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Analysis

Efficiency and equity in negotiated resource transfers: Contributions and limitations of trust with limited contracts

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ABSTRACT

We consider a case of water reallocation in Brazil, one which has numerous analogs elsewhere. To permit empirical study of the effects of institutions that can facilitate or restrict allocations, we conducted field experiments to explore trust's potential when resource contracts are limited, using a novel asymmetric-productivity ultimatum game with a final surplus-sharing step added. As a form of informal institution, trust could in principle make rights and contracts unnecessary. We observe whether trust in compensation is in fact expected and expressed. We also explore whether trust is exploited, and the effect of communication, within our two bargaining structures: (1) no communication; and (2) with a non-binding message concerning the surplus to be shared. We see that our participants both expect and express trust that some of the surplus will be shared. Trust raises total output and some surplus is indeed shared: those who trust gain a bit on average; and the more trust was shown, the more was shared. However, often the trust was barely repaid. Further, the messages—found to help in other research—had little impact and were often untrue. In sum, trust does matter but both efficiency and equity could well rise with complete contracts.

1. Introduction

We consider water allocation in Ceará, NE Brazil and analogous resource allocations elsewhere, including settings in which water re-allocations will be an important part of climate adaptation. For adaptation, institutions that facilitate mutually beneficial adjustment clearly will be critical. Within the state of Ceará, a new canal will bring water to the capital city from a rural reservoir and these resource transfers will have significant impacts on the origin and destination regions.

Transfer procedures could be clarified, perhaps along the lines of current allocation committees that exist in the rural agricultural valley to bring many stakeholders together in January and June, the latter being particularly important for choices about reservoir releases during the dry season. Valley representatives and key urban water stakeholders could bargain in an analogous fashion when the canal comes online. Instead water rights and contingencies have been left ambiguous. How existing water law can, should and will be applied is unclear. Analogs to this are numerous, including even the negotiations for transfers of resources (effort or inputs) within organizations.

The transfers of water being negotiated in Ceará could significantly affect efficiency and equity. State output rises when water is shifted from flooding of rice fields to either tourism or industry. For equity, it is critical that these shifts be compensated, i.e. that the surplus income be shared. Billboards for the canal say these gains will help everyone but the rural areas may not believe it. Likewise, in the context of a firm, one unit will not always help another despite net benefits for the firm; our setting in Brazil is one of many with output-raising transfers but limited contracts in which transfers may raise efficiency yet be held up by uncertainty about sharing. We hypothesize that until terms of transfers are known and accepted by all, both efficiency and equity can suffer.

Yet contracts may be limited.[2] We explore the role of trust in bargaining under limited contracts, using a novel experimental design that links the large literatures on trust and ultimatum games. We find that trust exists and raises efficiency but does little for average equity and is exploited. While the informal institution of trust accomplishes far more than in narrow models' predictions, our results suggest potential gains from the establishment of fully understood terms of transfers.

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[2] See, e.g., Arrow (1974). The literature on industrial organization examines limited contracts and the residual rights of control over assets (Grossman and Hart, 1986; Williamson, 1979). Regarding natural resources, a contract to lower deforestation might lack contingencies for fire. Trade agreements that reflect asymmetric productivity and efficient exchanges of resources, which are the setting here, often limit punishment tariffs given unforeseen contingencies.

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Trust in compensation (and thus equity) after water transfers can be critical for efficient transfers to occur. Our goal is to explore the expectation and presence of trust as well as its drivers and its impacts. By "trust" we refer to a resource allocation undertaken without full knowledge of its outcomes and, further, one subject to potential exploitation if others fail to share any surplus.[3]

We had 358 participants in the capital of Fortaleza and rural Jaguaribe Valley, in an 'artefactual' field experiment, i.e. done with relevant groups but not locally framed (Harrison and List, 2004). Our experimental design modifies the asymmetric productivity ultimatum game (UG), adding a surplus-sharing step like those in the classic trust games (Berg et al., 1995; Guth and Huck, 1997). In an asymmetric UG, if resources move to a high-productivity actor, her share rises with the size of the pie. Our game decouples equity from efficiency through the added sharing of the surplus.

In our experiment, each pair of participants allocates a bag of 10 tokens (i.e., units of a resource). This involves three steps: (1) the more productive actor proposes an initial split of the resources; (2) the responder rejects the split, giving both a small default payment of 5 Brazilian reals (R$5), or instead accepts the split and then (3) proposers decide whether to share some of their earnings. For maximum efficiency, the proposers should be given all of the resources at the first step, as tokens are worth R$1 for responders but R$2 for proposers in some games and R$4 in others. This asymmetry in resource productivity is what makes the transfer of the resources efficient.

Yet a proposer asking for a large amount and perhaps even all of the resource is requesting trust, since without surplus sharing the ceding of resources is less beneficial than the default payment. Given trust, any desired division of the earnings could be achieved by sharing in the third step. But whether trust is forthcoming is surely affected by concerns about the equity of the outcome.

Since the proposer initiates negotiations, we observe not only the responder's trusting behavior (acceptance of large requests) but also whether the proposer expects trust, instead of a rejection. Unlike in the trust game, the size of the request for trust, and thus the efficiency if it is accepted, is determined by the proposer. It is not chosen by the one who must decide whether to trust, the responder. In the trust game, the same actor chooses both (Berg et al., 1995; Guth and Huck, 1997).

We explore two institutional designs in order to examine the impact of communication on trust. In "no communication," a responder decides based solely upon the initial proposed split, while in "message," a proposer sends a non-binding, structured written message with the proposed split. This is by no means free-form communication or a back and forth between the two participants; rather, the proposer fills out a pre-determined form, with nothing other than an amount written. The message states how much will be given to the responder, in the third step, if she accepts the proposed split.[4] Both institutional designs were tested under the 2:1 and 4:1 productivity ratios.

Following prior literature (for instance Ben-Ner, 2009 and Schweitzer et al., 2006), we hypothesize that even this limited and one-sided communication could, to an extent, inspire additional trust by the responders.[5] In a responder's eyes, it may reduce uncertainty about what a proposer would do after acceptance (see discussions in Crawford, 1998, a survey of experiments with one-sided and two-sided "cheap talk"). Yet such non-binding communications certainly can be exploited (see Casari and Cason, 2007; Croson et al., 2003; Rockmann and Northcraft, 2008).

Our results suggest that trust is expected, occurs, and triggers some reciprocal sharing of surplus. With our surplus-sharing step, the proposers request enough to require the responders' trust and they request more than in our comparison UG with asymmetric productivity but no sharing step. As the acceptances are about the same as in the classic UG, these responders are clearly trusting. On average, trusting pays off slightly for responders. Proposers shared enough, in the final step, to bring responder earnings above the default payment of R$5 they could have had by rejecting. Thus even in our one-shot game, reciprocity of trust exists, as is found in the prior trust literature. The novelty concerning trust, to this point, is that our design shows also that trust was expected.

Yet while those who trusted did not lose out on average, trust seems a limited solution to equity. To start, one goal of trust within resource transfers surely must be to share in the surplus created. That is not accomplished when trusting responders earn only a bit more than if they had rejected.

Further, our novel message variation permits us to observe that not all proposers are trustworthy. Trust is not justified in that actual sharing is often lower than promised in the sharing messages. These lies, and the small gains from messages, challenge previous findings about communication as a coordination device (see Ben-Ner, 2009 and Charness and Martin, 2006) but are consistent with the lying previously found within repeated UGs (Croson et al., 2003) and within text-message communications in social dilemmas (Rockmann and Northcraft, 2008).

In fact, just as proposers accurately expected that responders would trust, some responders seem to have expected proposers' lies. Mid-game, we ask responders to estimate the chance of sharing, and the variation in those estimates is positively and significantly related to acceptance choices. Further, this link appears distinct from risk aversion's influence, as we do not find a significant relationship with acceptances for our measure of the responders' risk aversion. However, we do find that proposers who are more averse to risk request fewer resources initially, in the first step.

These results support the potential importance of informal institutions like trust in reciprocation. People are willing to gamble on others and their having done so inspires some sharing of gains. Thus, when contracts are limited, we might expect better outcomes than narrow models predict. Yet our results emphasize the limitations of relying solely on trust. Trust appears to accomplish very little in terms of equity on average and also those who trust clearly can be and are exploited. This suggests significant potential benefits from costly efforts to establish clear resource rights.

2. Related Literature

In the investment game first reported by Berg et al. (1995) and replicated by several studies with different subject populations (Guth and Huck, 1997), participants can give up a sure gain (like R$5 for rejection in our game) for the chance to gain more. Yet then they face the risk of gaining less. To trust in this way, or not, is the first action taken, i.e., first movers must trust the second movers. That decision about whether to trust is similar to what our responders (second movers) decide. By refusing the initial proposal, they can obtain the certain R$5. If instead they trust by accepting the proposer's split, the game advances with a larger economic pie whose division is uncertain.

As trust games' elements arise in our experiment, it is worth discussing the findings about trust: first movers send 50–65% of initial endowments on average, and second movers send back 30–40% of

[3] This is a gamble (see Schecther, 2007 on risk aversion), though a particular one based on expectations of reciprocity. Given randomly assigned roles, we interpret such behavior as sufficient "trust" given the average risk aversion level.

[4] Schweitzer et al. (2006) use a similar message design within their repeated classical trust game. However, since the message is sent by a computer, they can explore the propensity to trust but not the propensity to lie, as we do here.

[5] The ability of face-to-face communication to enhance cooperative behavior has been widely explored within the experimental literature, especially in the context of public and common pool games. See Shankar and Pavitt (2002) and Cardenas et al. (2003), for instance, for reviews of communication effects within social dilemma experiments.

earnings on average (Walker and Ostrom, 2002).[6] With a typical ratio of asymmetric productivities being 3:1, returning one-third of earnings means that the trusting actor receives back just what was given. Thus, trusting actors do not share in the surplus despite a return from the other actors. Trust is efficient, increasing the total pie, but its yield may be disappointing to those relying on trust.

Perhaps those who risk sharing are not trusting but instead gambling. Experiments in Peru by Karlan (2005) show that those who invest more in the trust game are risk takers. Yet the social setting or one's individual mindset can break that link. Kanagaretnam et al. (2009) find a link between risk attitudes and trust only for those whose "social value orientations measure" (Griesinger and Livingston, 1973) indicates a lack of strength either in pro-social or pro-self directions. Eckel and Wilson (2004, p. 464), using three different instruments, find no links between risk measures and trust: "Subjects do not think of trust decisions and financial gambles as similar." Bohnet and Zeckhauser (2004), p. 479 distinguish between types of expectations about returns from risks and say setting matters as actors are "more willing to take risk when the outcome is due to chance than when it depends on whether another player proves trustworthy."

The trust literature also explores the effect of different forms of communication and messages. Charness and Dufwenberg (2006) use "promise" as an informal, free-form message to explore the impact of written messages on trust. They find that messages are powerful and increase trust. Ben-Ner and Putterman (2009) explore multiple forms of pre-play communication and find that these increase trust as well as trustworthiness. Contracts were then largely unnecessary; i.e., trust institutions alone apparently achieved close to the optimal outcomes. Although messages can be lies, Lundquist et al. (2009) find an aversion to lying in bargaining with asymmetric information across different communication treatments. This aversion increased with the size of the lie, and freely formulated messages were associated with the fewest lies and greatest efficiency. We find otherwise. A significant number of messages in our experiments were not true, and the frequency of lying rose with the size of the economic pie (comparing 4:1 versus 2:1) and size of the lie.

Others report lies in bargaining games as well. In particular, Ellingsen et al. (2009) found that the propensity to lie depends on the quality of relationship between the participants, as measured by their performance on a paired prisoner's dilemma game. Participants lie more in the bargaining game when their opposite number defected in the earlier game. In contrast, note that our research considers lies by proposers when the responders have made the "cooperative" decision to trust.

Croson et al. (2003) report lies by both responders and proposers in repeated UGs where both players had a chance to send costless messages about their private information (outside options for responders and size of the pie for the proposers). Rockmann and Northcraft (2008) also find deception in social dilemma experiments, although less in face-to-face than in video-mediated communication and computer text messages (which is comparable to our method). Casari and Cason (2007) compare an unenforceable "bonus," that is like our message with contracts, in a new "partnership" (like principal–agent) game. In contrast to Ben-Ner and Putterman (2009) they find that contracts outperform such bonuses and suggest identifying where explicit contracts perform worse and better than implicit ones. With the bonus, a high share of participants lie.

[6] Some work also explores motives, finding high heterogeneity in motivations across people, contexts and cultures (Cox, 2004; Henrich et al., 2001; Ashraf et al., 2011; Kanagaretnam et al., 2009; Walker and Ostrom, 2002). Ashraf et al., 2011 found altruism (warm-glow kindness) relevant for those who trust little and that trustworthiness is not usually based on reciprocity. Others explore gender differences with mixed results. (e.g., Croson and Buchan, 1999 for Asia and for the United States see Chaudhuri and Gangadharan, 2002; Eckel and Grossman, 1996, 1998).

3. Methods

Our experiments were conducted with 358 members of civil society in Fortaleza, Ceara's capital city, and in the city of Limoeiro do Norte located in the rural and agricultural Jaguaribe Valley. Many of the participants are college students from local farming families and have experience working in agriculture. Others are university staff, officers from public institutions and, within Limoeiro, farmers. Of the 358 subjects, 196 were located in Fortaleza and 162 were in Limoeiro. All of our treatments were performed at each of these two sites within each of the subject pools. That is, people in Fortaleza were not playing the game with people in Limoeiro (though we have done that in other games and that did not affect the results in those). All recruitment was through local contacts who advertised the experiments. Table 1 summarizes the subjects' characteristics while Table 2 shows the number of observations for each game.

As described above we modified asymmetric-productivity UGs by adding a surplus-sharing step.

In "no communication," a responder decides based solely upon the initial proposed split, while in "message," a proposer sends a non-binding written message along with the initial proposed split. The message states how much will be given to the responder, in the third step, if she accepts the proposed split. To communicate an offer, a proposer filled out a pre-determined, structured form with the following information: "If Participant B accepts the offer, I will send him _____ reals".

We also asked responders, in mid-game, about the likelihood that the proposer would share any of the surplus. This was asked after the proposer's initial request for resources and any message.

Each set of paired, asymmetrically productive participants had to allocate 10 tokens. For the 2:1 productivity ratio, each token was worth R$2 for proposers but R$1 for responders; likewise, in the 4:1 productivity ratio case, each token was worth R$4 for proposers but R$1 for responders. We implemented both of our institutional designs for both of these ratios of the productivities.

Usually between 20 and 30 subjects participated in each session. Within each session, subjects participated in two one-shot games. For each game, players were randomly paired to avoid any learning. The games reported here were always the games that were played first by the subjects. Proposers learned responders' decisions at the end of the second game. Identities were hidden, but unlike some experiments reported in the literature (Hoffman et al., 1994) our design was not double-blind. Roles were randomly assigned at the beginning of the session and kept the same.

After reading the instructions aloud, we administered a quiz to check understating of the game. Responders then went to another room. At session's end, one of the two games was randomly chosen and all the payments were made in accordance with the decisions made in that game.

Table 1
Subject Characteristics.

Variable	Obs	Mean	Std. dev.	Min	Max
Age	358	22.79	5.1	18	54
Gender	358	0.52	0.5	0	1
Education (years)	358	15.1	2.0	8	18

Table 2
Experimental Design.

Productivities	No communication	Message
2 to 1	44 Observations	42 Observations
4 to 1	44 Observations	49 Observations

During payment calculations, participants answered a survey with socio-demographic questions and completed a risky-choice task like one used by Eckel and Wilson (2004) for a measure of risk attitude. Each chose between A, which yielded R$10 for sure, and B, a lottery with a 10% chance of R$0, a 20% chance of R$5, a 40% chance of R $10, a 20% chance of R$15, and a 10% chance of R$20. Note that B's expected value equals A's.

4. Results

We observe that trust is expected and expressed on average. This permits higher total outputs than would be possible in a setting of high levels of proposal rejection based on equity concerns. At the individual level, however, the expectations and expressions of trust do vary considerably. Further, while on average those who trust gained slightly, many individuals' trust was exploited.

Interpreting our findings is easier with a basis for comparison of prior results using classic UGs. Here we refer to prior literature and also specifically to UGs that we ran with these populations. With symmetric productivities, proposers requested 60% of tokens, which was accepted 94% of the time. Such behaviors are consistent with existing UG literature (Camerer, 2003 and Ooesterbeek et al., 2004). With asymmetric productivity, proposers requested about 50% of tokens, with an 85% acceptance rate; i.e., less acceptance despite lower resource requests likely due to asymmetry. If tokens are split equally, earnings will mirror the productivities ratio, creating a conflict about what is fair (Gneezy and Guth, 2003; Kagel et al., 1996; Schmitt, 2004). Recall, our UGs feature asymmetric productivity but also a novel third step of surplus sharing.

4.1. Responder Trust on Average—Expected and Expressed

Table 3's summary statistics show we observe both the expectation and the expression of trust.[7] Trust is expressed when responders accept initial splits that give them less than the default (R$5) payments earned by rejecting that split. Trust is expected when the proposers request for such splits.

Putting this in the context of prior results from classic UGs with the same populations, Table 3's first column shows the lowest average request is 66% of the 10 resource tokens to be split. That is clearly far higher than the 50% requests found in classic asymmetric productivity UGs without the third sharing step. It is even higher than in classic symmetric productivity UGs despite a default payment above the classic default of zero, which should raise rejections. Thus, given our third-step sharing, proposers expect that responders will trust, ceding more resources.

4.1.1. Trust's Existence (Expectation and Expression)

Comparing the first and second columns of Table 3 shows that there are limits to the trust here. Responders naturally reject the larger initial requests by proposers in favor of the R$5 payment. Still average accepted requests are clearly above 5 tokens and yield less than R$5 for responders. Thus, not only was trust expected, with average requests yielding less for responders than they could earn by rejection, but trust was also expressed, with average acceptances requiring trust.

From the detail in Table 4a, 4b, which breaks out behaviors by the level of request, we can state that within the no-communications treatments, a majority of the requests are for more than 5 tokens. While requests for five, i.e. to equally split tokens, are the single most common level of request, requests above 5 tokens occur for almost three-fifths of observations in each productivity ratio. With a message, that fraction rises to almost three-quarters, averaged across productivity ratios.

Table 3's average acceptance includes responses to requests for fewer than or exactly 5 tokens. The average resource request accepted is higher with messages for both the productivity ratios, although statistically significantly higher only for the 2:1 productivity ratio ($7.0 > 5.9$, $p = 0.06$). Concerning acceptance of the trust requests (i.e., those for more than 5 tokens), Table 4a, 4b extends Table 3. In no-communication treatments, acceptance averages under two-thirds, lower than in Table 3 but still clearly indicating a significant portion of responders who were willing to trust. With messages, this fraction rises to almost three-quarters, i.e., closer to Table 3's averages.

4.1.2. Trust's Efficiency

Tables 5 and 6 show earnings in accepted proposals and all proposals, respectively. In 2:1 games, the maximum possible total earnings is R$20, achieved if all resources go initially to a proposer. For 4:1 games, the maximum is R$40. Not surprisingly total earnings were below the maximum, though well above an equally unlikely lower bound of all rejections that yields earnings of R$10. The latter is not a helpful benchmark for the gains from trust, as it is easy to avoid being rejected.

A strongly equity-oriented benchmark that could come about without any requests for trust at all would be initial splits that yield equal earnings for the two actors. That implies total earnings of R$13.5 in 2:1 ratio games and total earnings of R$16 in 4:1 ratio games.[8] However, proposers might well be more aggressive, since the failure to request trust reduces total possible earnings.

With no trust the highest possible request, with the least possible equity, would be for 5 tokens. The responders would be indifferent between accepting such proposals and rejecting to get R$5. In 2:1 games, this produces total earnings of R$15 (R$10 for proposers and R$5 for responders). In 4:1 games, this produces total earnings of R$25 (R$20 for proposers and R$5 for responders). The latter distribution in 4:1 games would be particularly likely to be rejected for equity reasons. Thus equity concerns could well drive total earning below this level of highest no-trust requests.

Tables 5 and 6, then, suggest that the third sharing step, and trust that sharing will actually occur, may support efficiency by partially allaying equity concerns as a reason to reject an initial split. As seen within Table 5, earnings in all cases including the default payments are close to R$15 in 2:1 and R$25 in 4:1; i.e., the totals that equity concerns seemingly might prevent. The earnings shown in Table 6 for accepted proposals, where responders trust more, are somewhat higher and in particular higher in the 4:1 ratio where resource transfers are more productive in the aggregate.

Neither Table 5 nor Table 6 shows large gains from having the messages. In Table 5, which has not only the accepted offers but also the rejections from Tables 3 and 4a, 4b (blending 2:1 and 4:1), we see that the message and no communication sessions are roughly equal in total efficiency. Focusing on the accepted cases in Table 6, the gains are only a single *real* (R$1) on average.

4.2. Responder Trust Varies

The above averages mask considerable variation within each treatment, as seen in Table 4a, 4b which further breaks out the data by treatment and productivities ratio. Specifically, for each treatment and ratio, Table 4a, 4b separates data according to what the proposer requested. Proposers' choices clearly differed in identical settings and

[7] Going beyond the numerical results, the statements by participants on follow-up surveys explicitly mention trust. We must allow, though, that inferences from statements may be limited. Glaeser et al. (2000) find statements about trust from the General Social Survey do not line up perfectly with actual trusting behaviors in investment games.

[8] This might occur from distributional considerations and a lack of trust. A lack of trust might yield the expectation that third-step sharing would be zero. Then distributional considerations would dictate first-step requests inverse to the productivity ratios to produce equal earnings, such as requests for 3 or 4 tokens in the 2:1 case, perhaps 3.5 on average for total earnings of R$13.5 ($2*3.5 =$ R$7 earned by proposers and R$6.5 for responders). For the 4:1 case, a request of 2 tokens would yield earnings of R$16 (with $4*2 =$ R$8 earned by proposers and R$8 for responders).

Table 3
Summary Statistics by Treatment.

Treatment	Average Request	Average Request if Rejected	Acceptance Rate	Average Request if Accepted	Average Message (in R$)	Average Message if Rejected	Average Message if Accepted	Average Transfers (in R$)
Message 2:1	7.1 (1.72)	8.0 (1.58)	88%	7.0 (1.72)	4.0 (2.18)	4.6 (1.34)	3.9 (2.27)	2.8 (2.42)
No Comm 2:1	6.6 (2.10)	8.2 (1.42)	70%	5.9 (1.96)				2.5 (3.21)
Message 4:1	6.9 (2.06)	8.4 (1.50)	73%	6.4 (1.98)	8.3 (5.68)	8.0 (5.67)	8.4 (5.76)	5.9 (5.50)
No Comm 4:1	6.6 (2.44)	9.6 (0.81)	86%	6.1 (2.25)				4.8 (6.22)

(Standard deviations in parentheses).

that affected what the responders did. Appendix Table RT1 provides the descriptive statistics for all of the variables used in analyses of these choices.

All else equal, as seen in the Appendix regression tables (RT3a/b), a higher request decreased the likelihood a responder would accept (RT3a), including for the message treatments only (RT3b). As asserted above, requesting less trust is one way to increase the responders' acceptance rates (Ashraf et al., 2004). Messages could be another and in Table RT3b the amount promised also raises acceptance. The linear probability model says the promise of an additional *real* raises acceptance by 3%.[9]

In RT3a, we ask whether the act of communicating itself can engender trust. For instance, maybe simply having had a communication could reduce sensitivity to the level of the resource request. Neither having a message per se nor its interaction with request level is seen to shift acceptance. Characteristics of these individuals might help explain the varied choices, as we explore below.

4.2.1. Individuals' Risk Aversion

As noted, to trust could be to gamble, with outcome dependent on others' choices (Karlan, 2005). Responders gamble by accepting requests above 5 tokens. Proposers gamble on the responders, with larger requests being bigger gambles. We hypothesize that proposers who make risk-averse choices in our risk-taking exercise should be less likely to make large requests. Regression RT2, explaining proposed splits, finds that this is the case: request levels by the risk-averse are lower.

In contrast, risk aversion does not explain acceptance by responders. For all observations within Appendix Table RT3a, or just games with messages in RT3b, risk aversion has no effect. This is consistent with the claims in both Bohnet and Zeckhauser (2004) and Eckel and Wilson (2004).

4.2.2. Responders' Expectations

We asked responders how likely it is that proposers will share in the final step. In Tables RT3a and b, this measure of trust strongly influences the responder's decision to accept a proposal. All else equal and, in particular, distinct from risk aversion, this expectation can drive acceptance.

Having such expectations or trust may well be a personal characteristic. As seen in Table RT4, the personal risk-aversion assessment we did is negatively correlated with this measure of trust (not a causal linkage). Thus it seems that more risk-averse people, who already accept proposals less often for any given expectation of sharing, also tend to have lower expectations of sharing.

Further pursuing the idea that simply communicating could matter, we include in this regression a dummy for messages. It is significant and positive. Perhaps being in a "communicative setting" provides a sense that one can trust the proposer, consistent with our hypothesis that even simple communication can induce more trust. That suggests bargaining structures with communications could be more ripe for exploitation if communication is non-binding and relatively superficial (allowing that perhaps richer communicative interactions could have more profound impacts).

Finally, recall that the decision to trust is not the initial but the second decision within our game. With messages, the decision follows not only the request but also the message from the proposer and both could affect acceptance Table RT4 shows a negative effect for the level of the request. The message has no effect. Thus, large requests did not induce trust that sharing would follow.

4.3. Are Proposers Trustworthy?

4.3.1. Barely Trustworthy on Average

Table 3 shows that, on average, responders gained from trusting instead of choosing the default. Accepted resource splits plus the transfers beat the payment of R$5 that is earned by rejection. This is confirmed by results shown in Tables 5 and 6, second columns, although the gains from trusting are not always very high for either the no-communication or the messages treatments. However, the higher productivity itself does seem to help responders. While responders' shares of earnings are lower in the 4:1 productivity ratio, their absolute earnings are clearly higher.

Benchmarks are again useful for thinking about the impact of responders' trust on their earnings. The standard 60/40 UG result implies a proposer-over-responder earnings ratio of 1.5 while the typically equal split of resources within a standard UG with asymmetric productivity, in contrast, implies a proposer-over-responder earnings ratio exactly equal to the ratio of the productivities. Our asymmetric UG with sharing then might best be compared to an earnings ratio of 2 or of 4.

Tables 5 and 6 show earnings ratios that help to assess the impact of the third sharing step and of trust. In sum, it appears that sharing has some benefit for responders in terms of equity. For the 2:1 games, the ratio of earnings is closer to 1.5 than to the asymmetric productivities ratio of 2. For the 4:1 games, the ratio of earnings is very close to 2, well below the productivity ratio of 4.

Table 4a, 4b helps to assess whether the surplus sharing corresponds to the amount of trust extended. Proposers risk rejection by asking for a lot and may reward risky acceptance of an unequal split. For no-communications requests for 80% or more, average resource transfers were higher and raised the responder's share further above R$5 compared to when proposers requested less. Yet this result is not universal. In 2:1 with messages, transfers did not rise much

[9] Controlling for this positive message effect, which is intuitive, as well as the negative effect on acceptance rates of making a higher request (see Tables RT3a/b), we might also want to consider other features of the facts in Table 4. Higher requests directly imply, for a given truthful message, that a responder who accepts will have less before the transfer that may occur at the end of the game. That direct effect provides solid intuition for lowering of acceptance. However, asking for more up front in principle could signal to the responder that the proposer is trying for efficiency and will transfer later. Multiplying the request levels times their acceptance rates (Tables 4) suggests some signaling since, for instance, overall asking for 9 produces much less than asking for 10. Perhaps asking for everything is seen more as a first step to efficiency and equity than asking for 9, which might signal that 1 is enough for the responder? Testing this Table 4 idea (in a regression not reported here), a dummy for requesting 9 is negative and significant in both Table RT3a and Table RT3b, although much smaller in the latter, as if the message reduced this interpretation.

Table 4a
No-Communication Games: acceptance, message and transfer by request.

Treatment	# tokens requested	# of obsevartions	Rate of acceptance	Average R$ transfer if accept	Average R$ message if accept	% with Message > Transfer	Average R$ message no accept
No Comm 2:1	2	0	–	–			
	3	1	100%	0.00 (–)			
	4	7	100%	0.57 (0.53)			
	5	10	100%	0.60 (0.96)			
	6	5	60%	1.00 (1.00)			
	7	6	66%	3.25 (1.50)			
	8	5	40%	7.00 (0.00)			
	9	4	25%	8.00 (–)			
No Comm 4:1	2	1	100%	0.00 (–)			
	3	4	100%	1.75 (0.50)			
	4	2	100%	2.50 (2.12)			
	5	12	100%	2.16 (2.24)			
	6	4	100%	2.50 (3.00)			
	7	5	100%	6.00 (5.61)			
	8	5	80%	4.50 (5.44)			
	9	0	–	–			
	10	11	54%	14.33 (8.98)			

(Standard deviations in parentheses).

Table 4b
Message Games: acceptance, message and transfer by request.

Treatment	# tokens requested	# of obsevartions	Rate of acceptance	Average R$ transfer if accept	Average R$ message if accept	% with Message > Transfer	Average R$ message no accept
Message 2:1	2	0	–	–	–	–	–
	3	0		–	–	–	–
	4	3	100%	0.66 (0.57)	0.66 (0.57)	0%	–
	5	4	100%	2.25 (2.06)	2.75 (1.50)	25%	
	6	8	87%	1.57 (1.13)	3.42 (0.97)	71%	4 (–)
	7	13	92%	3.00 (1.34)	3.75 (0.96)	42%	4 (–)
	8	5	80%	3.00 (1.82)	4.00 (1.41)	75%	6 (–)
	9	3	66%	2.50 (3.53)	3.50 (2.12)	50%	3 (–)
	10	6	83%	6.00 (4.18)	8.00 (2.73)	20%	6 (–)
Message 4:1	2	0	–	–	–	–	–
	3	1	100%	2.00 (–)	2.00 (–)	0%	–
	4	4	100%	1.50 (1.73)	3.75 (1.70)	50%	–
	5	12	91%	2.18 (2.27)	5.63 (3.29)	64%	2 (–)
	6	5	100%	5.60 (2.60)	8.80 (8.55)	40%	–
	7	9	66%	6.66 (1.96)	7.33 (0.81)	17%	5.3 (5.77)
	8	4	75%	7.33 (4.61)	12.0 (3.46)	33%	6 (–)
	9	6	16%	10.0 (–)	15.0 (–)	100%	7 (3.74)
	10	8	62%	16.2 (5.21)	16.6 (4.66)	20%	15 (5.00)

(Standard deviations in parentheses).

with request, though in 4:1 with messages transfers were high if a request for all the resources was accepted.

4.3.2. Some Exploitation and Frequent Lying

Often proposers share little more than necessary to beat R$5 for responders (Tables 3, 4a, 4b, 5, 6). Here we focus on individual variation. To start with the extreme, some responders earned zero (Tables 5 and 6). They allocated all resources to the proposer initially, yet received no transfer. Thus with or without messages, it seems, these responders were subject to proposers' whims.

Table 4a, 4b shows that losses in earnings from trust, relative to payments from rejection, also occur in the 2:1 sessions with messages. For proposers' requests for 8 tokens, transfers were only R$3, which just barely allowed the responders to earn as much as the rejection payment of R$5. For accepted requests for 9 tokens, transfers averaged R$2.5, leaving responders less than the R$5.

The other equity extreme from zero or losses is equal earnings. This occurred about one-fifth of the time in no-communication games but only about a tenth of the time in games with messages (most of these involved requests for all of the resource). Comparing the two productivity ratios, we see that higher productivity treatments do worse in terms of equity. It seems that the transfers do not, in fact, scale up with the size of the total economic pie. That is consistent with proposers' planning to make the trusting responders better off than the default but not necessarily by much.

Most directly, trust in the messages is not fully justified because many of the messages are lies.[10] This is seen in Table 3, for instance, where average transfers are smaller than was stated in the average messages. In more than two-fifths of cases, the message about sharing was greater than the actual sharing.[11] Table 4a, 4b shows that this

[10] Table RT5 tries to explain the amount of discrepancy in the lie; i.e., the difference between amounts stated in the message and the eventual transfer (for the binary indicator of having lied, effects are insignificant). We find women lie less, though this is not quite significant at the 10% level, while risk aversion is significant at 10%. Perhaps those who are less likely to gamble not only have less trust but also find lying too aggressive. Note that we also considered (but are not reporting here), for all of these tables, whether the location of these experiments matters, and even if the location affected the impact of other key variables such as the amount requested. Other than for Table RT5, being in Fortaleza was not significant for these dependent variables and neither were the interactions with amount requested. Within the lying analysis, in Table RT5, in Fortaleza the lying was lower, while the interactions were insignificant.

[11] In 3% of the cases in 2:1 sessions and 8% in 4:1 the transfers that proposers send are for more than was promised.

Table 5
Earnings, all cases including rejections.

Treatment	Average earnings for proposers	Average earnings for responders	Earnings sum	Ratio average earnings, i.e. Prop/Resp	Mininum (=Responder)
Message 2:1	10.38 (3.41)	5.76 (1.97)	16.14 (2.78)	1.80	0
No Comm. 2:1	8.02 (2.39)	6.11 (1.53)	14.13 (3.14)	1.31	4
Message 4:1	15.67 (7.51)	8.34 (3.95)	24.01 (9.86)	1.88	4
No Comm. 4:1	17.72 (8.22)	8.15 (4.87)	25.87 (8.90)	2.17	0

(Standard deviations in parentheses).

occurs in varied situations. For both the 2:1 and the 4:1 sessions and for almost every level of initial resource request, many proposers share less than they promised. This level of dishonesty indicates, per se, limitations of solely implicit contracts.

5. Conclusion

We presented a novel experimental design that links the ultimatum and the trust game literatures. This permitted us to judge the influence of our novel potential compensation for having shared. It also freed efficiency and equity to move separately, unlike in the asymmetric productivity UG. Importantly, our design describes many cases of resource transfers with uncertain compensation including transfers in organizations and the water bargaining in our field site in Northeast Brazil.

We found that trusting behaviors arose far more often than is predicted by most narrow models. Further, we found that those who initiate negotiations expected trust from those who respond to proposals, an observation easily made in our novel UG yet not possible in the typical trust game. The combination of expecting, requesting and expressing trust is productive and it increases the total economic pie. Trusting actors gained slightly on average and were not “left out in the cold.”

However, these small average gains involved very little sharing of the surplus generated by trust, and it is hard to believe that this amount of sharing was all that trusting responders had expected. In addition, beyond the averages there was considerable variation across the many observations. Some trusting actors ended up literally with zero, showing one limitation of implicit contracting. There is risk inherent in putting one's outcome in the hands of others. Further, many promises of sharing were untrue. Thus, trust alone seems limited and rights might raise efficiency and equity.

Table 6
Earnings, accepted cases.

Treatment	Average earnings, proposers	Average earnings, responders	Earnings sum	Ratio average earnings, i.e. Prop/Resp	Mininum (=Responder)
Message 2:1	11.1 (2.95)	5.86 (2.08)	16.97 (1.71)	1.89	0
No Comm. 2:1	9.29 (1.62)	6.58 (1.61)	15.87 (1.94)	1.41	4
Message 4:1	19.52 (4.50)	9.55 (3.97)	29.08 (5.92)	2.04	4
No Comm. 4:1	19.73	8.65	28.39 (6.72)	2.28	0

(Standard deviations in parentheses).

Our experiments were with populations at the ends of a large new canal, who will share water. Such a population emphasizes the local relevance of these results, and for standard UG games these participants generated outcomes very typical of the literature. We believe that our design and our neutral framing also yield results relevant for many populations and negotiations, e.g. within work teams or across units within an organization where compensation rules are not set.

Considering other negotiations within organizations, we could extend the examination of trust. One natural dimension would be to permit a much broader range of forms of communication. Another way to extend communication is through having repeated play, allowing the formation of one's reputation. We would expect that lying, for instance, might be punished in later rounds. Finally, as it is an important option, we should compare results to those under explicit contracts. Casari and Cason (2007) note the value of understanding when explicit and implicit contracts perform the same and when they differ. This is relevant for incentive design within institutions.

More broadly, these results suggest potential gains from clearly established resource rights. Certainly the informal institution of trust can bring about some efficient transfers of resources and non-zero sharing of the surplus from efficient transfers. Thus, trust is not always exploited. Yet rejections indicating a lack of trust remain relatively common, limiting gains in efficiency. Also, proposers afraid of being rejected for equity reasons limit requests and thus efficiency.

Moving from implicit to explicit contracts could be expected to lower equity concerns. Holders of clear resource rights need not transfer their resources unless certain about compensation. This should greatly reduce not only the deception and exploitation but also the fear of such outcomes. Reducing that fear by clarifying one's compensation could easily increase efficient transfers and equity. While establishing rights can be difficult, and controversial, our results suggest its value.

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Appendix. Regression Tables (RTs)

RT1
Descriptive statistics.

Variable	Obs	Mean	Std. dev.	Min	Max
Acceptance	179	0.79	0.40	0	1
Request	179	6.79	2.09	2	10
Catholic	358	0.60	0.48	0	1
Chance Get A Transfer	179	2.65	1.20	1	5
Education	358	15.11	2.01	8	18
Gender	358	0.52	0.50	0	1
Own A PC	357	0.61	0.48	0	1
Risk	358	0.54	0.49	0	1

RT2
Explaining proposed resource splits.

Depen. variable = Request	OLS	# obs = 179	R squared = 0.0889
Indep. variables	Coefficient	T-statistic	t-probability
Risk	−0.962	−3.00	0.003
Age	0.003	0.13	0.898
Gender	−0.115	−0.36	0.723
Own A PC	0.359	1.05	0.296
Catholic	−0.234	−0.72	0.470
Education	−0.140	−1.78	0.077
Message2:1 dummy	0.411	0.90	0.367
Message4:1 dummy	0.462	1.05	0.294
Trust4	0.039	0.09	0.929
Constant	9.13	6.22	0.000

RT3a
Explaining acceptance of proposals—all treatments.

Depen. variable = acceptance	Probit	# obs = 178	Pseudo R2 = 0.3128
Indep. variables	Coefficient	T-statistic	t-probability
Request	−0.403	−3.87	0.000
Chance Get A Transfer	0.531	4.26	0.000
Age	−0.003	−0.12	0.906
Gender	0.139	0.49	0.626
Own A PC	0.202	0.70	0.484
Catholic	0.280	1.02	0.308
Education	0.002	0.04	0.968
Risk	0.059	0.21	0.830
Message dummy	−0.879	−0.76	0.446
Message dummy*Request	0.121	0.84	0.402
Constant	2.18	1.43	0.151

RT3b
Explaining acceptance of proposals—message treatments only.

Depen. variable = acceptance	OLS	# obs = 91	R squared = 0.3238
Indep. variables	Coefficient	T-statistic	t-probability
Request	−0.099	−4.01	0.000
Chance Get A Transfer	0.113	3.30	0.001
Message	0.027	2.60	0.011
Age	0.003	0.47	0.641
Gender	0.079	0.90	0.369
Own A PC	0.047	0.59	0.557
Catholic	0.028	0.37	0.71
Education	−0.010	−0.61	0.541
Risk	0.079	1.01	0.316
Message4:1 dummy	−0.209	−2.19	0.031
Constant	1.066	2.66	0.009

RT4
Explaining trust (view of likelihood of non-zero sharing by other).

Depen. variable = chance transfer	OLS	# obs = 178	$R^2 = 0.1008$
Indep. variables	Coefficient	T-statistic	t-probability
Risk	−0.330	−1.80	0.074
Request	−0.064	−1.49	0.137
Age	0.010	0.60	0.546
Gender	−0.231	−1.24	0.215
Own A PC	0.131	0.67	0.502
Catholic	−0.242	−1.30	0.194
Education	0.101	2.05	0.042
Message dummy	0.437	2.38	0.019
Constant	1.445	1.56	0.121

RT5
Explaining lying (amount by which Message > Transfer).

Depen. variable = liardiff	OLS	# obs = 73	$R^2 = 0.1654$
Indep. variables	Coefficient	T-statistic	t-probability
Request	−0.079	−0.35	0.73
Risk	−1.533	−1.73	0.089
Age	−0.031	−0.43	0.672
Gender	−1.484	−1.59	0.117
Own A PC	0.217	0.24	0.814
Catholic	1.365	1.57	0.122
Education	−0.026	−0.11	0.912
Message4:1 dummy	1.361	1.56	0.123
Constant	3.675	0.81	0.424

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