convey information on reserve values)**
*Higher requests from A reflect bargaining toughness in the sense of a higher MAO. Thus:*

*(i) The $MAO_B$-Curve increases in player A's request.*

*(ii) Very high request, however, may lose their information content as they fail to signal a credible threat of refusing a lower offer.*

**Hypothesis 3 (Reciprocity vs. strategic considerations)**
*If player B*

*(i) is purely self-centred: the FO-Curve should follow closely the MAO-Curve – providing risk neutrality.*

*(ii) has reciprocal preferences: the FO-Curve may lie above the MAO-Curve for low initial requests from A (positive reciprocity). For higher initial requests from A, the FO-Curve may follow closer or even drop below the MAO-Curve. Especially the latter would be a sign of punishment indicating B's willingness to end the bargaining as a result of A's excessive request (negative reciprocity).*

# 4 Data and Results

We first provide an overview of our data and a descriptive analysis of actual behaviour and beliefs. We then proceed with parameter estimations and a more detailed investigation of the counter-offers made by player B.

The experimental data is summarized in Table 1. Player A's average request was AUD 5.5 or 55% of the surplus and his minimal acceptable offer (MAO) was on average AUD 4.7. For player Bs, we divide the data in the actually resulting decisions (after the matching) and the data obtained from all hypothetical choices obtained via the strategy method. 32% of requests were actually rejected and followed by a counter-offer (CO). Interestingly, this CO was on average AUD 4.1, which is consistent with typical offers in the ultimatum game. Yet, it is rejected in over 80% of times if it was below 5, which is comparatively high (Fehr & Schmidt, 2006).

| Treatment | Mean Request (SD) | Mean CO (SD) | Mean FO (SD) | Mean Earnings player A (SD) | Mean Earnings player B (SD) | Bs' Rejection Rate | Mean MAO player A (SD) | As' Rejection Rate |
|---|---|---|---|---|---|---|---|---|
| Actual | 5.53 (1.24) | 4.12 (1.11) | 4.73 (.79) | 4.23 (1.81) | 4.25 (1.83) | 32% | 4.68 (1.59) | 48% |
| Strategy Method | 5 (3.16) | 4.22 (1.40) | 3.49 (1.88) | n/a | n/a | 48% | n/a | n/a |

Table 1: Summary Statistics

The data obtained via the strategy method gives us additional and deeper insight about the influence of player As' requests on player Bs' decisions and beliefs. We first look at the development of player Bs' acceptance rate depending on the initial request. In Figure 3, it can be seen that most player Bs accept a request that is smaller than five. The equal payoff request, however, seems to be the turning point as we observe a large drop in the acceptance rate once requests exceed this threshold. Player As' actual expectations as well as player Bs' belief about As' expectations are quite accurate – the respective curves follow both closely As' actual acceptance rate (Figure 3).
Closely related to B's acceptance decision is his final offer (FO). gives us a better understanding about how the request affects player Bs' decisions. As can be seen in Figure 4, Bs' $FO(r)$ follows closely the 45°-line up to a request of approximately 5 (reflecting the high acceptance rate for low

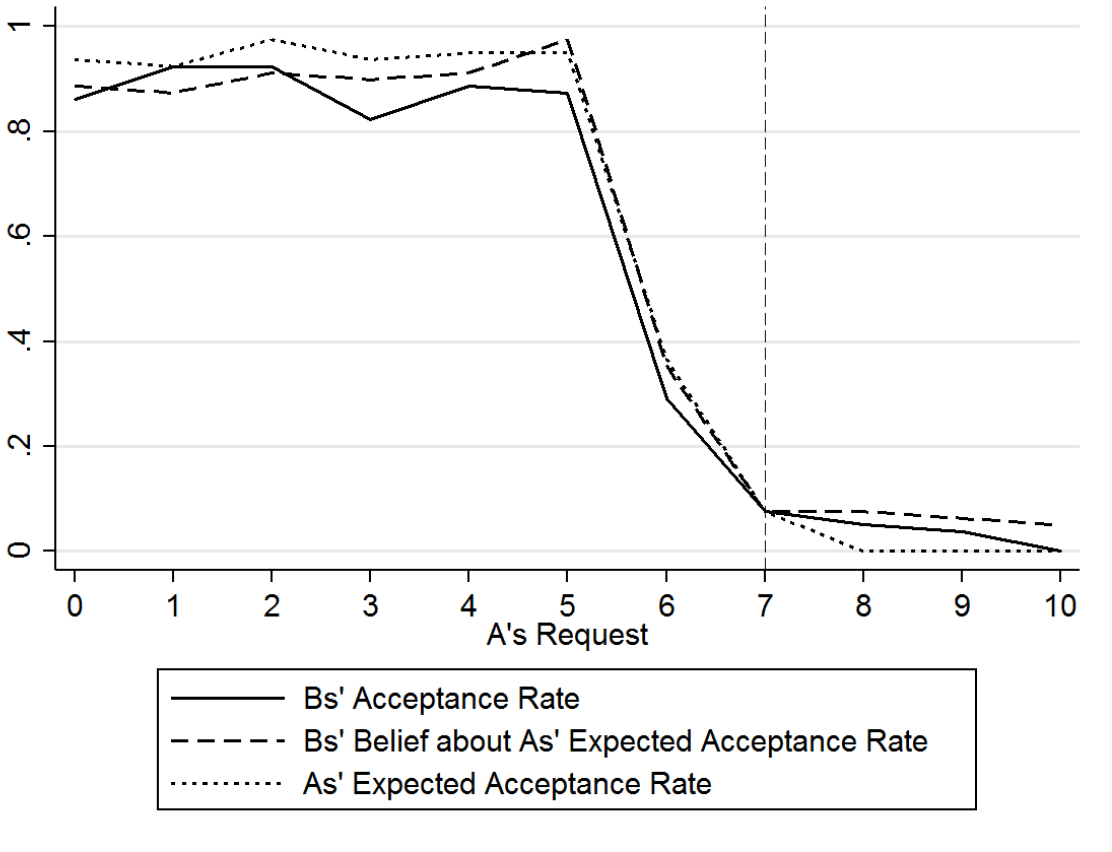


Figure 3: a) Bs actual acceptance rate; b) Bs' belief about As' expected acceptance rate; c) As' expected acceptance rate.

requests). Note that it lies slightly above it up to a request of 4 and from then onwards slightly below. Note further that it never reaches the equal payoff of 5. At a request of 5, we can again observe a severe kink which reflects the sudden drop in acceptance rate followed by counter-offers below the request. Most striking is the inverse U-shape, where final offers actually decline as requests reach more than 60% of the surplus.

**Result 1 (Final offer curve is inverse U-shaped)**
*B's final offer increases in A's request if the request is below 50% but decreases if A's request is above 60%. The final offer curve takes therefore an inverse U-shape.*

One of the advantages of our experimental set-up is the elicitation of beliefs, which helps to disentangle channels driving player B's behaviour reflected in the *FO-curve*. Specifically, we are interested in player B's belief about A's MAO as well as his belief about A's expected final offer. Their respective functions on A's request as defined in Section 3.2 are shown in Figure 4. We find that B's belief about A's MAO follows the pattern expected by Hypothesis 2. When A's request is

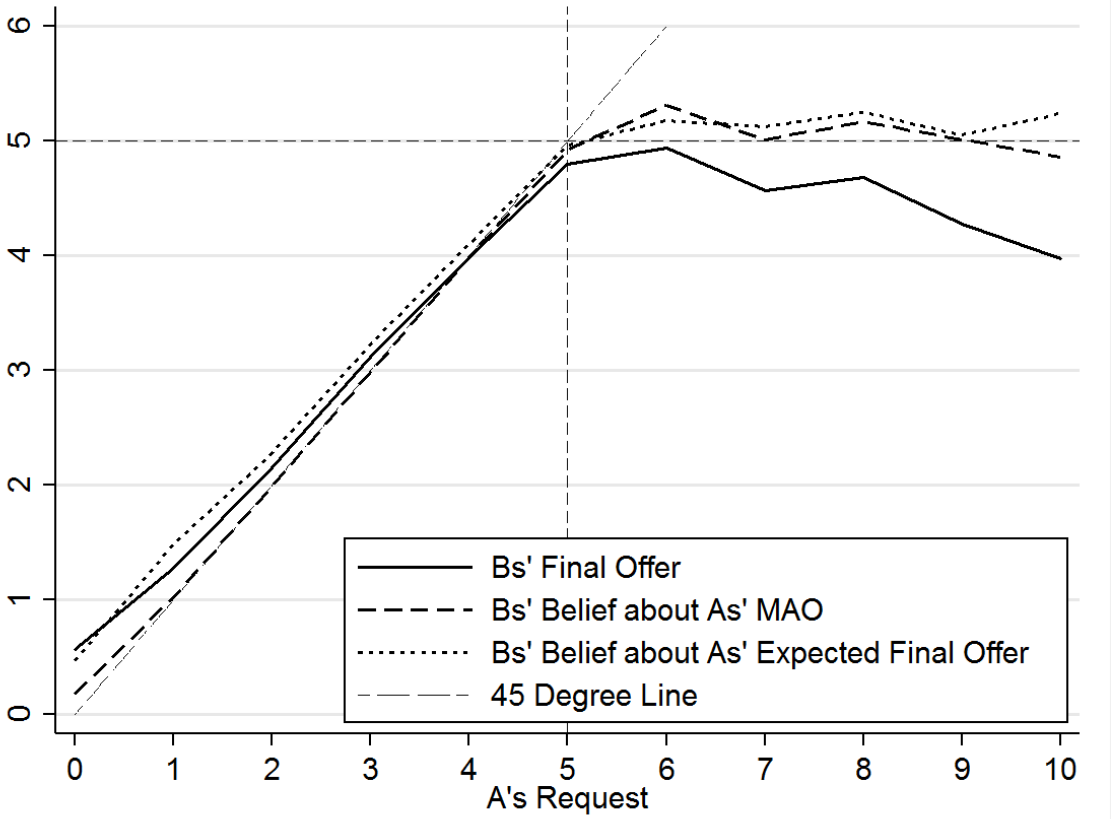


Figure 4: player Bs' $FO$, $EFO_B$ and $MAO_B$ as a function of player As' request.

below 5, B takes this first proposition as a signal of A's MAO. However, when A's request exceeds 5, it does not have the same information content. Any request from A above 5 is interpreted by B as indicating a MAO of around 5, no more.

**Result 2 (Requests partially signal the toughness in bargaining stance)**
*Small requests by A are interpreted by B as a weak bargaining stance (low minimal acceptable offer). But large first offers above 5 are not interpreted as signalling a credible indication of a tough bargaining stance (high minimal acceptable offer).*

Particularly interesting is the relation between the $MAO_B$- and the *FO-Curve*. Up to a request of 4, final offers exceed the B's belief about A's MAO. This suggests a small effect of positive reciprocity from player Bs: they respond to a modest (kind) split proposition from A by offering them more back than what they had asked for. For a request of 4 or 5, Bs' FOs are more or less equal to their belief about As' MAOs. Once, requests go beyond the equal payoff, FOs fall short of the $MAO_B$. This suggests a negative reciprocity on the part of player Bs who answer to high requests by making counter -offers which are on average lower than what they believe is A's MAO.

Doing this they seem to punish A at their own cost as according to their own beliefs their final offer is likely to lead to a rejection from A and therefore to a null payoff for both players. This pattern gets stronger as requests reach the full surplus.

**Result 3 (Reciprocity considerations in final offers)**
*B's FO-Curve lies above the MAO-Curve for low initial requests from A, indicating positive reciprocity. For higher initial requests from A, Bs' FO-Curve decreases and drops below the MAO-Curve as a sign of negative reciprocity on the part of B who is willing to end the bargaining as a result of A's request.*

To investigate the influence of reciprocity on player Bs' FOs in more detail, we define a reciprocity measure as the difference between player B's final offer and his belief about A's MAO: $Reciprocity(r) = FO(r) - MAO_B(r)$. The associated graph is shown in Figure 5. Player Bs' reciprocity is clearly decreasing in As' request – switching from positive to negative reciprocity at a request of 4. Another interesting observation is the much more pronounced negative reciprocity and a steeper slope for very high requests ($r > 8$).

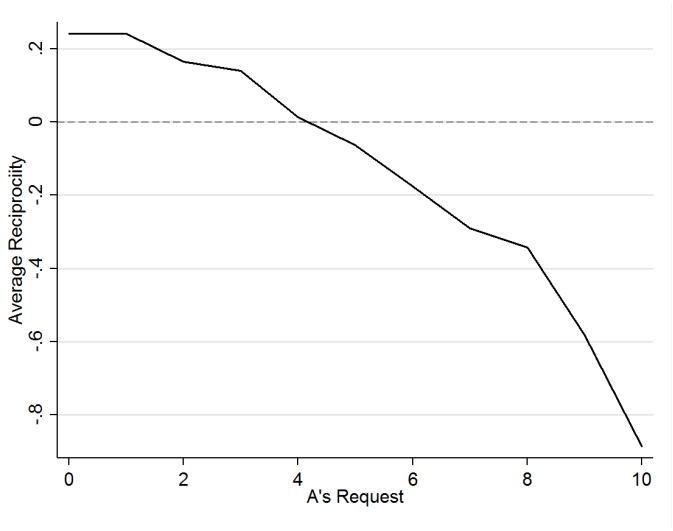


Figure 5: Player Bs' average reciprocity as a function of player A's request.

**Result 4 (Negative reciprocity plays a larger role than positive reciprocity)**
*Player B reacts much stronger to high (by proposing a lower final offer) than to low requests made by A (by proposing a higher final offer).*

As the final step, we want to test the hypothesis further that higher payoff expectations by player A indicate ceteris paribus less kindness and should therefore be punished by a reciprocal player B. This is being done by estimating the following equation:

$$FO_i = \beta_0 + \beta_1 MAO_{B_i} + \beta_2 EFO_{B_i} + \beta_3 Grt5 + \beta_4 EFO_{B_i} * Grt5 + e_i,$$

| | Final Offer | Robust SE |
|---|---|---|
| $MAO_B$ | 0.096* | .042 |
| $EFO_B$ | .697*** | .046 |
| $Grt5$ | 5.544*** | 1.078 |
| $EFO_B * Grt5$ | -.985*** | .170 |
| $Constant$ | .579*** | .153 |

OLS regression. $^*p < 0.05$ $^{**}p < 0.01$ $^{***}p < 0.001$

Table 2: Final offer as a function of B's beliefs following A's request

where $FO_i$, $MAO_{B_i}$ and $EFO_{B_i}$ denote the final offer, the belief about the minimum acceptable offer and the belief about the expected final offer associated with $i$ in the role of player B. To test whether $EFO_{B_i}$ has a different impact on B's final offer if it exceeds the equal payoff threshold of 5, we include the dummy $Grt5$, which is one if $EFO_{B_i} > 5$ and zero if $EFO_{B_i} \leq 5$. The results are reported in Table 2. We find a significant slope change from positive to negative once player Bs belief that As' final offer expectation exceeds 5.

**Result 5 (Bargainers react negatively to the perception of high expectations)**
*Player Bs' final offer are negatively influenced by their perception of As' expected payoff when this expectation exceeds 50% of the stake.*

As often, averages masks individual differences. Looking at individual data, we classified players B as "negatively reciprocal" whenever they punished A for first offers exceeding 5 by offering back a final offer lower than what they believe would be A's MAO. We classified B as "neutral" whenever their final offer was non decreasing for high first offers from A. In practice we did not observe one single B player who increased his final offer for higher first offers from A, above 5. So B players labelled as "neutral" typically offer a roughly constant sum to A whatever the first offer made above 5. We included individual graphs of players B choices in appendix. Figure 6 displays the proportion of B players adopting a punishing behaviour (FO<MAO) as a function of A's initial request. We observe that this proportion starts climbing for initial requests above 5 and ends up above 40% for A's initial requests asking player B to give the whole stake.

Figure 7 displays the distributions of Bs' final offers for each initial offer from A. For initial offers below 5. Most of Bs' final offers are exactly As' initial offer. A few Bs' reject the low offer and propose a fairer split around 50%. For initial offers above 5, the mode of Bs' final offers stay in 5, but now a substantial number of Bs' chose a counter offer below 5. Interestingly, as shown by Figure , the highest average payoff for A is reached for initial offers of 6, just above the 50% split. This is due to the fact that such a request is not punished by many Bs' and that a few of them even grant this request to As. The optimal initial offer from A's point of view is therefore not the fair 50% split, it is just above it.

**Result 6 (The optimal first offer is located just above the fair allocation)**
*Player A's maximal expected payoff is reached for an initial offer of 6 which lead to slightly better final offers on average than initial offers of 5.*

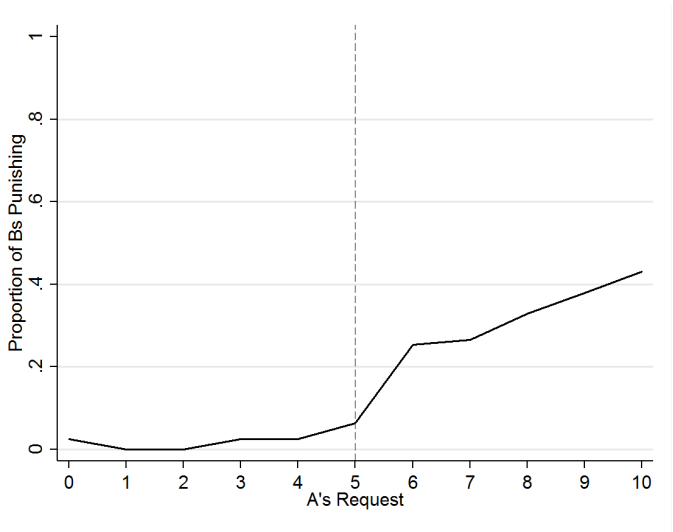


Figure 6: Proportion of players B punishing A as a function of A's first offer. B is said to punish A if FO<MAO.

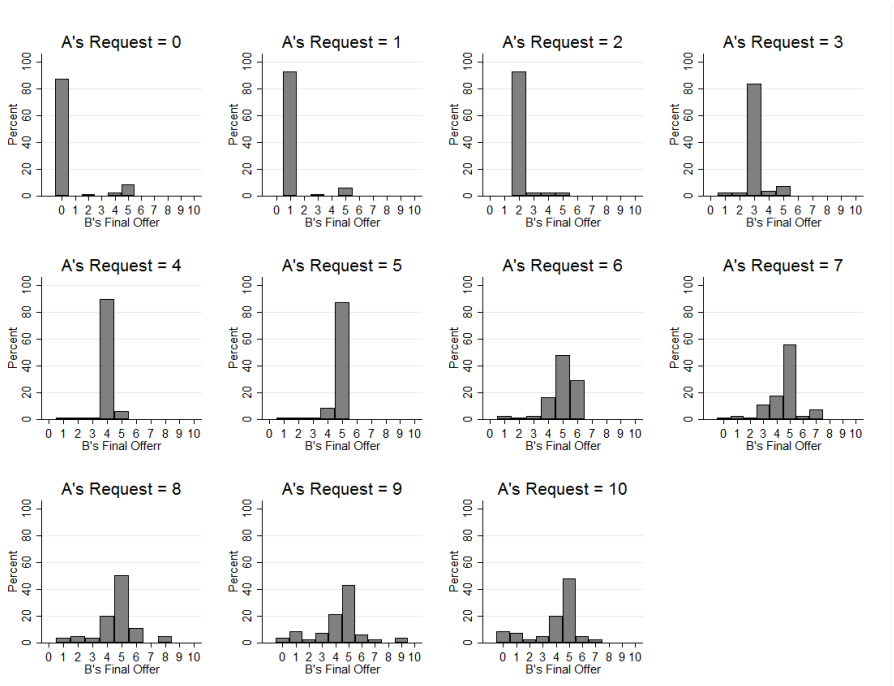


Figure 7: Distributions of Bs' final offers for each initial offer from A

# 5 Summary and Discussion

We have investigated the role of reciprocal preferences in bargaining. We designed a double round ultimatum game mimicking the typical start of a negotiation process, with a bargainer making an offer which the other bargainer can accept or reject and make a counter-offer. This design allows us to observe how a bargainer B receiving a first offer from A in a negotiation reacts to it. While A's initial offer is formally only cheap talk, we find that B reacts to the first offer with B's final offer being inverse U-shaped as a function of it: B's final offer is maximal for first offers close to the even split and lower for low and high first offers from A. We disentangle the two possible signals which B may read from A's the initial offer by eliciting B's beliefs about A's minimal acceptable offer and A's expectations. We find that B does not interpret a high offer from A as suggesting a high minimal acceptable offer. Our results suggest that Bs' final offer decreases for high initial request from A as a consequence of negative reciprocity. First, Bs' final offer is lower when B believes that A has expectations above 5. Second, Bs' final offers are on average lower than what they believe is A's MAO for initial offers above 5. This is driven by a substantial proportion of B players who take the risk to break the deal by making a punishing counter-offer which is lower than what they expect A to accept. For the most extreme initial request from A (asking for the whole stake), more than 40% of players B make a punishing counter-offer.

Overall our results indicate that reciprocity plays a substantial role in a bargaining process. Being kind and starting with a low offer is rewarded but not to the point where it is actually a profitable strategy as only a limited number of B players make a higher counter-offer when the initial offer is very small. On the contrary, an initial offer which is too demanding comes with significant risks of receiving a punishing low counter-offer as an answer. While we did not give the option to player B to break the bargaining process after the first offer, we observe a few B players who answer to a high request from A with a counter-offer of zero, which can be seen as a similar move. Interestingly, the optimal first request from A is not the even split, but just above it as it is not punished by many B players and even sometimes accepted.

A large body of economic research has shown that bargainers' distributional preferences play a substantial role in their decision to accept a deal or not. This study adds to this evidence by showing that another type of social preferences, reciprocal preferences, also play a role. As a consequence the success or failure of a negotiation does not only depend on the final offer on the table but also on the bargaining process. The intermediary offers made during a bargaining process can be interpreted by the other bargainer as suggesting either kind and compromising intentions or unkind and tough ones. And the perception of such intentions can influence the final outcome of a negotiation. For this reason, as suggested by Raiffa's citation at the start of this article in a classical book on negotiation, it is not the best strategy to always be as tough as possible in a negotiation. The role played by reciprocal intentions in bargaining suggests that striking a good bargain is a balancing act requiring not to be too soft (as it is not often rewarded) and not too tough (as it is often punished). The field of negotiation, taught in business school, investigates the role of "soft skills" in negotiation: how the interaction process during the negotiation can help it to be successful. The present research suggests that economists can meaningfully venture into this aspect of economic behaviour using inter alia the insights of models of reciprocal preferences, signalling game theory and psychological game theory.

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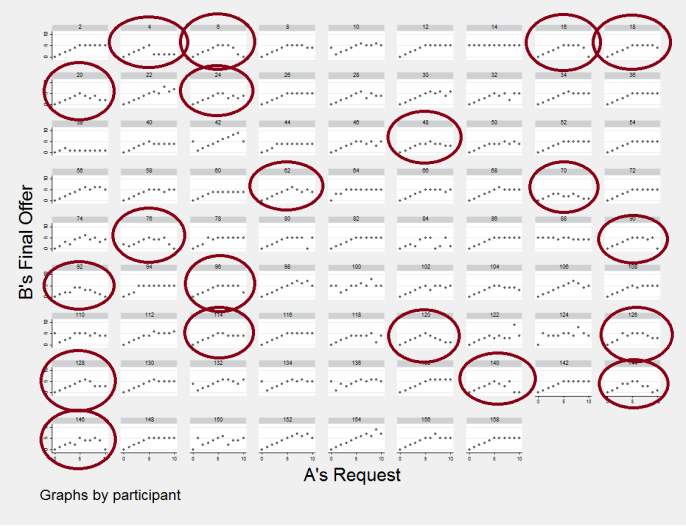
# A Individual Level Results

### Heterogeneity in player Bs' reaction

A) Individuals who are negatively reciprocal




B) Neutral Individuals