Assessing Adaptation Outcomes under Asymmetric Climate Information:

equity in resource-bargaining institutional field experiments in NE Brazil

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We assess the outcomes from interaction of climate information with management institutions as part of learning what key factors affect vulnerability to climate shifts at various time scales. We examine the equity effects of one actor being uncertain of water quantity when bargaining with a fully informed actor, using ultimatum games in Northeast Brazil. Within our novel asymmetric-information games, proposers know the total quantity and request fixed amounts then responders reject or accept the uncertain remainders. With both players informed, our population replicates the common 60-40% average division of the pie. With asymmetry, if proposers know quantity is low they obtain almost 80% of the actual pie, exploiting information using 'common pie division' (as responders concede 60% of the *expected* pie). When proposers know that the quantity is high, they would rather this be common knowledge and appear to try to signal it using large requests, a risky strategy that at best earns them 60%. These results are mapped out consistently across varied information asymmetry conditions. They suggest that in contexts of bargaining (a form of participation) better integrating science into management, through greater efforts to communicate climate information to all of those involved in decisions, can help to avoid inequities that arise despite all 'being at the table'.

Keywords field experiments, uncertainty, asymmetric information, climate, water, equity

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1. Introduction

Assessments of adaptive capacity, such as the ability to reduce vulnerability to shifts in climate, commonly find that the provision of information from natural scientific analyses can be helpful (see immense literatures, e.g. from Hilton 1981 and Glantz 1982 to Rayner et al. 2005 and more). Positive assessments often arise concerning the creation of participatory decision bodies as well. These involve bringing multiple stakeholders together to jointly make decisions relevant for all (another immense literature, e.g. Uphoff 1992 through and beyond Agrawal and Gupta 2005).

Such dual positive conclusions may arise in settings that do not integrate the social and natural, e.g. do not examine the institution of participation in light of provision of technical information. Integrated analysis could yield different conclusions if these highly touted interventions interact. For instance, the impact of information provided could depend on the details of the participation. We consider the important case of participation's impact depending on details of the information (Peterson et al. 2009 review, more generally, claims for and challenges for participatory bodies).

Concretely, even if a 'participatory' institution had managed to bring together every stakeholder, equity outcomes of stakeholder interaction would be likely to vary with information distribution. Specifically even a perfect climate forecast and perfect participation, e.g., could yield inequities within a bargaining context given asymmetric access to and understanding of the natural science. Further, such asymmetries in information across socially relevant groups are widely documented.

Thus, despite the reasonable perspective that both information and participation could be helpful, we hypothesize that participation can generate inequity, given imperfect climate communication. Such hypotheses can be tested if climate information is integrated with participatory institutions. This paper provides such a test using institutional experiments motivated by a case in NE Brazil.

This experimental study of resource allocation under uncertainty is motivated by water allocation and, specifically, a case we know well (Ceará State, NE Brazil) that has many analogs elsewhere. Allocation decisions occur in settings of low rain, high rain variance, and rural-urban differences that matter for both efficiency and equity. Our novel experimental design addresses both details of this case (see Taddei 2005, Broad et al. 2007) and many other resources-bargaining settings.

Its focus is one-sided uncertainty about resource quantities, i.e. an information asymmetry. In Ceará, past infrastructural investments (canals and reservoirs) to reduce vulnerability to climate imply that new information can be productive, e.g. climate forecasts can inform water allocation along the new canal from a large new reservoir in the main agricultural valley to the capital city.[1] Yet the parties affected by this allocation differ in their information. Agencies and industry in the capital city produce and use information on water demands, current supply and rainfall forecasts not widely held in the state's interior. Allocations are determined under information asymmetry.

More generally in semi-arid regions, where information on rainfall is critical for many decisions, access to relevant information is unevenly distributed across the interested parties. Past research documents that many groups lack both access to and full understanding of climate information. Technical advances in forecasts, e.g., tend to be distributed on the web in forms understood by those with technical backgrounds (e.g. Pfaff et al., 1999, Broad et al., 2002, Lemos et al., 2002; Lemos and Dilling, 2007; Nelson and Finan, 2007; Pennesi, 2007; and Taddei, 2009 and 2010). Such an uneven lack of climate information and understanding could affect bargaining outcomes as, quite generally, information about the resource to be divided often is critical for allocations determined in various bargaining processes (see, e.g., the cases in and inspired by Ostrom 1990).

[1] Seasonal-to-interannual fluctuations (associated with ENSO (El Nino, La Nina)) in rain in Ceará are large enough for analysts to propose, e.g., the use of forecasts for adjusting reservoir releases (Sankarasubramanian et al. 2003).

In Ceará's main agricultural valley, 'participatory' groups choose from among release scenarios. Globally, the institutions in which resource bargaining occurs vary considerably (Ostrom 1990). Thus we cannot mimic them all and, instead, focus on climate information in simple bargaining. Our goal is to reveal broadly relevant bargaining behavior given climate information asymmetry.

We do so using experiments, in the field (Ceará State in NE Brazil), with populations at the two endpoints of a new canal which will bring significant flows from the interior to the capital city. Experiments are 'artificial institutions' for evidence on choice within institutional settings that currently do not exist and/or could not be easily manipulated in reality (see, e.g., Smith 1994). There are no obvious empirical alternatives for our shifts across varied information conditions.

The use of such experiments (in the laboratory and field) to study both environmental and natural resources settings is, of course, not new (see, e.g., the review of such research in Ostrom 2010). Concerning water use, experiments have been used to explore the relation between upstream and downstream users in watersheds and in irrigation systems (see, e.g., Kelsey 2009, Cardenas et al. 2009, Janssen et al. 2008, D'Exelle et al. 2009, Cardenas et al. 2008, Cardenas and Janssen et al. 2008, Janssen et al. 2009). Experiments are also used to study specific water-market institutions (Murphy et al. 2000, Murphy and Howitt 1998, Dinar et al. 2000, Cristi 2007, Alevy et al. 2009). None of these, however, explores effects of information asymmetries on distributional outcomes.

Our experiments are ultimatum decision experiments to which we add asymmetric information. Ultimatum games (Guth et al. 1982) feature unclear property rights that we believe are common. They have specific asymmetric roles, i.e. the power to propose versus power to protest or reject, while permitting neither party the right of control, e.g. the right to impose a resource allocation.

Our results reveal highly strategic use of one's private information, as well as one's knowledge of the extent of others' information, to garner greater resources and thus payoffs. Results also show that private good news can be unhelpful even if private bad news easily can be exploited. In sum, our results imply that greater dissemination to those less informed could improve equity.

2. Experimental Design

Our experiments were conducted in the state of Ceará in Brazil's Northeast Region, in the capital city of Fortaleza as well as in the city of Limoeiro do Norte within the main agricultural region (the Jaguaribe Valley). In total, 1,200 people participated. Our unframed experiments had 506 in Fortaleza and 458 in Limoeiro. We also conducted water-framed experiments in each of these cities, with 116 participants total, as well as region-framed experiments that connected the cities, with 120 participants. In the latter, proposers were in Fortaleza, responders in Limoeiro and all confirmed using video over the internet that they were playing with people in another city (in the region at the other end of the new canal). The individuals monitoring these experiments in the two cities communicated via internet and cellular phones to inform players about pair decisions.

Our subjects were mainly college students from local families (in Limoeiro most are part-time students from families whose main income is from farming within the local irrigation projects), along with a mix of university staff, officers from public institutions and farmers (the latter in Limoeiro only, though). Recruitment was through local contacts who advertised experimental sessions for any person older than 18 years old. Table 1 provides a simple summary of subjects.

(Insert Table 1)

Our ultimatum game modifies the classical Ultimatum Game (UG) in which the proposer makes an offer to divide a known quantity and the responder accepts or rejects. Retaining that structure, we consider as a benchmark the standard information condition, in which both actors are certain, then we introduce asymmetric information using multiple information conditions, in all of which the proposer was certain about the total resource quantity while the responders were uncertain about the amounts to be divided and, thus, about what they would get by accepting a proposal.

Subjects participated in two one-shot games under different information conditions. We set the pairs of games such that no certainty-condition game was played before an uncertainty condition, in order to avoid possible bias regarding the priors of the subjects before the uncertainty cases.

Players were randomly paired to avoid learning or reputation. Proposers learned of responders' decisions at the end of the second game. The identity of the players was kept anonymous (our protocol was not double blind, as are some such as Hoffman et al. 1994; if anything, that might bias towards fairness but our results are indicating an absence of fairness). Roles were randomly assigned at the beginning of the session and kept for both games. After reading the instructions (see appendix), we administrated a quiz to check on the participants' understating of the game[2]. Responders then went to another room. At session's end, one game was randomly chosen and all of the payments accorded with the decisions in that game. Usually 30 subjects were participating.

In each game, for each pair, proposers announce but do not take their requested number of chips from a bag of chips that is to be divided if agreement is reached. A bag has either 6 or 10 chips. The proposer's request also offers to the responder any chips in the bag above the stated number, as accepting a proposal cedes requested chips to the proposer while earning any remaining chips.

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[2] Each quiz had two exercises as the following: The ball indicates 10 chips in the bag and only Participant A knows this. Participant A asks for 4, offering Bag Minus 4 to Participant B; Participant B rejects that offer in the table; thus Participant A gets ____ chips while Participant B gets ____; turning this into reais: Participant A earns ____ and Participant B earns _____ . Each participant had to fill in the blacks. Each quiz was checked and if the answered was incorrect additional explanation was provided to the subject.

Note that proposers could ask for any whole number in the range zero to ten, regardless of the actual number of chips in the bag. Thus, proposers could ask for more chips than are in the bag. This in principle permits requests over six to serve as false signals of high resource quantity.[3]

Mechanically, if requests greater than the chips in the bag were accepted, proposers got all the chips and responders got zero, i.e. the same outcome as a proposal equal to the number of chips. This was all clearly conveyed. The following example was in the instructions (Participant A reefers to proposers and B to responders[4]): "The ball indicates 6 chips in the bag and only Participant A knows this. Participant A asks for 8, offering Bag Minus 8 to Participant B; Participant B accepts the offer; Participant A gets 6 chips; Participant B gets 0 chips".

This fits Ceará water allocation, where there is a stock in the reservoir and thus more water could be transferred to the capital city, before rainfall, than the supply that the rainfall actually brings. This lowers water for the valley as an intertemporal buffer stock is maintained in the reservoir. The same can be true for other resources with stocks plus uncertain future replenishment rates about which information is asymmetric, e.g. bank accounts or fish quantities (Pfaff et al. 1999 and Broad et al. 2002 identify bargaining under asymmetry in the Peruvian anchoveta fishery).

In our benchmark information condition, with both players certain about the number of chips, responders knew exactly how many chips they would get by accepting. We include two cases: high resource quantity (CbCb, C=certain, b=big and proposer comes first), i.e. bag with 10 chips, and low quantity (CsCs, s=small), i.e. bag with 6 chips. Each chip was equivalent to $R4.

[3] Few participants request over 6 when the bag has 6. They could not earn more than 6 and a request of 6, i.e. 100%, might be sufficiently unanticipated by responders in cases of low quantity to serve as a false signal of high quantity.
[4] Note that to check on the participants' understanding of this issue, a similar question was also included in the quiz. At the end of each experiment, we ask participants regarding to explain their behavior in the experiments. Several occasions, proposers explained they asked for more than 6 chips even though they understand the bag only had 6 chips to make responder believe there were 10 chips in the bag.

In asymmetric information treatments, proposers know the resource total but responders do not. We have six additional treatments in this category, three each for resources being high or low. Responders have one of 3 forecasts: in the first, high and low are equally likely (Cs50 and Cb50 for small and big resources respectively, with the "50" indicating 50% beliefs for the responder); in the second, a 70-30 % forecast of low or small quantity (CsFs or CbFs); and in the third, a 70-30 % forecast leaning towards the high or big quantity (CbFb or CsFb). Table 2 summarizes. Proposers and responders were fully informed concerning the information hold by their pair partner. Therefore the asymmetric information was common knowledge for both players.

(Insert Table 2)

For the realization and the communication of uncertainty, in CsFs and CbFs we determined how many chips were in the bag by blindly selecting one of the ten balls in a box, seven saying 6 and three saying 10 (for CsFb and CbFb, the ratio was the opposite). The ball was drawn in front of the proposer and only he knew whether there were 10 chips or 6 chips before he made his offer. All of this was in the instructions and several boxes-and-balls examples were conducted for all.

For Cs50 and Cb50, the process worked a little differently. We had two boxes, each of which had ten balls. In one, all of the balls said 10 and in the other box all of the balls said 6. The ball was drawn from only one of the boxes but the proposers knew which box was used. That means that the proposers knew whether there were definitely 6 chips or definitely 10 chips inside the bag. We illustrated the (lack of) information responders had by pouring all twenty balls into one box

Despite being in the field, our experiments were neutrally framed, i.e. refer not to any details of the Brazilian case or even to water but instead only to generic bargaining over generic resources. Certainly we would rather have intervened in an actual water institution then observed behavior.

Given that not surprisingly this was not feasible, neutral framing avoids idiosyncratic reactions to our efforts to frame choices in local terms. It aims for generalize-able responses to asymmetries by improving the control in our data generation process, avoiding any particular framing effects linked to all sorts of local sociocultural connotations that we could not observe or, thus, control.[5]

Croson (2005) identifies reasons for preferring economic decision making experiments without specific context. First, the theory that is being tested or developed is supposed to apply generally. Second, reducing the variance added by reactions to a specific context raises the likelihood of statistically significant effects among treatments. Critical is the ability to argue that results are not driven by reactions to particular contexts and so could be applied generally (Croson 2005).

Still, we wanted to test whether our results are generalize-able or robust enough to stand up to the influences of such efforts at framing. In this region, simply referring to water gets attention and clearly brings forth idiosyncratic associations. Also, for this central valley and capital city, having the other player be from the other sub-population easily unearths various connotations. Yet all of our framed results (for the water and the region frame) yielded the same conclusions.

Working with inhabitants of the regions in Ceará affected by resolutions about water allocation while having our core experiments framed generically (without either water or regional context) makes these ‘artefactual field experiments’ (according to the Harrison and List 2004 typology).

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[5] Consider the following four experimental possibilities (and see Harrison and List 2004 for more such thinking): European or US university students with generic framing; field populations with generic framing; field populations with local framing; and interventions in field populations’ local reality. It is tempting to argue that more to the end of the list is better and without question the last possibility provides observations like any other observational data for inferring parameters relevant for real local policy. However, moving from the 2nd to the 3rd approach involves real tradeoffs and either could be preferred. In particular, if the attempts to frame are communicating *only some of the relevant details* that should inform real choices for such a population, and if they induce *idiosyncratic reactions* to the framing specifics that significantly affect choices, then the unframed field (‘artefactual’) experiments (i.e. 2nd approach) may be preferred. For a concrete example, if the framing involves the description of a policy that could be chosen by the local government and because of past political history in the area participants react in the experiments based upon their displeasure with the current president of the country in question, results are not generally relevant.

Since distinct populations could well behave differently (see, for instance, Henrich et al. 2005), despite generic framing we were eager to get results from a population relevant for water policy (note that our own distinct subpopulations, at the two ends of the canal, yielded similar results).

Our design and set of information conditions extends prior work with asymmetric information (Mitzhkewitz and Nagel, 1993; Rapoport et al., 1996; Rapoport and Sundali, 1996; Kagel et al., 1996; Straub and Murnighan, 1995; and Croson, 1996).[6] Further, our large field sample (1200 participants) in NE Brazil and our directly addressing real settings of climate vulnerability yield contributions to both development and natural-resources literatures that include behavior-based analyses of policy and institutional design (Cardenas and Carpenter 2005, Levitt and List 2007).

3. Results

Our benchmark, symmetric-certainty cases mimic the classic ultimatum-game literature for both high quantity (CbCb) and low (CsCs). Proposer share on average is 60% for high, 62% for low. Acceptance (94% for high quantity, 95% for low) is in the upper ranges from typical reports.[7]

Such offers to share surely involve strategic avoidance of rejection by responders. Yet positive offers are common even in dictator games, when responders do not have the option of rejecting (Forsythe et al., 1994). Thus the (larger) offers in ultimatum games are attributed to preferences for fairness plus strategy. Our varied information conditions show strategy matters at the margin.

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[6] Experiments for environment/resources include unframed lab experiments on policy enforcement and compliance,, e.g.: Cason, Gangadharan and Dukec (2003); Stranlund, J.K., Murphy, J.J., and Spraggon, J.M. (2008); Murphy, J.J., and Stranlund, J.K. (2007); Murphy, J.J., and Stranlund, J.K. (2006); Murphy, J.J. and Stranlund, J.K. (2008). Experiments also consider policies for climate change: Saijo, Sherstyuk,Tarui and Ravago(2009); Gowdy (2009). For recent reviews concerning laboratory experiments concerning the impacts of environmental policies and, more generally, responses to economic policies, see also Sturm and Weimann (2006) and Normann and Ricciuti (2009).

[7] Camerer 2003 reports mean offers of 30-40% with modal and median offers of 40-50%. Offers of 40-50% rarely are rejected while offers below 20% are rejected half of the time. Offers of 0-10% and 51-100% are rare. Further evidence is reviewed in Ooesterbeek et al. 2004, which reports an average offer of 40 percent and 16% rejections.

Table 3's columns A & B report for all observations average requests from two points of view: as a fraction of the true quantity; and as a fraction of a responder's expectation of that quantity. For Cs uncertainty scenarios, recall that if proposers ask for more than the 6 chips in the bag then proposers know they would earn less than what responders think they would cede by accepting.[8]

Column C reports acceptance fraction while columns D & E repeat A & B for all accepted offers. Columns C and D determine the returns each player gets, as rejection eliminates a return for any player while the accepted splits in D convey how the returns that remain in the game are divided. Thus, as noted in the table, F and G are computed from C and D (F = C x D and G = C x [1 – D], noting that this implies F and G are correctly calculated from the actual gains (see footnote 9)).

(Insert Table 3)

3.1 Private Upside of Private Knowledge

3.1.1 Successfully Hiding Bad News

The first three rows of Table 3 show exploitation of the 'social norm of sharing'[9], clear evidence that strategy is dominant at the margin in ultimatum offers. While fairness preference is present (responders incur costs of rejecting greed and some proposers ask for half of quantity (Table 4)), on average proposers do not implement 60-40% but instead exploit asymmetric information.[10] Table 3 shows statistically significant differences and here we discuss the significant results.

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[8] Specifically, recall all are aware such acceptance would yield for proposers only 6 chips. Therefore, in column A we treat such a request as a 6. For column B, though, recall responders receive requests without knowing quantity. Thus they could imagine conceding the entire request and so we calculate the average request using actual requests. This explains why the average request differs in Column A vs B. The same explanation applies for Column D vs E.

[9] While many may assert that the only 'fair' sharing is a 50-50 split, we refer to 60-40 as a 'social norm of sharing' because across many experiments that is the average proposal that has been accepted within ultimatum games.

[10] Consistent with Mitzkewitz and Nagel 1993, Rapoport et al. 1996, Rapoport and Sundali 1996 though our games likely permit easier computations shares (and in Straub and Murnighan 1995 and Croson 1996 responders lacked

Comparing CsCs with Cs50 shows a ‘norm’ can be exploited given better information. In Cs50 from the view of a responder, about whom the proposer has full information, quantity is equally likely to be big (10) or small (6). Thus, the responder’s expectation of quantity is 8 chips and in column B we see that proposers on average asked for exactly 60% of the expected quantity of 8. Spelling out ‘exploitation of the norm’, if a responder’s expectation is larger than actual quantity, 60% (‘sharing norm’) of expected in column B means over 60% of actual quantity in Column A. There we see that proposers asked for almost 80% of quantity, hiding information to gain chips.

We emphasize here the heterogeneity that is carefully documented within our Table 4, i.e. these players employ very varied strategies. For instance, about a quarter of requests in Cs50 and CsFs are for 3 while, as noted, some players asked for more than 6, trying to signal quantity is high. Overall, the average requests of almost 80% of the actual quantity (only 60% of the expectation) went over well with responders, as seen in columns C-E. Column C’s relatively high acceptance rate of 91% is consistent with the average accepted offer in D & E being only a bit smaller than the average of the set of all requests in A & B. Rejection occurs, but not of average requests.[11]

3.1.2 Why Would This Work?

Responders know proposers have better information yet on average cede 60% of the expected. Consider what responders might be thinking, as they know quantity is never 8 (Cs50 expected): should they be thinking about requests as fractions of that expectation? We need to spell it out.

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information on pie size). Our responders’ priors are similar to Huck 1999, Guth and Huck 1997, and Guth et al. (1996), which study behavior under different veto rules and without different information conditions as we do.

[11] “Potentially fair” offers (fair under one realization of uncertainty) are not rejected often. Responders unsure offers are unfair may well hesitate to reject. Responders may not want to be unfair to a proposer who has not been unfair. Alternatively, responders may wish to remove the burden, from their own shoulders, of enforcing the social norm. Rejection is costly for them so being able to identify or claim that the offer might be fair could be useful that way.

Consider a request for five. As quantity is never 8 but may be 10, ceding five might mean getting half the resources. That would be better for a responder than the full-information 'sharing norm'. Yet if quantity is six, it means under 20% of the pie, less even than in typical dictator results.

Given these possibilities, a responder in Cs50 could think there is 50% chance of ceding 50% and 50% chance of ceding 83%. Overall, the expected concession in accepting a request of five would be roughly two thirds. For a request of four, the analogs would be 40% and 66% and on average 53% (< 60%). From this perspective, accepting a request of four is sensible and of five is not unreasonable and a blend of accepting the two could yield an average accepted request of 4.8 as in Table 3. Thus, our results could be the implementation of 60-40% 'sharing-norm' thinking by these responders, as it is applied to the limited information they have about resource quantity.

3.1.3 What Do Empowered Proposers Want & What Risks Will They Take To Get It?

The CsFs row in Table 3 is consistent with the above but with a twist. To start, again the requests in the first column (76%) are much closer to 80% of the quantity than to a 60% 'norm' or CsCs. However, the information responders have is closer to correct. Their probability of low quantity is not 50% but 70%. That implies that even a smaller request (4.71 on average in CsFs versus 4.84 in Cs50) is a larger share of a responder's expectation (65% versus 60%, not statistically different) and such an increase could induce more rejections. As the proposer should know that, the requests look like a risky strategy to try for almost 80% (as possible in Cs50 but not CsCs).

Columns D & E conveys that the accepted offers in CsFs are lower than requests, i.e. some high requests are rejected. Column C shows 89% acceptance, lower than CsCs (statistically different at 10%). That rejections rise with the level of request implies a risky tradeoff if asking for more: if it is accepted, the proposer gets more; when rejected, however, the proposer gets nothing.

This is reflected in column F, which blends the requests and rejections (i.e., zero earnings) to get average returns for proposers for each information condition. With high acceptance rates, CsCs earnings are close to the shares accepted, i.e. at almost 60% of quantity. The limited responder information in Cs50 helps proposers. There is some rejection but, including that, earnings are considerably higher at 72% of the actual pie. That is not 80% but is considerably closer. In CsFs, the limitation from better responder information is apparent within the lower (66%) total returns.

3.2 Private & Social Downside of Private Knowledge

3.2.1 What Do Constrained Proposers Want & What Risks Will They Take To Get It?

The last three rows of Table 3 support the points just made, albeit with an apparently different proposer goal of simply keeping the 'typical' 60% share. Again the critical issue is the constraint created by responder information. Uninformed responders are constraints given high quantity.[12] Their expectations are less than true chip quantity. Thus applying a 60% 'division per the norm' to the expectation, as in Cs50 above, would yield considerably lower returns for a proposer.

Still, proposers apparently want 60%. In CbFb and Cb50, the average request is about 6 or 60% of quantity. That is far more than a 60% share of expected quantity (66% in CbFb, 75% in Cb50, different from CbCb at 1%). Much as 'shooting for 80%' when hiding bad news seemed to drive earlier risky requests, with private good news these proposers seem to take risks to retain 60%, though they should expect to be rejected more. Such a risky strategy is neither right nor wrong; its payoff depends on how much the rejection rate increases as the request's magnitude rises.

[12] In Straub and Murnighan 1995 responders do not know quantity. The authors argue that people may accept very low offers in such a situation since they cannot make social comparisons. We believe that in our games, relative to theirs and relative to some other games which did provide to responders information concerning resource quantity, responders can more easily evaluate shares of the pie. We may be empowering the responders to reject lower offers.

3.2.2 Why Might Proposers Try This?

One explanation for seemingly high requests is that proposers use limited means to communicate or signal quantity. A large request could serve as an honest signal that quantity must be large. Many literatures discuss signals. When direct communication is illegal, e.g. firms coordinating prices, signals may arise such as new online fares, printed catalogs or published 'lowest price guarantees' (to tie one's own hands to signal others can price high and all can capture surplus).

Here, successful signaling requires an expectation by the proposer of trust from the responder. Responders might trust that a large request is signaling a large pie and, also, proposers' desire to cooperate to raise total social surplus. Yet they might instead interpret it as greed to be punished.

For instance, a responder might reason that a request for seven chips means that the pie is 10. Seven might be the lowest possible such signal, as it would stand out (at 70%) from the 'norm' and potentially be recognized as an effort to communicate.[13] Thus it may be a rational request. Yet we know that some responders request more than 6 even when the bag has only 6 chips. Thus clearly there is at least some empirical basis for rational rejection of such efforts to signal.

3.2.3 The Costs of Non-Communication

Columns C-E show what transpired. Accepted requests (D & E) are lower than average requests in Cb50 and CbFb. Rejection rose to 17% for Cb50, when requests are ¾ of expected quantity (CbFb 97% acceptance rate seems a lucky break, much as 91% for Cs50 might be a bit unlucky). Thus there was a downside to the risky proposer strategy of trying one way or another for 60%.

[13] Perhaps a request of six would work too. It would match the 60-40 % division in the case of the large pie yet leave nothing in the case of the small pie. It is possible that a responder might reason that a proposer would not do that.

On net, proposer returns are constrained in this information condition, as summarized in F & G. While returns were 56% for full information, for Cb50 they are drastically lower at only 46% (different from CbCb at 5%), reflecting proposers' lower shares plus rejections of their strategy. This shows a downside of private information, like the well-known case of selling a used car. If the car is in fine shape, i.e. good news, the seller would like this to be public knowledge. The inability to communicate yields lower prices and failure to transact when both parties could gain.

Here proposers would like everybody to know that quantity is large. However, lacking an ability to credibly communicate this fact, the proposer gets less than 60% even if an offer is accepted (column D) and under half when including the rejections (that are analogous to not transacting). Like used car buyers, responders suffer too. They make the costly choice to punish high requests by rejecting. That earns zero for them, as a rejection cancels the entire social surplus for the pair.

3.3 Learning From 'Bad' Information

The central (fourth and fifth) rows in Table 3 emphasize the points above, using an extreme case, by going beyond just the lack of a forecast better than a 50-50 to 'giving the wrong information'. Thus, CsFb has low quantity (of which proposers are certain) but the responders have a forecast indicating a higher likelihood of the high quantity. In CbFs, the opposite combination arises.

Following from subsection 3.2, in CbFs a proposer is more constrained than ever by the inability to communicate high quantity since the responder's information is now weighted to low quantity. Impressively, whether from stubborn attachment by proposers to 60% as 'their rightful share' or instead from sensible risk taking (like gambling) given their beliefs about likelihood of rejection or instead faith in the high-quantity-signaling power of higher requests, proposers persist with requests of 60% of 10. Thus the average request in CbFs is once again about 60% of the quantity.

In this scenario, that is a full 85% of the expectation from the point of view of the responder. Yet it is not clearly a mistaken strategy. Some requests are accepted. While the accepted requests are lower than the average requests, the accepted ones earn 57% of the quantity (as in Cb50). Yet acceptance falls to 74% and this all nets out to only 42% returns. Thus, whether or not there was a better strategy, at the least we see a dramatic constraint due to the lack of communication.

For low quantity, CsFb extends our findings in an interesting and suggestive way using these lucky proposers whose responders' expectations are far above actual quantity. Following Cs50, proposers do appear as though they want to get 80% of the quantity, as their requests average almost that share at 79%. *Here, however, they might be limiting themselves to at or under 80%.*

Column B shows that this 79% share implies only a 55% share of responder's expected quantity. Given that, the proposer has room to raise the requests to 60% of the expectation, yielding over 80% of quantity. Perhaps the reasons the proposers do not do so are the same as motivations that drive offers in classic dictator game results where, on average, the deciding party donates 20%.

Yet self-limiting proposers still may gain. As the share being ceded (in expectation) is smaller, acceptance is very high, even above full information. That implies, as in F, that the returns to the proposer, even taking into account losses of surplus from rejection, are starting to approach 80%.

3.4 Breaking Down The Averages

Table 3 conveys our main points yet masks details of individual proposer and responder choice. Table 4 reports, by the level of request, the frequency of such requests and their acceptance and, blending those, the average return from such requests. It also indicates what share of responders' expected quantity such a request constitutes, to help in comparisons across varied scenarios.

(Insert Table 4)

For low quantity, there is less new information. There was rejection but mostly of uncommon requests over 2/3 of expected quantity. The modal request was 5, for 34% of CsFs, 37% of Cs50, and 58% of CsFb (the easiest to exploit). We note for comparison that the modal request (44%) with full information in CsCs was 3. Clearly, proposers can exploit information asymmetry.

Yet there is heterogeneity (Kurzban and Houser 2005), including the large group who seem to apply a "50% sharing norm". In CsFs, 27% of the requests are 3 (20% in Cs50, 15% in CsFb). This could be attributed to fear of rejection or it could be based upon other-regarding preferences (e.g. altruism (Levine 1998, Bowles 2003), fairness, inequity aversion (Fehr and Schmidt 1999)).

For high quantity, the conflict between proposer and responder goals is nicely documented here. In CbCb with full information, few proposers asked for very high fractions, while even with mild asymmetry (CbFb) the number whose requests constituted high shares of expected quantity rises. With more information asymmetry in Cb50, the conflict per high fractions of expected quantity seems inevitable as proposers try to get 'their 60%'. Almost half of the requests are for at least ¾ of expected quantity, with another half being at 63%. Rejection is much higher. Then by CbFs, every single request is a share of the expected pie of at least 69%. Clearly rejections will occur.

3.5 Robustness To Framing

Finally, we return to using averages and refocus on our central result: private information about bad news can permit a proposer to exploit a "sharing norm". Here we examine how robust that result is to shifts in our framing: first, using the term water instead of generic references; and second, using actual regions, i.e. identification of the other player as being at the other end of the canal. Table 5 presents the same kinds of results as Table 3 for CsCs and for Cs50 in each frame.

(Insert Table 5)

Water-framed CsCs is not statistically significantly different from the unframed CsCs in Table 3, e.g. 60% versus 62% in column A (p=0.436 from a two-sample t test with unequal variances). Moreover, our central result is robust, as column A shows that Cs50 offers clearly are greedier. Thus in this water frame the same exploitation occurs of private information about low quantity.

This result is robust also to when the region of the other player is identified. Again compared to unframed in Table 3 the region-framed CsCs is not statistically significantly different. And then critically, again column A shows that Cs50 offers are greedier, confirming the paper's message: with private information about low resources, proposers strategically capture a higher share.

4. Discussion

Our assessment of the outcomes for equity from integration of uneven climate information with bargaining institutions finds that asymmetric information, and specifically one-sided uncertainty, privileges those who know about resources. Across a wide range of information conditions, we showed that actors apply their knowledge about other actors' less-informed expectations to exploit private information when they can. Their gains moved very directly with the others' lack of information and the offers by which they gain seemed to strategically exploit "sharing norms".

For the water-allocation setting in NE Brazil that inspired this novel experimental design to the many other resources-bargaining settings to which its very simple fundamentals are applicable, these results suggest the critical importance for equity of informing all the decision participants.

That includes the provision of information to less empowered members of participatory groups, since these results show that simply being at the bargaining table does not bring “a fair share”.

We note not all private information is exploitable. Another’s lack of knowledge of abundance can in fact constrain what those in the know gain. Strategic choice involves not only exploitation of private information but also whether to keep it private to start. Our experiment had no direct mechanism for sharing information. Proposers appeared to try to ‘signal’ high resource quantity using high requests but were often rejected, though responders incur a cost of punishing greed.

Future research might use repeated games as participatory bodies may meet regularly over time, permitting reputation and trust to develop. Further, as in reality climate forecasting is imperfect, one might explore the bargaining impacts of having even the more-informed parties be uncertain. Both of these extensions could bring the experiments closer to particular adaptation settings.

Stepping back, we suggest that experiments as fake institutions can aid in integrated assessment. As in our results, there can be clear feedback to physical scientists, and those disseminating their outputs, concerning the implications of uneven dissemination in both access and understanding. There also can be clear feedback to social scientists, and those on the ground proposing specific institutions for adaptation, concerning the factors affecting equity outcomes from participation.

Importantly, it may be difficult to empirically study such natural-social interaction in other ways. Simply measuring the information condition for participants in actual settings is difficult enough. Measuring how meaningful is actors’ participation in real institutions also can face great hurdles. Finding pre-existing variation in information and institutions to examine impacts is even harder. In light of these constraints, we suggest the potential value of experiments within assessments.

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TABLE 1

Subject Characteristics

	Age	**Female**	**Education***	**% Owning Computer**	**#**
Fortaleza	22	0.61	15	0.74	506
Limoeiro	24	0.56	13	0.24	458
Region Frame	30	0.60	14	0.40	120
Water Frame	24	0.54	14	0.54	116
Total	***25***	***0.58***	***14***	***0.48***	***1,200***

*: These data result from eliminating the outliers (i.e., apparent mistakes, like >21) in the values for education.

We asked about years of formal education.According to the Brazilian system the interpretation would be that: four completes elementary school; eight completes middle school; eleven indicated finishing high school or a technical education, sixteen completes undergraduate college education, and 18 completes graduate education.

<u>**TABLE 2**</u>

Experimental Design

Treatment*	**Proposer knows:**	**Responder knows:**	**Unframed (#obs**)**	**Water Frame (#obs**)**	**Region Frame (#obs**)**
CsCs	6 chips	6 chips	79	30	30
CsFs	6 chips	70% on 6 30% on 10	71		
Cs50	6 chips	50% on 6 50% on 10	70	28	30
CsFb	6 chips	30% on 6 70% on 10	26		
CbFs	10 chips	70% on 6 30% on 10	27		
Cb50	10 chips	50% on 6 50% on 10	64		
CbFb	10 chips	30% on 6 70% on 10	72		
CbCb	10 chips	10 chips	73		

*C = possesses Certainty, F = possesses Forecast, s = indicates a small quantity, b = big quantity
The proposer's information condition comes first, and responder's second, in treatment names.

** An observation is a pair of individuals playing. Thus, e.g., Water Frame has 58 here but 116 in Table 1.

TABLE 3

Unframed Experiments[14]

	A	B	C	D	E	F = C x D	G = C x (1 - D) [also = C - F]
Treatment	**Average Request / Quantity** *(all obs)*	**Average Request / Expected** *(all obs)*	**Accepted Fraction** *(all obs)*	**Accepted Request / Quantity**	**Accepted Request / Expected**	**Proposer Return / Quantity** *(all obs)*	**Responder Return / Quantity** *(all obs)*
CsCs	3.72/ 6.0 = 62%	3.72/ 6.0 = 62%	0.95	3.65 / 6.0 = 61%	3.65 / 6.0 = 61%	3.47/6.0 = 58 %	37%
CsFs	4.54/6.0 = 76%***	4.71/7.2 = 65%	0.89*	4.44/6.0 = 74%***	4.60/7.2 = 64 %	3.94/6.0 = 66%**	23% ***
Cs50	4.77/6.0 = 79%***	4.84/8.0 = 60%	0.91	4.73/6.0 = 79% ***	4.80/8.0 = 60%	4.33/6.0 = 72%***	19%***
CsFb	4.73/6.0 = 79%***	4.88/8.8 = 55%**	0.96	4.68/6.0 = 78%***	4.84/8.8 = 55%**	4.50/6.0 = 75%***	21% ***
CbFs	6.15/10 = 61%	6.15/7.2 = 85%***	0.74***	5.7/10 = 57 %**	5.7/7.2 = 79%***	4.22/10 = 42 %***	32%
Cb50	6.00/10 = 60%	6.05/8.0 =75%***	0.83**	5.62/10 = 56%**	5.62/8.0 =70%***	4.66/10 = 46%**	36%
CbFb	5.85/10 = 58%	5.84/8.8 = 66%***	0.97	5.77/10 =58 %	5.77/8.8 =65 %**	5.61/10 = 56%	41%
CbCb	6.05/ 10 = 60%	6.05/ 10 = 60%	0.94	5.98 / 10 = 60%	5.98/10 = 60%	5.66 / 10 = 56%	38%

Within each column, we conducted *t* tests for equality of means, or proportion tests (for column C), comparing each treatment row to its 'baseline' (i.e. CsCs for other Cs rows and CbCb for other Cb rows). For CsFb and CbFs, which have fewer observations in particular, though, we conducted a Wilcoxon rank sum test (or Mann-Whiteney two sample statistic test). We use the following notation to signify differences between the means: *** means 1% level of significance; ** means 5% level of significance; * means 10% level of significance.

[14] We also ran regressions, in order to control for the effect of the few sociodemographic characteristics that we measure, when estimating the treatment effects in explaining the fraction of the pie implied by the amounts requested (AskFor) and in explaining the acceptances. Consistent with the indications of significance above, which are based on tests done without any controls, all the treatments when proposers knows the pie is small are statistically different from the symmetric certainty benchmark. None of the sociodemographic control variables we have for participants (age, gender, education and possession of a PC) are significant.

TABLE 4

Small-pie Scenarios for Unframed Experiments

	CsCs				CsFs			
ASK FOR	Relative ask for Prop	Freq.	% Accep	Return	Relative ask for Resp	Freq.	%Accep	Return
1	0.17	0%	0%	0.0	0.14	0%	0%	0.0
2	0.33	1%	100%	2.0	0.28	0%	0%	0.0
3	0.50	44%	100%	3.0	0.42	27%	100%	3.0
4	0.67	39%	97%	3.9	0.56	15%	91%	3.6
5	0.83	11%	78%	3.9	0.69	34%	87%	4.4
6	1.00	4%	67%	4.0	0.83	13%	66%	4.0
7	1.17	0%	0%	0.0	0.97	6%	100%	6.0
8	1.33	0%	0%	0.0	1.11	6%	75%	4.5
9	1.50	0%	0%	0.0	1.25	0%	0%	0.0
10	1.67	0%	0%	0.0	1.39	0%	0%	0.0
TOTAL		100%	95%			100%		

	Cs50				CsFb			
ASK FOR	Relative ask for Resp	Freq.	%Accep	Return	Relative ask for Resp	Freq.	%Accep	Return
1	0.13	0%	0%	0.0	0.11	0%	0%	0.0
2	0.25	0%	0%	0.0	0.23	0%	0%	0.0
3	0.38	20%	93%	2.8	0.34	15%	100%	3.0
4	0.50	13%	100%	4.0	0.45	12%	100%	4.0
5	0.63	37%	92%	4.6	0.57	58%	100%	5.0
6	0.75	26%	83%	5.0	0.68	8%	50%	3.0
7	0.88	1%	100%	6.0	0.80	0%	0%	0.0
8	1.00	3%	100%	6.0	0.91	8%	100%	6.0
9	1.13	0%	0%	0.0	1.02	0%	0%	0.0
10	1.25	0%	0%	0.0	1.14	0%	0%	0.0
TOTAL		100%				100%		

TABLE 4 (cont.)

Large-pie Scenarios for Unframed Experiments

	CbCb				CbFb			
ASK FOR	Relative ask for Prop	Freq.	% Accep	Return	Relative ask for Resp	Freq.	%Accep	Return
0	0.00	1%	100%	0.0	0.00	0%	0%	0.0
1	0.10	0%	0%	0.0	0.11	0%	0%	0.0
2	0.20	0%	0%	0.0	0.23	0%	0%	0.0
3	0.30	1%	100%	3.0	0.34	3%	100%	2.0
4	0.40	1%	100%	4.0	0.45	1%	100%	4.0
5	0.50	35%	100%	5.0	0.57	53%	100%	5.0
6	0.60	25%	89%	5.3	0.68	17%	100%	6.0
7	0.70	21%	100%	7.0	0.80	8%	100%	7.0
8	0.80	11%	88%	7.0	0.91	14%	90%	7.2
9	0.90	3%	50%	4.5	1.02	4%	66%	6.0
10	1.00	1%	100%	10.0	1.14	0%	0%	0.0
TOTAL		100%	94%			100%		

	Cb50				CbFs			
ASK FOR	Relative ask for Resp	Freq.	%Accep	Return	Relative ask for Resp	Freq.	%Accep	Return
0	0.00	0%	0%	0.0	0.00	0%	0%	0.0
1	0.13	0%	0%	0.0	0.14	0%	0%	0.0
2	0.25	0%	0%	0.0	0.28	0%	0%	0.0
3	0.38	0%	0%	0.0	0.42	0%	0%	0.0
4	0.50	5%	100%	4.0	0.56	0%	0%	0.0
5	0.63	50%	100%	5.0	0.69	56%	93%	4.6
6	0.75	9%	83%	5.0	0.83	11%	33%	2.0
7	0.88	19%	66%	4.6	0.97	11%	66%	4.6
8	1.00	14%	55%	4.4	1.11	11%	100%	8.0
9	1.13	0%	0%	0.0	1.25	7%	0%	0.0
10	1.25	3%	0%	0.0	1.39	4%	0%	0.0
TOTAL		100%				100%		

TABLE 5

Framed Experiments

	A	B	C	D	E	F *= C x D*	G *= C x (1 - D)* *[also = C - F]*
Treatment	**Average Request / Quantity** *(all obs)*	**Average Request / Expected** *(all obs)*	**Accepted Fraction** *(all obs)*	**Accepted Request / Quantity**	**Accepted Request / Expected**	**Proposer Return / Quantity** *(all obs)*	**Responder Return / Quantity** *(all obs)*
CsCs – Region Framed	3.60/6 = 60%	3.60/6 = 60%	0.93	3.53/6 = 59%	3.53/6 = 59%	3.3/6 = 55%	38%
Cs50 – Region Framed	4.73/6 = 79% ***	4.73/8 = 59%	0.90	4.85/6 = 81%***	4.85/8 = 61%	4.37/6 = 73%***	17%***
CsCs - Water Framed	3.63/6 = 60%	3.63/6 = 60 %	0.93	3.64/6 = 61%	3.64/6 = 61%	3.40/6 = 57%	37%
Cs50 - Water Framed	4.96/6 = 83% ***	5.32/8 = 66%	0.86	4.79/6 = 80%***	4.96/8 = 62%	4.11/6 = 68% ***	17% ***

Within each column, we conducted *t* tests for equality of means, or proportion tests (for column C), comparing each treatment row to its 'baseline' (i.e. CsCs for other Cs rows and CbCb for other Cb rows). For CsFb and CbFs, which have fewer observations in particular, though, we conducted a Wilcoxon rank sum test (or Mann-Whiteney two sample statistic test). We use the following notation to signify differences between the means: *** means 1% level of significance; ** means 5% level of significance; * means 10% level of significance.

APPENDIX

Instructions read to participants in treatment CsFs or CbFs[15]

We want to thank you all for accepting our invitation to participate in these research exercises. Before we begin, I will give to each of you 10R to cover your transportation costs (*give*). Now that, that's taken care of, I'd like to make some comments about what we will be doing today.

These exercises are part of a scientific research project conducted by Brazilian and international researchers with international research funding and the support of both local and international universities. We have three researchers helping with the exercises:

Our objective is to understand how people make decisions. We will learn from what you decide. Please note that all of the decisions you make during these exercises, and any other information you communicate to us, will remain confidential. The only people who will see that information are the project researchers and we will not divulge your individual information to anybody.

You could earn money. How much depends on your decisions and also the decisions of others. We do not know yet how much you will earn but it will be between R$0 and R$40. We use money in these exercises to make them more like real situations in which your decisions could earn you or cost you money. Any money that you may win in these exercises is yours to keep and nobody will know what you've earned.

These exercises may be different from other exercises in which members of your community might have participated in the past. Therefore, any comment that you might have heard about the exercises may well not be relevant to the exercises in which you will participate today.

We want to emphasize that your participation is voluntary. You are free to leave at any time. However, to get paid you will need to stay until the end of the exercises. Today's exercises may take two to three hours. If you think you will not able to stay that long, please let us know now.

Again, at any point you can choose to leave. These exercises involve no risk to you. They are likely to provide benefits, specifically the earnings you can keep. Are you willing to participate?

(If end up with an odd number of people, randomly choose one to leave)

We will now explain how to participate. Please pay a lot of attention to the instructions. We will explain how your decisions affect what you earn. If you understand the instructions, you will be able to make better decisions during the exercises. Please, remain seated and do not speak with other participants. If you have a question, raise your hand. We will answer questions in private.

[15] The original instructions were done in Portuguese. A sample of formats in Portuguese are also included.

If anybody talks about the exercise with others in the group we won't be able to continue today. Please, everybody, be sure to follow this rule since is possible for one person to spoil the game.

(*MODERATOR: pause here and ask if that is clear?)*

You will each participate in 2 different exercises. At the end of both exercises we will select one exercise and pay everybody what they earned based on their decisions in that exercise. The exercise will be selected at the end, by blindly choosing one of these envelopes in front of all participants (*show envelopes*). If the number one is chosen, then exercise number 1 will determine the payment. If number 2 is chosen, exercise number 2 will determine the payment.

In each exercise, you are matched with somebody to make a pair. Your earnings will be affected only by you and other person in your pair. You will not know who it is. The researchers do know but they will never tell anyone. In each exercise, your pair will be randomly selected. Today we have XX pairs participating at the same time.

Each pair is made up of a **Participant A** and a **Participant B**. You will be the same type (A or B) in both exercises. Your type will be decided before the first exercise by what letter you select from an envelope. Together with your type, you will receive an ID number. This number is your identification during the game. Please don't show this number to anybody. (*DO: type letter & ID number on the paper they select- explain the papers*).

The general idea is that each pair has a bag of chips. Participant A decides how many chips to ask for and offers what is left in the bag to Participant B. Participant B rejects or accepts this offer. If Participant B rejects the offer, both participants get zero. If Participant B accepts the offer, Participant A receives the chips he asked for and Participant B gets the rest of the bag.

Now, we are going to explain the exercise in detail. Recall, you can earn money based on your decisions. Each chip will be equivalent to 4 reais.

We will not use real chips. Please imagine a bag with chips like this one (*show bag w/stuff*). Also, very important, you do not know how many chips are here (*pointing the bag*). In this bag there might be 6 chips or there might be 10 chips. The only possibilities are 6 chips or 10 chips.

How many chips will be in the bag will be determined by blindly selecting one of the ten balls in this box, seven of which say 6 and three of which say 10 (*show box with ten ping pong balls*). The number written on the ball will determine the number of chips to calculate the payments for all of the pairs participating today. The blind selection of one of these ten balls means that there is a 70% chance that the bag has 6 chips and a 30% chance that the bag has 10 chips. It is more likely that the bag will have 6 chips.

However, only Participant A will know which ball was drawn before making his decision. That means Participant A will know whether there are 10 chips or 6 chips in the bag when making his offer.

Participant B won't know which ball was drawn from the box before making his decision. Thus, for Participant B, there is a 70% chance that the bag has 6 chips and a 30% chance that the bag has 10 chips. For him, it is more likely that the bag will have 6 chips-- even though Participant A knows if there are 6 or 10 chips.

(*MODERATOR: Do an example*)

In each pair, Participant A must decide how many chips to ask for and offer what is left in the bag to Participant B. Since the most possible chips in the bag is 10, Participant A must ask for any whole number no lower than 0 and no higher than 10.

Participant B then accepts or rejects the bag minus what Participant A asks for, deciding this without knowing how many chips are in the bag. That is, Participant B must write an X in accept or reject for Participants A's offer in a sheet similar to this poster that will be given to all Participants B in a moment. Participants A's offer will be circulated.

For example:
Example 1:

If participant A offers the bag minus 8 chips, Participant B decides if he wants to accept or reject this offer. If accepts, writes X in Accept; and if rejects writes an X in Rejects.

Example 2:

If participant A offers the bag minus 3 chips, Participant B decides if he wants to accept or reject this offer. If accepts, writes X in Accept; and if rejects writes an X in Rejects.

After all Participants B have taken their decisions, accepting or rejecting Participants A's offer, the first exercise will be done and we will be ready to start the second exercise. Recall, that after we finish both exercises, we will select one to be paid. If this exercise is selected, your payment will be determined in the following way:

For each pair, we will verify if the offer made by participant A was accepted or rejected by participant B. If Participant B rejects the offer, both participants get zero. If Participant B accepts the offer, Participant A receives the chips he asked for and Participant B gets the rest of the bag. However, if Participant A asked for more chips than are in the bag; then Participant A gets all of the available chips and Participant B gets zero. Recall that Participant B doesn't know how many chips are in the bag but Participant A does it.

For example:

- The ball indicates 6 chips in the bag and only Participant A knows this. Participant A asks for 8, offering Bag Minus 8 to Participant B; Participant B accepts the offer; Participant A gets 6 chips; Participant B gets 0 chips.

- The ball indicates 6 chips in the bag and only Participant A knows this. Participant A asks for 8, offering Bag Minus 8 to Participant B; Participant B rejects the offer, thus both participants get zero.

- The ball indicates 10 chips in the bag and only Participant A knows this. Participant A asks for 8, offering Bag Minus 8 to Participant B; Participant B accepts the offer; thus Participant A gets 8 chips while Participant B gets 2.

- The ball indicates 10 chips in the bag and only Participant A knows this. Participant A asks for 8, offering Bag Minus 8 to Participant B; Participant B rejects the offer; thus both participants get zero.

- The ball indicates 10 chips in the bag and only Participant A knows this. Participant A asks for 3, offering Bag Minus 3 to Participant B; Participant B accepts the offer; thus Participant A gets 3 chips while Participant B gets 7.

- The ball indicates 10 chips in the bag and only Participant A knows this Participant A asks for 3, offering Bag Minus 3 to Participant B; Participant B rejects the offer; thus both participants get zero.

(*MODERATOR: GIVE ONE TABLE TO EACH PARTICIPANT and explain how to read it*)

In sum, if Participant B rejects the offer, both participants get zero. If Participant B accepts, this table shows the earnings[16]:

OFERTA	**Saco tem 10 fichas**	
	Participante A	**Participante B**
Total do saco Menos 10 fichas	10 fichas	0 fichas
Total do saco Menos 9 fichas	9 fichas	1 fichas
Total do saco Menos 8 fichas	8 fichas	2 fichas
Total do saco Menos 7 fichas	7 fichas	3 fichas
Total do saco Menos 6 fichas	6 fichas	4 fichas

Any questions?

[16] This is sample of the format; the actual format had all the possible offers. We also had a format for 6 chips.

Recall, each chip earns 4 reais. For the exercise that gets selected at the end for doing payments, we will multiply the number of chips that you received in that exercise by 4 to get reais earnings:

Fichas	0	1	2	3	4	5	6	7	8	9	10
Reais	0	4	8	12	16	20	24	28	32	36	40

Remember that this will be money for you to keep and that nobody else will know your earnings.

We are going to give some examples:

- The ball indicates 6 chips in the bag and only Participant A knows this. Participant A asks for 8, offering Bag Minus 8 to Participant B; Participant B accepts the offer; thus Participant A gets 6 chips while Participant B gets 0; turning this into reais: Participant A earns R24 = 6 * R4; Participant B earns R0 = 0 * R4.

- The ball indicates 10chips in the bag and only Participant A knows this. Participant A asks for 8, offering Bag Minus 8 to Participant B; Participant B rejects the offer;thus Participant A gets 0 chips while Participant B gets 0; turning this into reais: Participant A earns R0 = 0 * R4; Participant B earns R0 = 0 * R4.

- The ball indicates 10 chips in the bag and only Participant A knows this Participant A asks for 3, offering Bag Minus 3 to Participant B; Participant B accepts the offer; thus Participant A gets 3 chips while Participant B gets 7; turning this into reais: Participant A earns R12 = 3 * R4; Participant B earns R28 = 7 * R4.

QUIZ: *(MODERATOR GIVES ONE TO EACH PARTICIPANT)*

- The ball indicates 6 chips in the bag and only Participant A knows this. Participant A asks for 7, offering Bag Minus 7 to Participant B; Participant B accepts that offer in the table; thus Participant A gets _____ chips while Participant B gets _____; turning this into reais: Participant A earns R_____ and Participant B earns _____ .

- The ball indicates 10 chips in the bag and only Participant A knows this Participant A asks for 4, offering Bag Minus 4 to Participant B; Participant B rejects that offer in the table; thus Participant A gets ____ chips while Participant B gets ____; turning this into reais: Participant A earns R____ and Participant B earns _____ .

END QUIZ

Now we are ready to start. Participant As will make the decision first. So I will ask all the Participant Bs to go with XXX to the room next door. Please do no talk with other participants about the exercise.

Responders Leave

Proposers Alone

All of you are Participant As. Each of you will be paired with a Participant B person who is in the room next door. The pairs will be randomly determined. You won't know who is your pair.

Recall that to determine how many chips will be in the bag, we will blindly select one of the ten balls in this box, seven of which say 6 and three of which say 10 (*show box with ten ping pong balls*). However, only you will know which ball was drawn before making your decision.

Participant B won't know which ball was drawn from the box before making his decision. Thus, for Participant B, there is a 70% chance that the bag has 6 chips and a 30% chance that the bag has 10 chips. For him, it is more likely that the bag will have 6 chips even though you know if there are 6 or 10 chips.

Recall, if Participant B rejects the offer that you made, both get zero. If Participant B accepts your offer, then you will get what you asked for and Participant B will get the chips that remain in the bag. But if you asked for more chips than are in the bag; then you get all of the chips and Participant B gets zero.

Note that your decisions are final once you write them down, no matter the Participant B's decisions.

NOW WE NEED A VOLUNTARY TO SELECT THE BALL (*do it*). We won't show this result to Participant B before his decision.

Now that you know how many chips are in the bag, please write (*give form*) your identification number and also how many chips you are asking for:

PARTICIPANTE A   NÚMERO DE IDENTIFICAÇÃO_______
Eu quero ________ fichas. Então, eu estou oferecendo o Total do saco
Menos _______ fichas ao Participante B.

Please circulate the offer to Participante B[17]:

[17] This is sample of the format; the actual format had all the possible offers.

NÚMERO DE IDENTIFICAÇÃO PARTICIPANTE B ________

Se o participante A oferecer Total do saco menos 10 fichas você aceita a oferta ou rejeita?

( ) Aceito ( ) Rejeito

Se o participante A oferecer Total do saco menos 9 fichas você aceita a oferta ou rejeita?

( ) Aceito ( ) Rejeito

Se o participante A oferecer Total do saco menos 8 você aceita a oferta ou rejeita?

( ) Aceito ( ) Rejeito

Se o participante A oferecer Total do saco menos 7 você aceita a oferta ou rejeita?

We are going to ask for Participants B decisions. Each participant B will blindly select one of these envelopes to determine the pair.

Responders Alone

All of you are Participant Bs. Each of you is paired with a Participant A person who is in the room next door. Each Participant A's offer is written on these envelopes. There is one envelope here for each of you. Please chose one of this envelopes but don't open it now.

Recall, that you do not know which ball was drawn to determine how many chips are in the bag. So for you there is a 70% chance that the bag has 6 chips and a 30% chance that the bag has 10 chips. For you, it is more likely that the bag will have 6 chips even though Participant A knows if there are 6 or 10 chips

Recall, if you reject the offer made by Participant A, both get zero. If you accept the offer, then Participant A will get what he asked for and you will get the chips that remain in the bag. However, if Participant A asked for more chips than are in the bag; then Participant A gets all the chips and you get zero.

Note that your decisions are final.

Now open your envelope; please write your number of identification and write an X in accept o reject for the Participants A offer.