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Implicit communication in the ultimatum game

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Highlights

- Modified ultimatum games highlight the role of implicit communication in bargaining.
- Responders' decisions are partly driven by the intent to communicate to proposers.
- Responders reject low offers to show disapproval and accept low offers to hide envy.
- To manipulate implicit communication, we reveal or conceal responders' decisions.
- We complement literature on explicit communication (e.g., text chat) in bargaining.

Implicit communication in the ultimatum game*

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August 2018

Abstract

We use modified ultimatum games to examine the effect of implicit communication on behavior in bargaining. To manipulate implicit communication, we introduce random noise so that proposers cannot infer responders' decisions unless we disclose these. We find that responders reject low offers not only because they disapprove them but also because they want to demonstrate their disapproval. Proposers anticipate this effect and make higher offers to evade rejection. In a second study, proposers forward random offers rather than make their own offers. We thus exclude disapproval of the proposer's choice as a motive of rejection. Our results show that responders refrain from rejecting random offers as rejection might make them appear envious. Our study contributes to the growing literature on communication in bargaining, which has focused on explicit rather than implicit communication.

Keywords: Bargaining, implicit communication, punishment, ultimatum game.

JEL classification: C78, C91, D83.

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Implicit communication in the ultimatum game

1 Introduction

Bargaining is an interesting setting to examine the role of communication in economic interactions. A growing body of literature shows that communication can improve cooperation in ultimatum games (Greiner et al., 2014; Samahita, 2017; Xiao and Houser, 2005; Zultan, 2012). Most of this research has examined explicit communication, such as face-to-face talk or on-line chat. It is commonly understood, though, that people communicate through their actions as much as through their words. To illustrate, imagine a negotiator who rejects an offer that he or she disapproves in order to demonstrate this disapproval. Conversely, a negotiator may also reluctantly accept an offer to avoid admitting disapproval or appearing as a sore loser. We examine such implicit communication in bargaining. Specifically, we explore whether negotiators' responses to offers are driven by their intent to communicate (or not to communicate) with their actions.

In our first study, we conduct an experiment to answer two questions: Do responders reject offers to—implicitly—signal their disapproval to proposers? Do proposers anticipate implicit communication? We modify the ultimatum game, which is widely used to simulate bargaining situations, to manipulate whether or not responders' actions imply communication. In the standard game, a proposer suggests how to divide some amount of money between him- or herself and the responder, who either accepts or rejects this offer. If the responder accepts the offer, the money is allocated as proposed; otherwise, neither gets anything (Güth et al., 1982). Rejection can be driven by various motives (Güth and Kocher, 2014), including emotions and the intent to communicate emotions (Pillutla and Murnighan, 1996; van Dijk et al., 2018). In the standard ultimatum game, however, these motives cannot easily be disentangled.

Prior studies added a communication channel to enable communication (e.g., chat messages). To explore implicit rather than explicit communication, in turn, we block communication. Specifically, we introduce noise to prevent the proposer from learning the responder's decision. In 25% of the games, offers are randomly accepted or rejected, so that the proposer cannot know whether the responder has accepted or rejected his or her offer. This experimental setup allows us to manipulate whether or not actions imply communication by either disclosing or not disclosing the responder's decision. If responders' decisions are disclosed, they can use rejection to communicate to proposers. Otherwise, responders cannot communicate to proposers, no matter whether they accept or reject offers. If responders care about whether proposers learn their decisions, rejection rates differ presumably between the disclosure and no-disclosure conditions.

Emotions have turned out helpful in understanding bargaining behavior, although negotiators are usually warned against becoming emotional (Pillutla and Murnighan, 1996). Bargaining combines cooperative with competitive elements, which elicit naturally negative emotions, like anger, envy, or disappointment. Such negative emotions drive bargainers to reject offers (Sanfey et al., 2003; van 't Wout et al., 2006). Specifically, anger and disappointment have been identified as the prevalent affective reactions to unfair offers (Pillutla and Murnighan, 1996; Lelieveld et al., 2012). Emotions turn thus into a factor that negotiators need to consider and that are also communicated. In particular, negotiators can show or hide emotions and even pretend to have emotions that they do not have to influence other negotiators. Hence, the communication of emotions is a powerful tactic in bargaining (Keltner and Haidt, 1999; van Kleef, 2016).

Andrade and Ho (2009), for instance, show that negotiators exaggerate their anger to dissuade opponents from exploiting them. "Gaming anger" is a potentially useful tactic because complementary evidence shows that negotiators concede more to angry opponents (van Kleef et al., 2004). Depending on the relative power of the negotiators, however, anger can trigger fear or anger in others and gaming anger can therefore backfire. Negotiators may therefore signal disappointment instead, which makes their opponent feel guilty and prompt the opponent to make better offers (van Dijk et al., 2018). Summing up, the literature highlights the role of emotions and the communication of emotions in bargaining. Depending on the situation, though, different emotions can arise and be

expressed. Negotiators game rather than downplay emotions to induce affective responses in their opponent that benefit themselves.

Other related research investigates how responders' behavior depends on whether they can communicate to proposers. Xiao and Houser (2005) see rejection rates drop when they enable responders to send proposers written messages along with their decisions. They conclude that (explicit) communication allows responders to vent their anger, which otherwise factors into their decisions. Samahita (2017) finds similar results even when responders may comment on proposers' offers, knowing that their comments will not be sent to proposers. Other studies employ the impunity game instead, where proposers receive their payoffs regardless of responders' decisions. They find that responders reject offers and thus forgo their own payoffs without reducing the proposer's payoff (Yamagishi et al., 2009; Ma et al., 2012). While these studies argue for anger as a driver of rejection, evidence on the role of communication remains inconclusive.

Although none of these experiments considers implicit communication in bargaining, they offer intuitions for potential effects. The changes in rejection rates that Xiao and Houser (2005) and Ma et al. (2012) record when they enable communication suggests that responders want proposers to know about their disapproval. Xiao and Houser's outcomes provide indeed indirect evidence for implicit communication. Rejection rates are arguably higher without than with written messages because responders who may not communicate their disapproval in writing use rejection instead. Hence, provided that rejection is the only way of communicating disapproval, we should observe higher rejection rates when this implicit communication channel is available than when it is blocked. In particular, an increase of rejection rates under disclosure would offer direct evidence for implicit communication in the rejection of proposers' offers.

We complement our first study on whether responders reject offers to send implicit messages with another experiment to address a related question: Do responders accept offers to avoid sending implicit messages? We run another set of modified ultimatum games, where we replace proposers' offers with random offers, but keep the distribution of offers constant with our first study (Blount, 1995). We thus create a bargaining setting that is identical to our first study, except that proposers are passive as they do not make offers. This setup rules out anger about the proposer as a driver

of rejection (van 't Wout et al., 2006). Responders may still reject offers for various motives, of course, such as discontent with an unfair distribution of payoffs or envy. Knowing that proposers cannot disentangle these motives, though, responders must anticipate that proposers allege them to be envious, regardless of their actual motive (Kirchsteiger, 1994).

Envy, unlike anger, is condemned by all societies (Schoeck, 1969). While anger is potentially justified by someone else's behavior, envy is a negative feeling toward someone who is better off, which is not in response to others' actions (Clanton, 2006; Schoeck, 1969). Envy is usually repressed, denied, disguised, or relabeled, because people feel embarrassed to admit that they are envious (Salovey and Rodin, 1984; Parrott and Smith, 1993).¹ In particular, responders can normally disguise their envy with anger. In the absence of anger, however, envy remains as a plausible motive of rejection, and the responder must expect that the proposer may interpret rejection to indicate envy. As a result, responders will tend to accept low offers to avoid appearing envious in the random-offers ultimatum game. Hence, while we should see rejection rise under disclosure in response to proposers' offers in Study 1, we should see it fall with random offers in Study 2.

2 Experiment

We used ORSEE to recruit students of a large European university for two experimental studies (Greiner, 2015). Each study involved two conditions. Subjects could only participate in one condition of one of the two studies. In both experiments, subjects interacted anonymously through a computer network. The experiment was programmed in z-Tree (Fischbacher, 2007). Subjects were remunerated in cash at the end of their session, earning €2 for each experimental currency unit (ECU).

2.1 Study 1

In Study 1, subjects played the two-player ultimatum game repeatedly over 10 rounds. We opted for repeated games with stranger matching instead of a one-shot experiment to generate more data,

¹Wubben et al. (2011) show that people consider others' motives to defect in prior interactions when deciding whether to cooperate with them. They are more willing to cooperate when they learn that the defector was angry or disappointed than when they do not learn about the defector's motive, which may then have been greed. Hence, people distinguish between just and unjust motives.

because we are particularly interested in the rejection of low offers, which are rare. Subjects were randomly assigned either as proposers or responders and kept their roles throughout the experiment. Upon arriving at the laboratory, they drew cards with the number of their computer. They first received general instructions, which applied across roles. They then took a quiz to make sure that they had understood the instructions. Only after passing the quiz, they learned, in private, whether they were a proposer or a responder.²

At the beginning of each round, proposers and responders were randomly rematched within sessions for repeated one-shot games. The proposer suggested how to divide 10 ECU between the proposer and the responder. The possible offers were 0, 1, 2, ..., 10 ECU. The responder accepted or rejected this offer. We modified the standard ultimatum game design, however, by adding noise to the responder's decision. Specifically, in 25% of the games, nature decided about the proposer's offer after the responder had made a decision. Independently of the responder, nature accepted or rejected the offer, each with a probability of 50%, overriding the responder's decision. In 75% of the games, nature did not make a decision. At the end of each round, the proposer learned whether the offer had eventually been accepted or rejected. The proposer could not infer whether the offer had been accepted or rejected by the responder without further information. The probability for nature to accept the offer was not revealed to subjects to prevent proposers from updating their beliefs about responders' decisions. If the proposer's offer was eventually accepted, both players received their payoffs according to the proposer's offer, and no payoff otherwise.

While the proposer could not infer the responder's decision from the rejection or acceptance of the offer, we could always disclose this information. We manipulated, between subjects, whether or not the responder's and nature's decisions were disclosed to the proposer along with the outcome.³ In the disclosure condition, the proposer was thus told the responder's decision; whether nature had taken a decision and, if so, how nature had decided; the outcome that resulted from the responder's or nature's decision. In the no-disclosure condition, the proposer was only told the

²The instructions, which are reprinted in the appendix, refer to the proposer as "Participant A" and to the responder as "Participant B."

³After ten rounds, we manipulated the treatment also within subjects and changed whether the responder's and nature's decisions were disclosed. Subjects were not told about this manipulation at the beginning of their session, but only after the first ten rounds were finished. Comparisons between the first and second ten rounds did not yield any meaningful insights. We thus exclude the data and related tests for brevity.

outcome. Responders knew whether proposers would learn their decisions. Hence, depending on the condition, they either could or could not use acceptance and rejection for implicit communication to proposers. While noise is technically not necessary in the disclosure condition, we used it across conditions to keep everything except disclosure constant.

After the last round, subjects took the Mach-IV test to measure Machiavellianism (Cristie and Geis, 1970) and answered demographics questions. Finally, they were paid for one round, which was randomly selected at the end of the experiment. In addition to their payoffs from the ultimatum game, they received an additional fixed amount of 2.5 ECU.

2.2 Study 2

Study 2 differed from Study 1 only in the task of the proposer. Proposers could not decide on offers themselves but had to forward to responders offers that were randomly drawn. (For consistency, we still label the role as the proposer.) Specifically, the offers were drawn from the distribution of offers that resulted from Study 1. To exclude that differences in responders' rejection decisions between both conditions were driven by different distributions of offers, we pooled offers across the conditions of Study 1. This distribution was then used to determine offers in both conditions of Study 2. Responders were told that offers were not the proposers' choice, but that they were adopted from another experiment conducted earlier in the same laboratory.

Again, we manipulated, between subjects, whether or not the responder's and nature's decisions were disclosed to the proposer at the end of each round. Like in Study 1, the responder's acceptance or rejection decision implies communication if it is disclosed. As opposed to Study 1, however, the responder cannot possibly react to the proposer's decision because the offer is not the proposer's choice.

3 Results

Either study involved 6 sessions of about one hour, for a total of 12 sessions. In half of these sessions, responders' decisions were disclosed, in the other half, they were not disclosed. A total of 352

students participated in both studies (188 in Study 1 and 164 in Study 2). Subjects' age averaged 23.5 years (SD 4.2) and 65.3% were male.

3.1 Responders' rejection decisions

We first consider the effect of disclosure on the rejection of offers in either study. Fig. 1 summarizes the responders' rejection rates. Specifically, a responder's rejection rate averages, for each offer, the responder's rejection decisions over the ten rounds of the experiment. The panels depict, for either study, the means of the individual rejection rates by offer and condition. They highlight the mean rejection rates for offers of 2, 3, and 4 ECU. We pool offers of 0 ECU, which are rare, with offers of 1 ECU. Likewise, we pool the few offers of 6 ECU and more with offers of 5 ECU. Offers of 5 ECU and more are usually accepted. By contrast, rejection rates vary considerably between studies and conditions for offers of 2, 3, and 4 ECU.

Insert Fig. 1 about here.

Unsurprisingly, rejection rates are lower for higher offers across both studies.⁴ Contrasting the studies, rejection rates are generally higher in Study 1, where offers are chosen by proposers, than in Study 2, where proposers do not have any choice. The difference in rejection rates between the studies suggests that rejection is, to some extent, driven by whether proposers have the choice over offers. However, rejection rates differ only between offers below 5 ECU. Likely explanations for the rejection of low offers in Study 2 are concerns about distributional fairness or envy. In Study 1, where proposers choose the offers, rejection can in addition reciprocate proposers' choices, and low offers are indeed more often rejected than in Study 2, which rules out reciprocity as a motive for rejection by design. Rejection rates differ especially when responders' decisions to accept or reject offers are disclosed. Without disclosure, rejection rates are similar.⁵

⁴Pairwise differences between the rejection rates within either condition and study are significant with $p < 0.05$ or better according to one-sided t -tests. Exceptions are the differences between the rejection rates of 54.2% and 46.3% (not significant) as well as 46.3% and 30.0% ($p = 0.064$) in the no-disclosure condition of Study 2. The decrease of rejection rates is also reflected in the negative β -coefficients on the offer variable in Table 1 below, where we report statistical tests.

⁵Untabulated results of a mixed-effects probit regression, which controls for offer levels, confirms that the rejection rate is higher in Study 1 than in Study 2 in the disclosure condition ($p < 0.001$) but not in the no-disclosure condition.

Looking at the effect of disclosure, we note that rejection rates increase under disclosure in Study 1. That is, responders are more likely to reject a given (low) offer when they can be sure that proposers learn their decision. While rejection has apparently some value for responders (they forgo money as they reject offers), this value is even higher when their decisions are disclosed. Disclosure enables implicit communication from the responder to the proposer. Responders can let proposers know that they have rejected an offer to punish them, that they are angry about proposers' greed, or that an offer violates their self-esteem. This said, implicit communication remains necessarily vague, which arguably reduces its value. As rejection does not imply one specific reason, the proposer may or may not interpret rejection as intended by the responder.

Interestingly, we observe the inverse pattern in Study 2, where rejection rates decrease under disclosure. While disclosure makes rejection more valuable for responders when it reciprocates the proposer's choice in Study 1, it reduces the value of rejection when it is not in response to anything the proposer has done to justify this decision. Specifically, as rejection does not respond to any action of the proposer, it can only reveal the responder's preferences about the allocation of payoffs. Responders must therefore anticipate that proposers take rejection as a signal of envy. Hence, a potential motive for responders to accept a given offer under disclosure that they would otherwise reject is that they do not want to appear to be driven by envy.

Both the increase in rejection rates in response to disclosure in Study 1, where offers are made by proposers, and the decrease in Study 2, where offers are random, are most striking for offers of 3 ECU ($55.2\% > 31.5\%$, $t_{80} = 2.52$, $p = 0.007$ in Study 1 and $11.3\% < 30.0\%$, $t_{72} = 2.31$, $p = 0.012$ in Study 2, with one-sided t -tests). Both effects are even discernible for offers of 2 ECU despite the relatively low frequency of these ($76.5\% > 55.0\%$, $t_{40} = 1.59$, $p = 0.060$ in Study 1 and $30.0\% < 46.3\%$, $t_{45} = 1.19$, $p = 0.120$ in Study 2). Offers of 4 ECU, which come close to an equal split, and particularly offers of 5 ECU and more, give little reason to reject. Offers of 2 or 3 ECU, in turn, leave responders rather undecided between rejection and acceptance. The additional value of communication (or avoiding communication) tips the scale when the offer is such that the responder is wavering whether to accept or reject it.

Regression results confirm these observations. Table 1 reports mixed-effects probit regressions

with random effects on the subject level that test the effect of disclosure on rejection in either study for significance. Since rejection obviously depends on the offer, which is reflected in Fig. 1, offer is included as a covariate in the baseline model. The most important finding reported in the table is that both the increase of the probability for an offer to be rejected in response to disclosure in Study 1 and the decrease in Study 2 are significant. It turns out that disclosure has opposite effects depending on whether offers are made by proposers or whether they are random. The significant negative effect of the offer is also in keeping with Fig. 1, which shows that rejection rates decrease as offers increase—irrespective of disclosure and of whether offers are the proposers’ choice.

Insert Table 1 about here.

The second and third models, which include the round as a covariate, show that the probability of rejection declines over time. The third model includes a measure of the responder’s Machiavellianism. Machiavellianism predicts skillful negotiation tactics, cynical views of others, and disavowal of moral standards (Cristie and Geis, 1970). It is interesting to note that Machiavellianism reinforces the effects of disclosure in both studies. This observation aligns well with the intuition that Machiavellianists exploit implicit communication as an additional tactic of negotiation that disclosure provides to them. Depending on the signal that rejection implies, Machiavellianists appear to care more about showing their disapproval, but also about concealing their envy.

3.2 Proposers’ offers

The difference in rejection rates between the conditions in either study shows that responders’ rejection decisions are contingent on whether these decisions are disclosed to proposers. In particular, responders reject low offers more often in Study 1 when disclosure ensures that proposers learn about rejection. Given the effect of disclosure on responders’ behavior, it is interesting to examine whether disclosure also affects proposers’ offers. That is, do proposers anticipate the effect of disclosure on responders, which would lead them to make different offers depending on whether responders’ decisions are disclosed? To answer this question, we consider the data from Study 1, where proposers make offers. Fig. 2 depicts the distribution of offers.

We noted in the previous section that offers of less than 2 and more than 5 ECU are rare. Fig. 2 pools these low and high offers and focuses instead on offers of 2, 3, and 4 ECU, like Fig. 1 for rejection rates. Overall, Fig. 2 suggests that proposers raise their offers in response to disclosure. Comparing offers between conditions, we see that low offers of 0 through 2 ECU are less frequent with disclosure than without ($2.4\% < 8.5\%$, $t_{92} = 2.23$, $p = 0.028$; $4.6\% < 9.6\%$, $t_{92} = 1.76$, $p = 0.081$). Offers of 3 ECU and more, in turn, are more frequent ($93.0\% > 81.9\%$, $t_{92} = 2.81$, $p = 0.006$). On average, proposers offer 4.0 ECU with disclosure, but only 3.7 ECU without ($t_{92} = 1.81$, $p = 0.073$). Hence, they seem to anticipate responders' increased willingness to reject offers under disclosure. They make higher offers to reduce the risk of rejection, which is reflected in the peak of 4-ECU offers, while the relative frequency of offers of less than 3 ECU declines.

Insert Fig. 2 about here.

Table 2 reports the results of mixed-effects regressions of offers on disclosure with random effects on the subject level, which confirm our observations on Fig. 2. As offers of 5 ECU are rarely rejected, we consider only the 32 proposers who consistently offer less than 5 ECU.⁶ The effect of disclosure is highly significant in the baseline model and with the round as a covariate. The third model shows that the effect of disclosure is reinforced by Machiavellianism. Proposers who are high in Machiavellianism seem to understand particularly well that responders reject offers to communicate disapproval if they can, and make better offers to avoid rejection. These results are in line with the concept of Machiavellianism, which combines opportunism with negotiation skills. From a tactical viewpoint, it is reasonable for a proposer to make better offers, which reduces payoffs directly but increases them indirectly as it makes rejection less likely.

Insert Table 2 about here.

3.3 Responders' and proposers' earnings

Taking together the results for rejection rates and offers in Study 1, we see two opposite effects of disclosure on earnings. On the one hand, responders reject offers more often to communicate

⁶The results for all proposers are very similar except of the effect of Machiavellianism, which remains insignificant in the unrestricted sample.

their disapproval, which potentially reduces responders' and proposers' and thus total earnings. On the other hand, however, proposers anticipate that disclosure increases responders' willingness to reject offers. They therefore make higher offers to avoid rejection, which increases responders' earnings at the expense of proposers' earnings. To understand the effect of disclosure, we compare the hypothetical earnings, which would result from responders' decisions, rather than their actual earnings, which are distorted by the noise that we used for our manipulation. Moreover, we restrict our attention to Study 1, where proposers make decisions that responders can reciprocate.

Responders' earnings average 3.26 ECU with disclosure and 3.20 ECU without. While their earnings are slightly higher under disclosure, this difference is not significant ($t_{92} = 0.34$, $p = 0.736$). Proposers' hypothetical earnings, in turn, average 4.24 ECU with disclosure and 4.61 ECU without. Unlike the difference in responders' earnings between conditions, the 0.37-ECU decline of proposers' earnings under disclosure is marginally significant ($t_{92} = 1.87$, $p = 0.065$) because either of the aforementioned effects diminishes proposers' earnings. Overall, proposers' and responders' total earnings, which average 7.50 ECU with disclosure and 7.81 ECU without, do not differ significantly between conditions ($t_{92} = 0.82$, $p = 0.417$).

In summary, the negative effect of higher rejection rates on total earnings is largely compensated by higher offers, so that total earnings are almost the same with and without disclosure. Nonetheless, the small decrease in total earnings and the small increase in responders' earnings, which are individually insignificant, combine to reduce proposers' earnings slightly. Although proposers anticipate the effect of disclosure and improve their offers to avoid rejection, they underestimate the increase in responders' willingness to reject offers. Assuming that proposers offered 5 ECU, we would arguably observe no rejection and proposers would earn 5 ECU, which is significantly more than their 4.24 ECU ($t_{45} = 6.74$, $p < 0.001$). It is thus very likely that proposers could increase their own and total earnings by further improving their offers.

4 Discussion

The ultimatum game has been widely used to study economic behavior in bargaining. The rejection of unfair offers provides compelling evidence that negotiators' actions are driven by non-monetary motives, such as fairness and reciprocity (Fehr and Schmidt, 1999; Falk and Fischbacher, 2006). Another important motive is negative emotions, like anger, and their communication to opponents (Xiao and Houser, 2005; Ma et al., 2012). While standard experiments reduce interaction to a minimum, recent research has shed light on (explicit) communication in the ultimatum game (Xiao and Houser, 2005; Zultan, 2012; Greiner et al., 2014). As a contribution to this literature, we examine implicit communication. Our study explores whether negotiators communicate, implicitly, through their actions and whether they condition their actions on what these (may) tell others about themselves. We also examine whether negotiators understand that others communicate implicitly and act accordingly.

To single out the effect of implicit communication, we introduce noise, so that the proposer cannot infer the responder's decision. We manipulate implicit communication by either disclosing or not disclosing this decision to the proposer. We find, first, that low offers are more often rejected under disclosure, where rejection can be used to communicate anger to proposers. Second, as we rule out anger, rejection communicates envy rather than anger, which is embarrassing to admit. As a result, low offers are rejected less often under disclosure. The opposite effects of disclosure depending on whether envy can be masked with anger is noteworthy. Responders are apparently aware that rejection will be interpreted differently in both cases and they condition their decisions on what these may communicate to proposers. Machiavellianism reinforces these effects, as Machiavellianists cunningly use implicit communication in negotiations.

Implicit communication influences responders' decisions most when they face moderately unfair offers (20–30% of the amount to be divided). In turn, very low offers (10% and less) are mostly rejected and higher offers (40% and more) almost always accepted, both with and without implicit communication. Being one potential driver of rejection, implicit communication tips the scale when people are undecided whether to accept or reject an offer that is quite obviously unfair, but that still

earns them a sizable amount of money. This observation should not lead us to underrate the effect of implicit communication, though. It is unsurprising that there is little variation in responders' decisions when offers are either high or very low. Moderately unfair offers are most interesting and relevant to study in bargaining situations, and we find that implicit communication has a significant effect on responders' decisions about these offers.

It has often been pointed out that punishment can enhance cooperation (Fehr and Gächter, 2002; Fehr and Fischbacher, 2004). Specifically, cooperation increases as people anticipate that defection will be punished and they cooperate to avoid punishment (Fehr and Gächter, 2000). However, proposers will only be more cooperative and improve their offers if they understand that responders will reject low offers to punish them. Our results suggest that proposers anticipate but underestimate the effect of implicit communication. They make higher offers when responders' decisions are disclosed to avoid rejection. Nonetheless, the number of offers that are rejected does not decline under disclosure, so that proposers' earnings decrease, albeit slightly. Responders' earnings, in turn, are about the same with and without disclosure. As a result, proposers rather than responders bear the potential cost of implicit communication.

Relating our results to Xiao and Houser's (2005), we note that the negative effects of implicit communication can be mitigated by either allowing explicit communication or blocking any communication. This has the potential to enhance our understanding of institutional design. One interesting example to consider are voting rules in parliaments. In particular, votes are usually preceded by deliberations, which in the light of our study can be seen as a channel of explicit communication for parties to voice their motives and especially explain voting behavior that their supporters would not approve. This communication relieves pressure for protest vote. This method contrasts with secret ballots that are held without any prior deliberation, which turn out to block communication. While there are different reasons to argue for secret ballots, it rules out the vote as a means for the member to communicate his or her anger over a proposal.

Implicit communication is inherently vague in content. Rejection, for instance, can be a signal of anger, envy, fairness concerns, and other motives (Güth and Kocher, 2014). The responder must therefore consider, first, that the proposer may misinterpret the signal that he or she wants to send

and, second, how much sending the (costly) signal is worth, whether or not the proposer interprets it correctly. Given these uncertainties, it is noteworthy that implicit communication has nonetheless a considerable and significant effect on responders' decisions, which proposers anticipate. While these outcomes suggest that implicit communication works, further research is needed to understand the underlying mechanisms. Specifically, it would be interesting to analyze, in future research, whether the responder and proposer agree also on the content of the message that the responder sends.

Appendix: Experimental instructions

The following text is taken from the instructions displayed to participants on screen. The proposer is referred to as “Participant A”; the responder, as “Participant B.”

Where instructions vary between Studies 1 and 2, the sections with differences are labeled as “Study 1” or “Study 2.” Within either study, differences between the two conditions are marked with curly brackets. The text marked with “D” appeared in the disclosure condition; the text marked with “ND,” in the no-disclosure condition.

Welcome

In this experiment you will make decisions that affect other participants. However, you will remain anonymous. Nobody will learn which decisions you have made. The data will not be tracked to you personally but to your workstation.

Please follow the instructions of the experimenter. Look on your own screen and do not speak. Switch off or mute your mobile devices and stow them in the pocket at the partition panel. If you have any questions, raise your hand. The experimenter will come to you and answer your questions quietly.

All necessary information will be displayed on your screen. You will not be deceived. Only the decisions that you will make based on this information will be analyzed after the experiment.

Compensation

You can earn money in this experiment. Amounts are in ECU and not in Euro. The conversion rate is as follows:

$$1 \text{ ECU} = 2.00 \text{ Euro.}$$

Each participant receives a fixed compensation of 2.50 ECU. You will find information about the variable compensation on the following screens.

The compensation will be paid confidentially and in cash. No participant will learn how much the other participants are paid.

Overview

The participants have different tasks. One half of the participants are Participants A, the other half Participants B.

The experiment consists of 20 rounds. In each round, random new couples of one Participant A and one Participant B will be formed. Nobody learns who the other participant is.

Participants are randomly assigned as Participant A or Participant B. However, you will always remain either Participant A or Participant B.

At the end of the experiment, you will answer questions on your computer. Your answers help us understand your decisions.

The compensation is based on **1 round** of the 20 rounds. This round will be randomly selected at the end of the experiment.

Task (Study 1)

Participant A and Participant B divide 10 ECU between them. Participant A proposes an allocation (allocations are in whole numbers: 0 and 10 ECU; 1 and 9 ECU; 2 and 8 ECU etc.). Participant B either accepts or rejects this offer.

In 75% of the games Participant A's offer is accepted or rejected as decided by Participant B.

In 25% of the games, however, nature decides whether the offer is accepted or rejected. Nature can reach the same decision as Participant B and thus confirm Participant B's decision. If nature makes a different decision than Participant B, however, the decision of nature prevails.

If the offer is eventually accepted, the 10 ECU are divided as suggested by Participant A. If the offer is rejected, both participants receive zero payoffs.

Whether the offer is accepted or rejected thus depends either on Participant B or on nature. Participant A learns whether the offer is eventually accepted or rejected $\{\text{and always}\}_D/\{\text{but never}\}_{ND}$ learns

- whether Participant B accepted or rejected the offer;
- whether the offer was eventually accepted or rejected by Participant B or by nature.

Sequence of events (Study 1)

The following figure illustrates the sequence of events in each round.

Whether the offer of Participant A is accepted or rejected as decided by Participant B or whether nature decides: Participant A $\{\text{always}\}_D/\{\text{never}\}_{ND}$ learns

- whether Participant B accepted or rejected the offer;
- whether the offer was eventually accepted or rejected by Participant B or by nature.

Task (Study 2)

10 ECU are divided among Participant A and Participant B. Participant A receives a proposal for an allocation which he forwards to Participant B (allocations are in whole numbers: 0 and 10 ECU; 1 and 9 ECU; 2 and 8 ECU etc.). Participant B either accepts or rejects this offer.

Participant A does not make an offer himself. The forwarded offer comes from offers made by different Participants A of an **earlier** experiment in this laboratory. Participant A can neither change nor withhold this offer but must **forward it unchanged**.

In 75% of the games Participant A's offer ... (continued like Task in Study 1).

Sequence of events (Study 2)

The following figure illustrates the sequence of events in each round.

Whether the offer forwarded by Participant A is accepted or rejected as decided by Participant B or whether nature decides: Participant A **{always}**_D/**{never}**_{ND} learns

- whether Participant B accepted or rejected the offer;
- whether the offer was eventually accepted or rejected by Participant B or by nature.

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Table 1

Mixed-effects probit regressions of rejection decisions

	Baseline		Round		Machiavellianism	
	Study 1	Study 2	Study 1	Study 2	Study 1	Study 2
Disclosure	0.720*** (0.235)	-0.655** (0.322)	0.715*** (0.234)	-0.722** (0.322)	0.775*** (0.242)	-0.707** (0.337)
Offer	-1.261*** (0.212)	-0.866*** (0.091)	-1.272*** (0.207)	-0.918*** (0.104)	-1.271*** (0.210)	-0.925*** (0.109)
Mach.					-0.213 (0.188)	0.077 (0.053)
Discl. $\times$ Mach.					0.426* (0.234)	-0.371** (0.158)
Round			-0.049** (0.021)	-0.131*** (0.030)	-0.049** (0.021)	-0.132*** (0.029)
Constant	3.017*** (0.660)	1.513*** (0.258)	3.313*** (0.649)	2.313*** (0.187)	3.270*** (0.627)	2.325*** (0.215)
Observations	940	820	940	820	940	820
Subjects	94	82	94	82	94	82

Data from responders only. Includes (subject) random effects; robust standard errors (clustered by matching group) in parentheses. "Discl." and "Mach." abbreviate disclosure and Machiavellianism. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 2

Mixed-effects linear regressions of offers for proposers who offered less than 5 ECU

Dependent variable: Offer	Baseline	Round	Mach.
Disclosure	0.427*** (0.119)	0.427*** (0.119)	0.237* (0.130)
Machiavellianism			-0.269* (0.159)
Disclosure × Machiavellianism			0.332** (0.163)
Round		0.051*** (0.016)	0.051*** (0.016)
Constant	3.006*** (0.085)	2.725*** (0.101)	2.906*** (0.104)
Observations	320	320	320
Subjects	32	32	32

Data from proposers in Study 1 only who never offered more than 5 ECU. Includes (subject) random effects; robust standard errors (clustered by matching group) in parentheses. “Mach.” abbreviates Machiavellianism.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Fig. 1. Rejection rates by offer, condition, and study.

Fig. 2. Distribution of offers by condition in Study 1.