Contracts versus Trust in Water Allocation:

growing & sharing the pie in Northeast Brazil

preliminary

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We explore the efficiency and equity resulting from allocation of a fixed resource within a bargaining institution, using a modification of the Ultimatum Game with asymmetric productivity and a surplus-sharing step that permits us to explore trust. Sharing allows pie division independent of pie growth. We use generically framed experiments based on water allocation in NE Brazil with 570 participants in Ceará, in Fortaleza (the capitol) or the Jaguaribe (largest agricultural) Valley. These areas are soon to be further connected by a large canal to bring water towards Fortaleza. Our games have 3 steps: [1] proposers request a resource amount; [2] responders accept that split or reject it, yielding a low default payment for all; and [3] if that proposal was accepted, proposers choose whether to send back some of the gains. We consider three institutional designs distinguished by levels of communication. In 'No Communication', a benchmark, and in 'Message' where the proposer sends a non-binding written message about 3rd-step sharing conditional upon acceptance, we see evidence of 2nd-step trust (acceptance of less than the default) that pays off. Yet when that sharing message is a binding 'Contract', efficiency and equity rise.

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bargaining, trust, field experiment, water, allocation, Brazil, Ceará

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1. Introduction

In the state of Ceará, as in the rest of Brazil's semi-arid Northeast region and many other places, climatic challenges include variability, i.e. drought and flood, as well as frequent water scarcity. Within Ceará's largest agricultural valley, the Jaguaribe, even for the re-allocations implied by small reservoir releases, the inherent balancing of water needs is discussed within a committee. Perhaps even more indicative of a high marginal value of water, to this point the larger allocation decisions which guarantee water for drinking, tourism and industry in the capitol city, Fortaleza, are not discussed publicly at all. Yet the pressures may be rising for more transparent allocation.

Looking ahead, population and output growth are expected to cause demands for water to again overtake water supply, which relatively recently rose considerably through the construction of a large new reservoir. To facilitate the allocation of this water, a large new canal has been built to bring water from this reservoir in the valley to the metropolitan region. Its completion signals the arrival of new allocation decisions for which no decision process or body has been announced. In this setting and elsewhere, it is no exaggeration to say these decisions could shape development, both through the allocation of the water and through the division of any surplus due to transfers.

This paper uses economic field experiments to explore implications of the design of institutions for making such resource-allocation decisions. In keeping with the *de facto* situation in Ceará, and we believe also numerous other settings, we consider a situation in which the rights to the resource are not sufficiently clear to permit an actor to dictate its use without others' agreement. We also focus on situations in which aggregate output or efficiency is affected by the allocation, a setting we summarize as a higher marginal productivity of water in the city than in the valley.

Specifically, we present here the results of a modified ultimatum game (UG) with asymmetric productivity. Games are neutrally framed. Thus, we do not mention water but just 'tokens' and describe actors not as locations, valley and city, but as player A (proposers) and B (responders).

Our goal is explore the efficiency and equity implications of the enforceability of contracts. In particular, we wish to compare enforceable contracts with settings where responders must 'trust'. 'Trust' here means decide on a resource allocation without full knowledge of what it brings and, further, with the knowledge that others' subsequent decisions will affect the division of the pie.

Within a traditional UG with asymmetric productivity, where division of the pie is decided along with pie size; as resources move to a high-productivity actor the pie and that actor's share grow. In our modified UG, we add a surplus-sharing step in which the more productive proposer can give back some of the growth in the pie if the responder accepted a surplus-creating allocation. The give-back option allows the division of the pie to move independent of the pie's growth.

Effectively the proposer's sharing step divides the pie that results from initial resource allocation. Thus responders decide whether to permit more resources to flow to (more productive) proposers knowing such flows raise the total revenue but, in some institutions, not knowing who will get it. Proposers, then, essentially invite responders to trust by asking for a larger share of the resource. Trust is productive, as the largest total pie is created by initially sending everything to proposers. For instance, in Ceará, output rises as water is shifted from flooded rice to tourism and industry.

We did artefactual field experiments (Harrison and List 2004) with 570 participants in Ceará, in Fortaleza or in the Jaguaribe Valley. The setting and what we believe is an analog to actual water allocation settings and our large field sample in a poor region make possible a contribution to the natural resources and the development literatures (Cardenas and Carpenter 2005, Levitt and List 2007). Also, this could provide insights into the design of any new institution to allocate water.

Proposers are more productive (two or four times so) and our UG experiments have three steps: [1] proposers set the agenda by requesting an amount of the resource, which also implies a share; [2] responders accept the split or reject it, the latter giving both a small default payment of R$ 5; [3] if responders accept, then proposers must decide whether to send back some of their earnings.

In adding a surplus-sharing step to the UG, we vary the institutional (information) design: 'No Communication' provides no signal to the responder of the proposer's intention of sharing in the 3rd step, so the responder decides based solely upon the initially requested split of the resources; 'Message' provides with the initial proposed split a non-binding written message stating what transfer of surplus will occur in the 3rd step if, in the 2nd step, the responder accepts the request; and 'Contract' provides with the initial proposal a binding written message about that transfer.

Our modified UG allows trust similarly to a classical trust or investment game (Berg et al. 1995, e.g., or Guth et al. 1997). There an actor gives up a sure gain, in this case 5R$, for the possibility of gaining more but also the risk of gaining less.[2] In contrast with the classical trust game, in our 'give back' modification of a UG where the gains from trust arise from asymmetric productivity (when the weaker co-owner of the resource offers it due to trust in getting a share of the surplus), the more productive first mover reciprocates a trust offered by the less productive second mover. In the classical trust game, the first mover must trust the second mover for trust's gains to arise. Here we summarize our results with some comparisons to the literature we discuss more below.

We find evidence of trusting behavior, by responders, and expectations of trust by the proposers. Thus in our one-shot game[3], as previously reported in the literature trust exists and it pays off in the sense of raising not only efficiency, i.e. total earnings, but also the earnings of the responder.

However, we also find that contracts do even better than trust in terms of efficiency and equity. Under binding written messages, proposers wary of imperfect trust are liberated to request most or all of the resources in the initial split, which raises efficiency. Then the 3rd, sharing step splits the pie not evenly but sufficiently to improve responders' absolute earnings and even their share.

Such initial high allocations to the proposers are significant in light of previous results in Ceara for the classical UG with symmetric productivities and default payment of zero given rejection.[4] There proposers request 60% on average and it is accepted 94% of the time (for recent reviews of the outcomes in many related experiments, see Camerer 2003 and Oosterbeek et al. 2004).

[2] Walker and Ostrom 2002, p. 382, defines trust "as the willigness to take some risk in relation to other individuales on the expectation that the other will reciprócate".

[3] Our reports of trust obtained in a one shot game could be considered as the minimal trust. We expect trust to increase with a repeated game since punishment, reputation and learning could well help to develop more trust.

[4] That is not an exact benchmark here, though, as in our modified UG the default payment with rejection is R$5.

Asymmetric productivity alone means the proposer earns more money for a given split of these resources. Retaining default payment of zero, we found an average request by the proposers of 52% when proposers are two times as productive and 46% when four times more productive. In both cases, modal proposed split is 50% of resource units, i.e. two to four times more earnings for proposers, and acceptance rates are around 85%. Further background resides in the literature on ultimatum games with different marginal productivities. Proposers ask for fewer resources if proposers have higher returns and ask for more (i.e., offering less) when responders have higher returns. One might imagine that different rates of return on resources could create conflict about what is fair and thus more rejection (Schmitt 2004, Kagel et al. 1996, Gneezy and Guth 2003).

Then adding the surplus-sharing step increases proposer requests, as now proposers ask for and get 66% on average (across both productivity ratios). Thus proposers to some extent expect trust (which is socially productive, as total earnings in the game rise with proposer initial allocation). They feel they can ask for more because responders trust that the final transfer will share gains.

They are right, even when there is 'No Communication'. Acceptance is high for the case of 4:1 productivity (86%) despite higher requests for resources, though lower for the 2:1 case (70%). Also, trust pays off. Transfers in the 3rd, sharing step are not high (R$4.8 in 4:1, R$ 2.5 in 2:1) but added to the initial resource split beat the default payment (R$5) that rejection would earn.

A non-binding 'Message' raises further the initial allocation to the proposer and thus efficiency. The average proposer request rises to 70% for 2:1 and 69% for 4:1, with accompanying message about 3rd-step sharing averaging R$4 for 2:1 and R$8.3 for 4:1. Keeping in mind that if a request is above 50% then some 3rd-step sharing is required for the responder to do better than the R$5 earned by rejection, here requests are further above that 50% thus proposers expect more trust.

Again they are right. Acceptance increased to 88% for 2:1 and while lower for 4:1, at 73%, the efficiency is still greater on average with the 'Message'. Also, again trust pays off. Trust is not fully justified, in one sense, as 3rd-step actual transfers are lower than the non-binding messages. Transfers are similar to in 'No Communication' for 2:1, i.e R$2.8, and in 4:1 they are only R$1 greater with 'Message'. Nevertheless, average earnings for responders accepting resource splits from proposers were not only above the R$5 default but also above the 'No Communication'.

Yet 'Contract' significantly outcompetes all of this trust, even though trust exists and has value. Proposed initial resource splits rise to 83% in 2:1 and 78% in 4:1 and the modal proposed split in both 2:1 and 4:1 is a striking 100%. Acceptance for 2:1 is down to 68%, likely due to binding transfers being low, while acceptance for 4:1 is 80% and overall the efficiency is clearly higher. Here a responder does not have to trust, as messages are binding, so efficiency is much simpler.

Transfers are higher too, R$5.2 for 2:1, with an average of R$6 for accepted offers, and R$8.9 for 4:1, with an average of R$10 for accepted offers. This clearly improved equity in the sense of greater earnings for the less well-off party, the responders. Further, despite the increase in the total pie, responder share also rose. Thus both efficiency and equity rise with enforceability.

The rest of the paper is as follows. Section 2 provides background on the Ceará setting and the experimental trust literature. Section 3 then describes our experimental design, while Section 4 provides more detail about the results and section 5 concludes with discussions of such results.

2. Background: Ceará setting & experimental trust literature

2.1 Ceará Setting

Ceará, in Brazil's relatively highly populated and relatively undeveloped semi-arid Northeast, has over 7.4 million inhabitants (IPLANCE 2002). Its GDP has grown in the last fifteen years while the productivity of agriculture mostly has been low and thus the fraction of GDP from agriculture has dropped from 30% in the 1950s to 7% (industry and services in Fortaleza are now responsible for 85%). The fraction of the population dependent on agriculture is still above 30%.

Recurring drought has long been identified as a critical factor in the state's economy, ecology, culture and politics (Girão 1986; Prado Júnior, 1989; Parente, 2000, 2002; Neves, 2002; Magalhaes, 2002). Persistent poverty, rudimentary agriculture and drought have created ongoing vulnerability. Actions to reduce it have focused on reservoirs, canals and irrigation schemes. The reservoirs are central to rural life but also supply the capital city, Fortaleza, home to another third of the people. Thus, improved management of this water system could affect many.

The Great Drought between 1877 and 1879, alleged to have killed over 500,000 people (Neves 2000; Greenfield 1986, 1992, 2001; Davis, 2001), transformed climate variability from a private to a public matter (Villa 2000). The imperial (later federal) government sent its best technicians to fight drought through the application of science, with a focus on water storage (later periods, migration to other parts of the country was also used to limited extent). Construction of massive reservoirs began under Emperor Pedro II in 1886, was continued by IOCS in 1909, and IOCS became DNOCS whose responsibilities are mainly research on infrastructure and operations of the reservoirs and whose history is enmeshed with the history of the state. DNOCS' past actions have been linked to the state's politically 'clientilistic' relationships with the elite and the poorer classes. For instance, documentation exists that some of DNOCS' infrastructural investments were made to benefit local elite groups (Coelho, 1985; Villa 2000; Albuquerque Junior, 2004).

In 1992, Ceará's state law 11.996 created a state system for management of water resources that called for water planning and management to be integrated, decentralized, and participative. The management was to include licensing of and charging for water, plus permits for infrastructure development, but these have been only minimally enforced. A formal partial decentralization of water management was effected as CONERH (the State Council for Water Resources) was given the ability to arbitrate water conflicts, although oversight remained with the state's judiciary.

Relatively recent changes in water management include major institutional shifts such as the creation of COGERH (the Company for Management of Water Resources in Ceará) and the increased importance of the meteorological agency FUNCEME (Ceará's Meteorological and Water Resources Research Foundation) providing forecasts to inform agricultural planning (e.g. seed distribution schemes), water management, health (e.g. dengue control) and drought relief.

Further, local allocation of water now involves multi-stakeholder participatory water committees, one for each sub-basin of the Jaguaribe River and each of the other river basins. These were up and running by the late 1990s. They choose the seasonal rates of water release from the main reservoirs in the (sub-) basins, selecting from a small set of scenarios prepared by COGERH.

Within Brazil, the push towards local participation in water governance has been hailed in terms of democracy (Garjulli 2001a, b; Garjulli et al. 2002; Johnsson and Kemper 2005). Yet the form of "participation" that is most effective has not been demonstrated. Cases where participatory-process effects are shown are relatively few and careful empirical examination of participation or decentralization remains relatively rare (Kemper, Dinar and Blomquist 2005, Bardhan 2002,).

In 2000, a national water agency (ANA - Agência National de Águas) was created to modernize water management with a focus on transboundary watersheds. Despite all of the recent efforts to modernize the local institutional landscape, however, the turnover within the political cycles in Brazil poses challenges for water management. The heads of even the most technical agencies are often replaced after state elections and the highest offices are filled with an eye to party lines.

After the 2002 elections, for instance, political changes with implications for the organization of the state water system occurred at both the national and the state level. The responsibility for organizing the water committees was firmly centralized, within the state, at the SRH agency. In terms of local reflections of national debates, within Ceará revenue generation to cover the water system's costs became an explicit policy priority (Lemos and Oliveira, 2004; Taddei, 2005).

The case-based part of our motivation draws on the Jaguaribe-Metropolitana (JM) area. The Jaguaribe River system is the source of water for over forty-five municipalities. All of the most important economic centers of the Jaguaribe Valley are among them. The valley occupies about half of the area of the state and is home to just over half of the state's interior (non-Fortaleza) population. Its occupants range from rainfed agriculturalists to large agribusiness enterprises.

The JM hydrosystem is dominated by reservoirs and pumping stations operated by COGERH. Water demands include: human consumption in Fortaleza and in the small towns in the valley; growing agribusiness; small family farmers; marginalized riverbed farmers using sump pumps; and poor fishermen who require specific reservoir levels to be productive (for a level of detail within such stakeholder typologies that is beyond our scope here, see Taddei et al., 2006).

The organization of water stakeholders has been in large part dominated by their locations. Communities located upstream of the reservoir tend to disagree with those downstream, as the former tend to oppose water releases while the latter tend to favor them. Organization concerning water issues also occurs along occupational lines, e.g. by unions, cooperatives and associations.

For example, the water allocation commission of the Jaguaribe River has 153 members, from four of its sub-basins (Alto Jaguaribe, Médio Jaguaribe, Baixo Jaguaribe, and Banabuiú). Of the 30% from civil society, 40% are from rural workers unions. Roughly 30% are local water users, e.g. companies providing water for human use and producers with public and private irrigation. Also 40% are from a variety of local government agencies and a suite of state as well as federal institutions. Across all of the sub-basins, the Baixo Jaguaribe has the most representatives (36%). It has more fruit and bigger, more organized producers using sophisticated irrigation methods.

Two stories are commonly offered to explain the limited representation of actual water users in these committees, which one might have imagined would be made up only of actual water users. First, all of civil society indirectly uses water and directly produces water pollution. Second, and as suggested by government and agency roles, COGERH and others in government feared shifts

2.2 Experimental Trust Literature

In the "investment game" first reported by Berg et al. 1995 and replicated by several studies with different subject population, first movers send between 50%-65% of their initial endowment and second movers reciprocate by sending between 30%-40% of their earnings depending upon the experimental conditions (Berg et al 1995, Burks et al 2003; Holm and Danielson, 2005; Walker and Ostrom 2002). This literature explores motives behind trusting and reports a high individual heterogeneity in motivations and variation across contexts and cultures (see Henrich et al. 2001; Walker and Ostrom, 2002; Cox 2004, Asharf, Bohnet y Piankov 2003 and Kiridaran et al. 2009). Asharf, Bohnet y Piankov 2003 found that altruism (warm-glow kindness) is very relevant for those who trust little and only a fraction of subjects´ trustworthiness is based upon reciprocity. Other studies have explored gender differences across contexts with mixed results regarding its effect on trust (see for example the work of Croson and Buchan 1999 in Asia and United States, Chaudhuri and Gangadharan 2002, Eckel and Philip 1996 and 1998 and Croson et al. 2008).

Some have explored the relation between trust and making a risky decision or gambling behavior. Bohnet and Zeckhauser 2004 find that participants "are much more willing to take risk when the outcome is due to chance than when it depends on whether another player proves trustworthy". Karlan 2005, in experiments in Peru, explores whether trust in the classical investment game is a measure of propensity to gamble and suggests that those who send more in the trust game are risk takers. On the other hand, Eckel and Wilson 2004 explored risk orientation (using 3 different instruments) and trust and found that no risk measure correlates with trust. They say "subjects do not think of trust decisions and financial gambles as similar". Kiridaran, Mestelman, Nainar, and Shehata 2009 find a strong significant positive relationship between risk attitudes and trust only for participants whose 'social value orientations measure' (the measure developed by Griesinger and Livingston 1973) indicate neither strongly pro-social nor strongly pro-self leanings.

Others have explored the effect of communication as coordination device in trust games (Ben-Ner and Putterman 2009 offer a review).[5] Charness and Dufwenberg 2006 explore the impact of written messages on trust in a principal–agent game. They use a free-form message which they call 'promises' versus empty talk versus no message. Our message could be called a 'promise', since proposers write down planned 3rd-step sharing. Charness and Dufwenberg say messages are powerful because they shape beliefs that influence motivation. If the players are selfish, this form of "cheap talk" has no impact, unless other concerns motivate the players. They find that promises enhance trustworthy behavior and explore the role of guilt aversion in keeping them.

Ben-Ner and Putterman 2009 explore other forms of pre-play communication (from numerical proposals to chat room communication) in a one-shot classical trust game. They examine choices to enter into costly non-binding contracts (with and without penalties). They find communication (especially exchange of words) increases trust while trust enhanced by communication increases trustworthiness. Contracts were largely unnecessary and only about 7% of interactions in which

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

an agreement was reached had a binding contract. Thus, perhaps trust is a viable alternative to contracts, although they report slightly higher average earnings under contracts-with-penalties.

3. Experimental Design

The experiments were conducted in Fortaleza and the Jaguaribe Valley in the town of Limoeiro do Norte. 570 members of civil society (a high percent college students from families in the area) participated, 302 in Fortaleza and 268 in Limoeiro. All treatments were conducted in each site. Our subject pool is more diverse than the standard pool of college participants in US universities especially in Limoeiro. A mix of students, university staff, and officers from public institutions and, in Limoeiro, farmers participated. Recruitment was done through local contacts; any person leaving in the area and older than 18 was permitted. Table 1 provides a simple summary.

Table 1 -- Subject Characteristics

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	568	22,54577	4,799473	18	54
Gender	570	0,5245614	0,499835	0	1
Education (years)	570	15,22281	1,900284	8	18

As discussed above, we modified the ultimatum game (UG) with asymmetric productivity with an additional surplus-sharing step (see Introduction). The experiment was framed generically. Each pair had to allocate a bag of chips. Given asymmetric productivity each chip was equivalent to $R2 for proposer and $1R for responders in the 2:1 case in which the proposer is two times as productive and $R4 for proposers and $R1 for responders in the 4:1 ratios-of-productivities case.

As noted, we have three institutional designs for a total of 6 treatments (see Table 2 and the Introduction for the designs), since each design is carried out for each of the productivity ratios.

Table 2 Experimental Design

Productivites (Prop: Resp)	Observations per treatment	Observations per treatment	Observations per treatment
2:1	No Communication 44	Message 42	Contract 51
4:1	No Communication 44	Message 49	Contract 55

In each session, subjects participated in two one-shot games. The games reported in this paper were those played first. In each game, players were randomly paired to avoid any learning. Proposers learned responders' decisions at the end of the second game. Identities were kept anonymous.[6] Roles were randomly assigned at the beginning of the session and roles were kept for both games. After instructions, we administrated a quiz to check understating of the game. Then responders then went to another room. At session's end, one of the two games was randomly chosen and then all payments were made in accordance with the decisions made in that game.

[6] Yet our protocol was not double blind, as are some in the experimental literature (e.g., Hoffman et al 1994).

During payment calculations, participants answered a survey with socio-demographic questions, the General Social Survey with trust-related questions as those reported by Glaeser et al. 2000 and Gachter et al 2004 and, to learn their attitudes to risk, a risky-choice task similar to the one used by Eckel and Wilson 2004 but adapted to our case. For this preliminary draft, we focus on only the experimental results. Usually between 20 and 30 subjects participated in each session.

4. Results

4.1 Evidence & Expectations & Efficiency of Trust (in 'No Communication and 'Message')

We find evidence of trust and expectations of trust in our one shot game (Table 3)[7], which is of course consistent with previous literature. This can be seen in the Average Ask For and the Acceptance Rate in "No Communication" and "Message" (in "Contract" we cannot have trust as the message is binding), since trust is present when a responder accepts an initial resources split giving them less than the default payment they would receive if they rejected the initial request.

The only reason to do so is trusting that the expected 3rd-step transfer will be sufficient for a gain greater than the default in case of rejection. We see Average Ask For greater than five in "No Communication" (6.6 for both 2:1 and 4:1) and "Message" (7.1 for 2:1 and 6.9 for 4:1). These imply that responders get less than the default of R$5 and thus would have to trust in transfers to make acceptance a rational response. We note that acceptance rates are quite high (70-86%) given the initial unequal splits. In accepted cases, even, the Average Ask For ("No Communication" 5.9 for 2:1 and 6.1 for 4:1 and "Message" 7.0 for 2:1 and 6.4 for 4:1) yields less than R$5 for responders. Thus responders trust and proposers clearly expected them to trust.

Proposers' expectations of trust increase in "Message" in the 2:1 case, which seems reasonable given that the message about the transfer to come is supposed to be a coordination device. The Average Ask For significantly increased compared to "No Communication" (p=0.06). That was not the case for 4:1, though, i.e. the "No Communication" and "Message" were about the same.

Trust paid off on average since responders' earnings when they accepted are above the earnings default of R$5. We see in Table 3, for instance in Message 2:1, that the Average Ask For of 7 leaves the responder with 3, i.e. less than the default of R$5, but the average transfer when offers were accepted was only 2.8. Since 5.8 is greater than 5, we can say that the trusting has paid off.

[7] We expect trust to increase with a repeated game since punishment and reputation will help.

Table 3: Summary Statistics by Treatment

Treatment	Average Ask For	Average Message R$	Acceptance Rate	Average Ask For If Accepted	Average Ask For If Rejected	Average Message R$ If accepted	Average Message R$ If rejected	Average Transfers R$ If accepted
Contract 2:1	8,3	5,2	68%	8,1	8,9	6,0	3,5	6,0
Message 2:1	7,1	4,0	88%	7,0	8	3,9	4,6	2,8
No Communication 2:1	6,6		70%	5,9	8,2			2,5
Contract 4:1	7,8	8,9	80%	7,8	7,8	10,0	4,4	10,0
Message 4:1	6,9	8,3	73%	6,4	8,3	8,4	8	5,9
No Communication 4:1	6,6		86%	6,1	9,6			4,8

4.2 <u>Superiority of Enforceability (in'Contracts')</u>

4.2.1 Efficiency

Binding (i.e., enforced) messages improve efficiency. Earnings rise due to higher initial requests for resources. Table 3 shows Average Ask For, when proposers' initial offers are accepted, to be greater in "Contract" (8.1 for 2:1 and 7.8 for 4:1) than in "No Communication" (6.6 and 6.6) or in "Message" (7.1 and 6.9). This implies a gain in efficiency (see Table 4 summary of earnings).

For 2:1, the maximum possible total earnings is 20; for 4:1, it is 40. "Contract" earnings ranked first in efficiency with summed earnings (18.05 for 2:1 and 33.36 for 4:1), closer to the possible maximum than are "Message" (16.96 and 29.07) and "No Communication" (15.87 and 28.38).

Interestingly, the 2:1 case ($18/$20) did better than the higher productivity case ($33/$40) in terms of efficiency. However, that is only clearly the case for Table 4, for the accepted offers. It is not clear in Table 5 which includes cases of rejection. The reason is that the Ask For are less aggressive in 4:1. This lowers the efficiency of accepted 4:1 offers, as just noted, however it also raises the acceptance rate. That shows up in Table 5. If proposers try to make acceptance only marginally better than rejection, e.g. using larger Ask For in the 2:1 case, then rejection can rise.

4.2.2 Equity

Proposers lie. This is seen in Table 3, where tranfers if accepted are smaller than the messages if accepted. While despite this the responders earn more on average from trusting, nonetheless it is a mark in favor of enforceable contracts that they remove a propeser's ability to lie (and gain).

Proposers also share only a little more than is needed to avoid a loss by responders who trusted. For instance in the Message 2:1 case, while 5.8 is greater than 5 most of the surplus is not shared. Also, as noted above, Contract 2:1's Ask and Transfer combinations are simply more aggressive.

Given this, enforceability ('Contract'), does better in terms of equity measured in two key ways. A relative measure of equity is the ratio of proposers to responders' earnings. Closer to Rawls would be a focus on aiding the lowest earner, i.e upon the always lower earnings of responders. "Contract" was best on both criteria. Its earnings ratio is 1.28 for 2:1 and 1.72 for 4:1, numbers lower than the corresponding values for "No Communication" (1.41 and 2.28) and "Message" (1.89 and 2.04). For responders´ earnings, "Contract" (7.9 for 2:1 and 12.2 for 4:1) does better than "No Communication" and "Message" institutions. Each of the latter groups included a game in which a responder earned zero, which almost surely is not possible with the explicit Contract since the responder would have to accept a 0% share in the resource allocation and zero transfer. As discussed further below, bad outcomes for responders are less common when more is explicit.

Comparing the two productivity ratios, we see higher productivity treatments do worse in equity. It seems the transfers do not scale with the size of the pie, consistent with proposers making responders better off than if they had rejected but not necessarily by much. (Per a trust literature in 2.2, we can use our risk-attitude surveys to test if such behaviors appear to relate to gambling.)

Table 4: Earnings if Accepted

Treatment	Average Earnings, Proposers	Average Earnings, Responders	Earnings Sum	Ratio, i.e. Prop/Resp	Mininum (=Responder)
Contract 2:1	10,14	7,91	18,05	1,28	5
Message 2:1	11,1	5,86	16,96	1,89	0
No Communication 2:1	9,29	6,58	15,87	1,41	4
Contract 4:1	21,09	12,27	33,36	1,72	5
Message 4:1	19,52	9,55	29,07	2,04	4
No Communication 4:1	19,73	8,65	28,38	2,28	0

Table 5: Earnings for all observation including if rejected

Treatment	Average Earnings for Proposers	Average Earnings for Responders	Earnings Sum	Ratio, i.e. Prop/Resp	Mininum (=Responder)
Contract 2:1	8,52	7	15,52	1,22	5
Message 2:1	10,38	5,76	16,14	1,80	0
No Communication 2:1	8,02	6,11	14,13	1,31	4
Contract 4:1	17,87	10,78	28,65	1,66	5
Message 4:1	15,67	8,34	24,01	1,88	4
No Communication 4:1	17,72	8,15	25,87	2,17	0

4.2.3 Explicitness & Welfare

Table 5 considers earnings in both rejection and acceptance outcomes. “Contract” still rank first in efficiency for 4:1. However, it does not rank first in total earnings for 2:1 due to higher rates of rejection. For 2:1, “Message” ranked first in efficiency but this result may be quite misleading. Specifically, this appears to be a case in which efficiency rankings are not indicative of welfare.

Consider the offers accepted in Message 2:1. The average Ask For is 7 and the average Transfer if 2.8 when offers are accepted (Table 3). Looking at Contract 2:1 in the same table, we can see that rejected proposals have average 8.9 Ask For and 3.5 Transfer. This looks worse than the Message 2:1 offers, which provide R$3 plus R$2.8, i.e. R$5.8, since in Contract 2:1 rejections responders get R$1.1 plus R$3.5, i.e. R$4.6. However, the averages here obscure some key facts. To start, Ask For equal to 7 is not what lowers Contract efficiency as those Asks are all accepted.

Table 6 shows that fact and generally breaks games down by the level of resources Asked For. When that is 8 in Message 2:1, the Transfers accepted average R$3 (just barely reaching the default R$5 though the promised transfer on average was 4). Yet when Ask For equals 8 in Contract 2:1, the average transfer that is rejected is 2.8. That is very close to 3, though it leaves only 4.8 for the responder. When 9 is requested, Message 2:1 transfers accepted average R$2.5 (again less than promised) yet in Contract 2:1 transfers rejected average R$2.6, i.e. more than what is accepted in Message! Thus, explicit enforceable contracts may be rejected more often in a one-shot game but this may benefit the responder, who in Message is lied to and ends up with a deal he rejects when explicit.

Table 6 Acceptance rate, Message and Transfer by Ask for

Treatment	Askfor Chips	Accep. rate	Average MessageR$ ifaccept=1	Average MessageR$ ifaccept=0	Average Transfer $R ifaccept=1	Average Transfer $R ifaccept=0
Contract 2:1	5	1	1,71		1,71	
	6	1	2		2	
	7	1	3,5		3,5	
	8	0,22	6	2,8	6	2,8
	9	0,25	8	2,6	8	2,6
	10	0,73	9,11	5,5	9,11	5,5
Contract 4:1	2	1	0		0	
	4	1	5		5	
	5	1	5		5	
	6	0,9	6,6	6	6,6	6
	7	0,71	7	3.5	7	3.5
	8	0,41	7,6	4	7,6	4
	9	1	10,25		10,25	
	10	0,93	16	8	16	8
Message 2:1	4	1	0,66		0,66	
	5	1	2,75		2,25	
	6	0,87	3,42	4	1,57	
	7	0,92	3,75	4	3	
	8	0,8	4	6	3	
	9	0,66	3,5	3	2,5	
	10	0,83	8	6	6	
Message 4:1	3	1	2		2	
	4	1	3,75		1,5	
	5	0,91	5,63	2	2,18	
	6	1	8,8		5,6	
	7	0,66	7,33	5.3	6,66	
	8	0,75	12	6	7,33	
	9	0,16	15	7	10	
	10	0,62	16,6	15	16,2	
No Communication 2:1	3	1			0	
	4	1			5,71	
	5	1			0,6	
	6	0,6			1	
	7	0,66			3,25	
	8	0,4			7	
	9	0,25			8	
	10	0,5			9,33	
No Communication 4:1	2	1			0	
	3	1			1,75	
	4	1			2,5	
	5	1			2,16	
	6	1			2,5	
	7	1			6	
	8	0,8			4,5	
	10	0,54			14,33	

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