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Social Status and Bargaining when Resources are Scarce: Evidence from a Field Lab Experiment

by Ben D'Exelle*, Els Lecoutere**
and Björn Van Campenhout***

* CBESS, University of East Anglia
** Ghent University
***University of Antwerp

Abstract
This paper studies how individual social status influences bilateral bargaining in small-scale societies where resources are scarce. It reports the results of a field lab experiment with members of irrigation schemes who participate either as water distributors or receivers. Our results indicate that social status influences bargaining behavior in two ways. First, with social status being positively correlated with economic wealth, our results confirm a self-serving bias in fairness conceptions. Second, social status influences how receivers react to the received share as well as how distributors adapt their distributive decisions after the receivers' reaction. We also highlight implications of the results for the efficient use of scarce resources.

Keywords
Bargaining; Social status; Scarcity; Small-scale Societies; Field lab experiment

University of East Anglia

CBESS

Centre for Behavioural and Experimental Social Science

CBESS
University of East Anglia
Norwich NR4 7TJ
United Kingdom
www.uea.ac.uk/ssf/cbess

1. Introduction

How do individuals in developing countries bargain over the limited resources they have at their disposal? When does it lead to open conflict, efficiency losses and possibly persistent poverty? Thanks to the increasing use of experimental methods, economists now have substantial empirical knowledge about bargaining behavior.[1] There is ample evidence on the conditions under which people not only care about their own material well-being but also take the well-being of others into account. We also know a lot on the conditions that influence the likelihood of conflict within a bargaining setting (for surveys see, e.g., Camerer, 2003, Cooper and Kagel, 2010).

The settings people in developing countries are confronted with, however, differ in at least two important ways from the ones simulated in this bargaining literature. First, resources are scarce, in a sense that they are often insufficient for all people to reach a minimum critical production input, which condemns (at least) part of the population to persistent low income levels. Second, most people in developing countries live in close-knit small societies where elements of social status, defined as one's position in the social hierarchy, are crucial in determining social and economic interaction.

In this paper, we will implement an experiment explicitly designed to test bargaining models appropriate for these settings; that is, they account for resource scarcity and the importance of individual social status in small-scale communities. To do so, we select a population that faces recurrent and intense resource scarcity and needs to engage in bilateral bargaining over the distribution of scarce resources. An interesting such population are small farmers in rural Tanzania who depend on self-governed irrigation schemes for water access, hence their production and income. They are used to a situation where users upstream in the irrigation scheme make appropriation decisions about the water flow, and are often confronted with dropping water levels because upstream users cut off water channels. Moreover, in the dry season water in irrigation schemes becomes scarce, in a sense that it is technically impossible to give all irrigation users a water share that guarantees a decent production and income.

[1] In economic experiments, a randomly selected pool of participants interacts with each other in a controlled environment, receiving real incentives through financial payments that depend on their pay-offs in the experimental game. These pay-offs depend on their individual decisions and the decisions of the other participants they interact with. In this way, one is able to study how changes in incentive structures as well as real-life socio-economic characteristics affect individual behavior and social interaction. Experimental methods have been very useful for the empirical testing of bargaining models (Kagel and Roth, 1995).

A sample of this population is grouped in pairs to interact anonymously in a repeated bargaining experiment. To study the influence of social status on bilateral bargaining we rely on the natural heterogeneity within the sample. As pay-offs in the experimental game are the same for all participants and participants remain anonymous during the experiment, behavioral differences in the experiment can only be attributed to non-payoff asymmetries, such as heterogeneity in social status.

To analyze the data we make use of dynamic panel data models that allow us to control for state dependence, the interaction between the decisions of distributors and receivers, and the influence of their social status. By doing so, this article makes an important contribution to the analysis of bilateral bargaining. Most repeated bargaining experiments produce rich dynamic data, but the dynamics are often only superficially analyzed. We will show that a dynamic analysis can provide a more complete understanding of the influence of social status in a repeated bargaining setting.

By following this approach, this study produces evidence that individual social status plays an important role in the bargaining over scarce resources. We find that at least part of the influence of social status works through self-serving biases in fairness norms, which is consistent with previous experiments (Kagel et al., 1996). Whereas distributors with high social status (who generally face better economic conditions) have a tendency to share resources equally, distributors with lower social status aim at receiving higher than equal shares to correct for initial unequal conditions. We also find evidence in support of strategic considerations. Many distributors keep higher than equal shares but when punished by the receiver switch to equal split or even altruistic distributions. Finally, we observe a tendency for distributors to rotate as to who receives a share above the production threshold. This is an important observation as such rotation makes it possible to reconcile efficiency considerations with sharing norms that support equal sharing

In general, our results provide a more nuanced picture on sharing in Sub-Saharan African societies than most commonly presented in the literature, where sharing norms have been considered as strong (e.g., Platteau, 2000) and accepted by all socio-economic sectors, as suggested by experimental bargaining studies who did not detect any correlation between individual socio-economic characteristics and bargaining behavior (Henrich et al., 2001). Our study demonstrates that under conditions of scarcity, deviation from equal sharing is very common, which can be rationalized through biases in fairness considerations, strategic play and efficiency considerations, that are related to heterogeneity in social status.

2. The influence of socio-economic heterogeneity on bargaining

The study of bargaining behavior has a long tradition in economics, and game theory in particular (see for instance, Binmore and Dasgupta, 1987, for a review of modern bargaining theory in historical perspective). Thanks to the use of experimental methods bargaining models have been increasingly tested empirically. An important experimental game that has been used intensively to study bargaining processes is the *ultimatum game* (Güth et al., 1982). In this game, one player (the proposer) receives a fixed amount of money that she has to distribute between herself and another player, the respondent. The respondent can accept or reject the proposal, but if he rejects it, both players receive nothing. Assuming (common knowledge of) narrow material self-interest, there is a unique pure strategy equilibrium. As punishment is costly for the respondent he would always refrain from rejecting the offer made by the proposer. Consequently, the proposer, anticipating this, will keep most if not all of the resources in order to maximize her pay-off. Such equilibrium, however, has been consistently refuted by numerous ultimatum game experiments, where the mean of the proposals is around 40% of the available amount and the mode is the equal split. At the same time, most offers of less than 20% are rejected by the responder (Camerer and Thaler, 1995).

These results have stimulated a lively and ongoing debate about the predictive role of game theory and more specifically about how theoretical models need to be adapted to rationalize the observed behavior. New utility models have been elaborated that account for both strategic play and fairness considerations through inequity aversion (e.g., Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000) and reciprocal fairness (e.g., Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2006).

The ultimatum game has been implemented with numerous variations; many of them to test this new generation of utility models. The most interesting for the purpose of this paper are those that have looked at the effect of socio-economic heterogeneity on bargaining behavior. Heterogeneity in ultimatum games has been modeled through differences in payoff conversion rates (Kagel et al., 1996; Schmitt, 2004), differences in outside options (Knez and Camerer, 1995; Schmitt, 2004), differences in endowments (Armantier, 2006; D’Exelle and Riedl, 2008) or through framing (Ball and Eckel, 1998). Summarizing the main findings of these experimental studies, introducing socio-economic heterogeneity in a bargaining setting may have at least two important consequences.

First, it may translate into a *self-serving bias* in the application of conceptions of fairness. Social psychologists have indicated that people have a psychological self-serving bias when interpreting the fairness of a particular situation (Babcock et al., 1995). Neale and Bazerman (1992: 162) state that: "the selection of an allocation norm is often instrumentally motivated - the individual will choose a particular norm that maximizes his or her portion of the valued resource." One such bias may be created by the wealth of the parties involved. That such self-serving bias may be present within a bilateral bargaining setting has been confirmed by the study of Kagel et al. (1996). In a repeated ultimatum game they introduced inequality through the use of chips with different conversion rates. They observed that when the respondent had the higher conversion rate, the *money* was equally shared. When the proposer had the higher conversion rate, however, the *chips* were equally distributed leading to very unequal sharing in money terms.[2]

Second, socio-economic heterogeneity may also translate into differences in *bargaining power*. This has been demonstrated by Schmitt (2004) who in a repeated ultimatum game found that offers are more often rejected when responders have an outside option and that proposers strategically make higher offers accordingly. People with outside options have a better fallback position (or threat point) which is assumed to positively correlate with the amount of power they can bring to the bargaining process. Armantier (2006) introduced inequality in a repeated ultimatum game experiment through endowment inequality, and found that over time rich subjects demand more whereas poor subjects increasingly accept this. D'Exelle and Riedl (2008) similarly found in a repeated distribution game with endowment inequality that proposers demand more only after being punished by the responders. Ball and Eckel (1998), who artificially introduced social status in ultimatum games by randomly assigning participants a label of high or low social status, which is publicly known, found that the generosity of both high and low social status proposers increases with the social status of the respondent. This suggests that people expect high social status respondents to demand more and therefore give them higher shares to avoid rejection.

Most of these experiments relied on college students in developed countries. Because of the limited socio-economic heterogeneity in this population, heterogeneity had to be introduced in an artificial way, through asymmetries in the pay-off structure or through framing. It is, however, not clear whether the results observed in the student lab will be replicated with people outside the lab, where socio-economic heterogeneity is considerably larger. As with people outside the lab there is no need to artificially introduce socio-economic

[2] For a theoretical model that rationalizes people's behavior of deviating from an assumed objective fairness concept in a direction that favors them, see Konow (2000).

heterogeneity, it is crucial that socio-economic heterogeneity is spontaneously brought into the game by the participants themselves. It seems that in populations where real-life socio-economic heterogeneity is substantial this is indeed the case. This is even the more so among participants who tend to interact with each other outside the lab in daily life as well (Cardenas and Ostrom, 2004). Cardenas (2003), for instance, observed a strong correlation between real life economic heterogeneity and contributions in a public goods experiment with Colombian peasants, although socio-economic heterogeneity does not have any (marginal) pecuniary costs or benefits in his game. In particular, participants' real wealth and inequality reduced cooperation, but only so when face-to-face communication was allowed. He suggests that the lower cooperation among more heterogeneous groups is partly due to less direct communication among the participants.

In our study, we will show that even where people do not have any face-to-face contact, real-life social status and differences in it may lead to strong behavioral differences in a bargaining setting. To study the influence of social status on bargaining behavior we bring a group of people heterogeneous on social status to the field lab and let them participate in an anonymous bargaining experiment. As pay-offs are constant for all participants, only non-payoff asymmetries can explain behavioral differences in the experiment, such as heterogeneity in social status.

An additional contribution of our study to the bargaining literature relates to the simulation of scarcity. We simulate scarcity by making use of a production threshold. In a first treatment the threshold is low enough for both players to be reached with the available resources, whereas in a second treatment the available resources are not enough for both to reach the threshold. Up to our knowledge, no studies have investigated bilateral bargaining in a setting characterized by resource scarcity.

3. A field experiment to study bargaining over scarce water access

The experiment aims to reproduce the actual incentives that the participants face in their daily life when they bargain over access to an irrigation water flow. The participants are used to a situation where users upstream in the irrigation scheme make appropriation decisions about the water flow. They are often confronted with dropping water levels because upstream users overuse or even cut off water channels. In such occasion, downstream users try to force upstream users to reconsider and adapt their distribution decisions.

3.1. Experimental design: the pay-offs

The participants in the experiment are randomly assigned the role of upstream or downstream (water) user. Anonymous pairs of upstream and downstream users are formed, which remain fixed for the entire exercise. The experiment consists of several rounds. In each round, the upstream user takes as much water as she wants from a constant water flow, and what is left flows to the downstream user. More specifically, the upstream user decides how many hours in a day (of a maximum of 12 hours) to take water from the irrigation canal. While the upstream user taps water, there is assumed to flow no water to the downstream user. There is a direct relation between water use and income, represented by the production function in Table 1. As irrigation-dependent production requires a critical water input, this production function is characterized by a threshold. This represents a minimum water condition below which production is equal to a low level irrespective of the exact water input. In addition, above this critical water input, production shows decreasing marginal returns.

Table 1. Production function

	Water abundance		**Water scarcity**	
Hours upstream user	upstream	downstream	upstream	downstream
0	50	500	50	350
1	50	500	50	325
2	50	475	50	300
3	50	450	50	250
4	175	425	50	200
5	250	375	50	125
6	325	325	50	50
7	375	250	125	50
8	425	175	200	50
9	450	50	250	50
10	475	50	300	50
11	500	50	325	50
12	500	50	350	50

Note. Pay-offs are measured in Tanzanian Shilling (TSH), with 1 US$ = 1200 TSH.

In the water scarcity treatment, the water flow is reduced (approximately half as large as in the abundance treatment), so that more hours are needed to reach the minimum production threshold. At the same time, beyond this threshold, declines in marginal returns are less drastic with increasing number of hours of water use. Parameters are so that, in the abundance treatment, total water availability is sufficient for both water users to reach the minimum water input, whereas in the scarcity treatment, total water availability is insufficient for both users to reach this threshold.

After each decision made by the upstream user, the downstream user can react in one of the following ways. First, he can make use of a mediator who punishes the upstream water user. The cost of relying on the mediator is 30 TSH (Tanzanian Shilling) for the downstream user, whereas it reduces the payoff of the upstream user by 100 TSH. Second, if not using this punishment option, he leaves individual pay offs unaffected and he can choose between one of the following communication options: to communicate satisfaction, to communicate dissatisfaction or to communicate nothing (and thus not to react at all).[3] The distribution game is repeated during five rounds in the abundance treatment and ten rounds in the scarcity treatment.[4] The participants did not know in advance the number of rounds in each treatment. More detailed experimental procedures and the instructions can be found in Appendix A.

Assuming (common knowledge of) narrow material self-interest, the only pure strategy equilibrium of our distribution game is the following. As punishment is costly for both water users, a downstream user would always refrain from punishing the upstream user irrespective of the distribution. Consequently, the upstream user, anticipating this, will appropriate as much water as to maximize her pay-off (i.e. at least 11 hours in the abundance treatment and 12 hours in the scarcity treatment). However, as the bulk of ultimatum game experiments have consistently refuted the assumption of narrow material self-interest we do not expect such equilibrium to hold in our game either; and we expect that also in our distribution game experiment many participants, if not the majority, will opt for equal sharing.[5]

In the scarcity treatment, water levels are insufficient for both water users to reach the critical water input. Proposing the equal split therefore comes with large foregone efficiency gains. In other words, equal sharing conflicts with efficiency in the one-shot version of this

[3] Note that the punishment option is not framed as direct punishment, which would be a too intrusive instrument in these societies. Instead, downstream users are told they can rely on a local mediator who would then punish the upstream user. Moreover, as in these societies people often rely on less conflictive reaction options, we included three non-punishment reaction options, which allows us to study more subtle and realistic behavioral patterns.

[4] We followed this sequence of treatments for the following two reasons. First, we argue that it is only after playing an abundance treatment (where resources are sufficient for everyone to reach the production threshold) that the participants will consider the pay-off structure in the scarcity treatment as simulating resource scarcity. Second, the five rounds of the abundance treatment can be considered as trial rounds, as they will not be used in the analysis.

[5] This may be even more the case in Tanzania, where the socialist project of President Nyerere (1964-1985) has put a lot of emphasis on an egalitarian society and possibly solidified egalitarian sharing norms (see also Alesina and Fuchs-Schuendeln, 2005 on the influence of communism on social preferences).

game. Yet, thanks to the repeated character of the distribution game, rotation as to whom receives a share above the critical water input, may again equalize the returns over time. By elevating the received water for one of the irrigation users above the minimum threshold, such strategy may lead to substantial efficiency gains.[6]

3.2. The behavioral influence of social status

We now elaborate on the possible behavioral influence of social status in our bargaining experiment. Social status in African societies is closely related to economic conditions, but it is more than that. It can best be understood as the honor or prestige attached to one's social position, that is the position one occupies within a vertical social hierarchy in a society (Weiss and Fershtman, 1998). It translates into one's ability to attain what one wants, to influence others and to be respected.[7] So, it is not only indirectly linked to power through its correlation with economic conditions, but also in a direct way.

From the review of the experimental bargaining literature above we expect that social status influences individual strategy choice in our bargaining game in the following ways. First, heterogeneity in social status may translate into different degrees of bargaining power and conflict aversion. In particular, people with lower (higher) social status have lower (higher) bargaining power. According to the psychological literature there is a direct inverse relation between power and conflict aversion. Less powerful people display more behavioral inhibition because they have fewer resources and are more dependent on others, whereas more powerful people have more capacity to behave according to their internal states (Keltner et al., 2003). In small-scale societies we expect this relation between social status, bargaining power and conflict aversion to be even stronger, as outside options are much more limited in comparison with Western societies, leading to higher levels of dependency. Second, with

[6] It should be noted that even after taking account of possible punishment costs such rotation strategy remains superior. To show this, imagine the smallest possible rotation (7 hours to upstream user in one round, 7 hours to downstream user in another round), which leads to an efficiency gain of 2 x 75 TSH relative to the equal split strategy. When the upstream user is punished (we assume this is only realistic if she has more than 6 hours water access), this leads to a social efficiency loss of 130 TSH being the result of a 100 TSH cost for the upstream user and 30 TSH for the downstream user, which is lower than the efficiency gain of 150 TSH of the rotation strategy relative to the equal split.

[7] Although social status and economic wealth are closely related, heterogeneity on social status tends to be larger than economic differentiation in African societies. This is an additional argument in favor of focusing on social status instead of economic wealth.

social status being positively correlated with economic conditions, heterogeneity in social status may also lead to biases in fairness considerations.[8]

In summary, we expect social status to result in two behavioral forces related to differences in bargaining power and fairness conceptions. People with lower social status may bring less bargaining power into the game but at the same time have fairness conceptions that make them claim higher than equal shares. People with high social status, in contrast, can bring more bargaining power into the game but will not claim higher than equal shares. The strategy choices of upstream and downstream users will therefore depend on the balance of both forces. As upstream users have considerable bargaining power anyway (due to the first mover advantage), we expect that possible differences in strategy choice between upstream users of different social status are less the result of differences in power than of biases in fairness conceptions. As a result, we expect that social status influences the upstream user's strategy choice as stated in the following hypothesis.

H1: Upstream users with high social status have a tendency to share resources equally, whereas upstream users with low social status aim at keeping higher than equal shares.

For the strategy choice of downstream users, in contrast, differences in power/conflict aversion may be more decisive and even outweigh the influence of biases in fairness conceptions. This leads to our second hypothesis regarding downstream users' reaction behavior:

H2: Downstream users with low social status are more reluctant to protest against the offers made by upstream users, compared to downstream users with high social status.

Before moving to the empirical section, it is important to extend on the possible influence of resource scarcity in our distribution game, as this is an important feature that makes our distribution game different from traditional ultimatum games. Because of the production threshold, strategy choice may be influenced by efficiency considerations in addition to fairness considerations. There are empirical indications that in addition to (in)equality people

[8] It should be noted that, while the participants in our experiment do not know the social status of their opponent (as they do not know whom they are matched with), they are able to make inferences about it. For example, if they have a low social status, they are in equal or worse conditions than their opponent, whereas if they have a high social status they are in equal or better conditions than their opponent. One could of course directly reveal information on the social status of the participants' opponents. However, it is likely that this would lead to an experimenter demand effect (Zizzo, forthcoming). Our approach, in contrast, is conservative as it leads to an underestimation of the influence of social status.

pay attention to efficiency when making distributive decisions (see e.g. Engelman and Strobel, 2004; Güth et al., 2009). While efficiency considerations are often not strong enough to outweigh fairness considerations, it is plausible that they interact with the latter. In particular, upstream users with lower social status may be supported in their aim to receive higher than equal shares (hypothesis H1) by the fact that such unequal distributions are also good for efficiency. For upstream users with high social status, who prefer to share resources equally, efficiency considerations may stimulate them to rotate as to who receives a share above the threshold (i.e. more than the equal split). Whereas equal sharing conflicts with efficiency in the one-shot version of our distribution game, such rotation makes it possible to reconcile equal sharing and efficiency in a repeated setting.

To measure real-life social status of the participants, we visited each of the irrigation schemes in the selected villages a few weeks before the actual experiment. During this visit, we conducted a social status ranking exercise. In each irrigation scheme, we invited twenty individual irrigation users. With the support of the local executive officer, we looked for participants with very different socio-economic characteristics, in an attempt to maximize diversity. The participants were randomly divided in four groups. Each group was asked to rank all members of the irrigation scheme according to their social status. To avoid embarrassment and overestimation or underestimation of one's own social status, the participants were not asked to rank themselves. For detailed instructions and procedures of this ranking exercise we refer to Appendix B.

4. Results

The experiment was conducted in Mufindi district, which is located in the Southern Highlands in Tanzania. Five irrigation systems where traditional irrigation is practiced were selected. These irrigation systems are located in the lowlands of the district which is characterized by a semi-arid climate.[9] In this region agricultural income is highly dependent on irrigation water access (Mkavidanda and Kaswamila, 2001; Majule and Mwalyosi, 2003; United Republic of Tanzania, 2006).

In total 156 irrigation users participated in the experiment in 13 different sessions, distributed over the five irrigation systems. We did not allow more than 14 participants in

[9] The altitude in the lowlands of Mufindi district ranges from 1200 to 1500 meters. There is an average annual rainfall between 900 and 1200 mm and rainfall is unimodal and lasts from December until April (Ministry of Agriculture, 1999).

each session, so that we could provide additional assistance to illiterate participants during the explanation of the instructions.[10] In the instructions we also included several control questions and examples to ensure participants' understanding. One third of the participants (52) were female and average earnings were 2460 TSH, equal to 1.37 US$, i.e. around two days average income. After the experiment, the participants were asked how much the experiment reminded them of in real life. Only 8.3% of the participants did not recognize anything from real life.

4.1. Descriptive statistics

Because of our interest in bargaining in periods of scarcity, we will only use the data of the scarcity treatment. Table 2 shows the distribution of the decisions made by upstream and downstream users. What is striking is the large proportion of distributions with the upstream user giving a higher than equal share to the downstream user (24.5%). We know from other studies that offers in ultimatum games above 50% tend to be very rare (Camerer and Thaler, 1995). It is even more striking considering that punishment in our distribution game has a lower cost for distributors than in ultimatum games.[11] The relatively small size of the community where our experiment was conducted may account for this 'super fair' behavior. This is supported by the fact that similarly generous offers in ultimatum games have been observed in other small-scale societies (see e.g. Henrich et al., 2004). It should also be noted that part of the altruistic distributions may be the result of a deliberate rotation between altruistic and selfish distributions. While such rotation makes it possible to reconcile efficiency considerations with equal sharing, it is remarkable that the equal split distribution remains so frequently chosen, as equal sharing in the scarcity treatment makes upstream users forego large efficiency gains. It seems the very prominent egalitarian norms in the Tanzanian society make upstream users reluctant to deviate from the equal split.

Table 2 also shows the decisions made by the downstream users. We observe quite some variation in downstream user strategies. In almost 40% of the cases, the downstream user expresses satisfaction to the upstream user. We also observe that with larger shares kept by

[10] We also had tested and adapted the instructions in several pilot sessions to make sure that they would be understandable to the illiterate and poorly educated people.

[11] Moreover, in contrast to most repeated ultimatum games where participants are randomly rematched every period, in our game pairs remain fixed. In this way, reputation considerations may become important and reduce the relative importance of fairness concerns. As demonstrated by Slembeck (1999) in such a setting proposers demand more and rejection rates are higher than in the standard repeated ultimatum game. He attributes this to the super game strategies of income-maximizing proposers who try to obtain a reputation as a tough player in the early rounds in order to increase future earnings.

the upstream user the likelihood of expressing satisfaction decreases while the proportion of punishment decisions increases.

Table 2. Distribution of upstream and downstream users' decisions

Upstream user decision			*Downstream user decision*			
Hours upstream user			Punishment	Dissatisf.	Silent	Satisfaction
0	**1.4%**	11	0	0	4	7
1	**3.7%**	18	2	2	4	10
2	**8.6%**	38	1	2	10	25
3	**12.6%**	31	1	4	5	21
4	**19.0%**	50	2	7	13	28
5	**24.5%**	43	0	6	19	18
6	**52.8%**	221	4	23	56	138
7	**72.2%**	151	24	89	9	29
8	**78.7%**	51	13	24	6	8
9	**84.4%**	44	18	15	3	8
10	**89.6%**	41	19	14	2	6
11	**95.3%**	44	20	17	2	5
12	**100.0%**	37	22	8	0	7
		N = 780	126	211	133	310
		100.0%	**16.2%**	**27.1%**	**17.1%**	**39.7%**

Besides the decisions made by upstream and downstream user a third important variable in this study is the social status of the participants. As described before, to measure social status we implemented a social status ranking exercise. In each irrigation scheme we let four different groups rank all water users of the irrigation scheme (excluding the members that belong to the ranking group), with a higher rank number indicating a higher social status (rank 1 = lowest social status; rank 2 = second lowest social status; etc.). Each ranking was transformed into a score, equal to the rank number divided by the total number of rungs on the ladder (for a similar procedure see Van Campenhout, 2007). The mean of the scores made by the four groups was calculated for each irrigator. These values were converted into the standardized deviation from the mean score per irrigation scheme, which were used as the irrigators' final social status score. The average of this score is zero with the standard deviation being equal to 0.343. By observing the groups at work during the ranking exercise, it can generally be concluded that the level of consensus was relatively high. Also in the expost group discussion on advantages and disadvantages from being high, respectively low in the social status ranking, consensus was high. This confirms that the 'social status' concept was well understood and empirically relevant.

It is interesting to look at how the social status variable correlates with other socio-economic variables. First, social status correlates with wealth measured through proxies such as land property (spearman's rho = 0.198, two-sided P = .015) and food security (spearman's rho = 0.217, two-sided P = .008). Whereas land property is measured in number of hectares, for food difficulties we used five categories ranging from 'never food secure' to 'always food secure'. Second, social status also correlates with education (spearman's rho = 0.316, two-sided P = .000), for which we used three different categories (1. no education, 2. primary education, 3. secondary education). Third, comparing male with female participants we observe that on average women score significantly lower on the social status variable than men: -0.107 versus 0.086 (t = 3.482; two-sided P = .001). Fourth, social status does not correlate with age (spearman's rho = -0.010, two-sided P = .903).

In the rest of this empirical section, we will look at the dynamic behavior of downstream and upstream users, taking due account of the interaction between the decisions of upstream and downstream users and the influence of their social status. For this, we will estimate several regression models. We start with an explanatory model on the behavior of the downstream users.

4.2. Reaction of downstream users

To study the likelihood of each of the available options, we estimate a multinomial logistic regression with the reaction of the downstream user as dependent variable. We use the downstream user's reaction of "remaining silent" as reference category. As explanatory variables we use the following variables.

First, we expect the reaction of a downstream user to be highly influenced by the number of hours during which the upstream user makes use of the water flow. It seems intuitive that downstream users are more inclined to express dissatisfaction or to punish the upstream user, the lower their received share. Moreover, with strong sharing norms it is expected that downstream users will compare their share with what upstream users keep for themselves. By doing so, it may matter whether the inequality is advantageous or disadvantageous for the downstream user. To control for the influence of 'advantageous inequality' we add a variable that is equal to the number of hours left for the downstream user minus six hours if this difference is positive. Otherwise this measure is zero. To control for the influence of 'disadvantageous inequality' we add a variable that is equal to the number of hours used by the upstream user minus six hours. In case this difference is negative (and inequality is thus advantageous for the downstream user), this measure takes the value zero.

Second, we expect that downstream users with different social status will react differently to the upstream user's distribution. In particular, we expect downstream users with low social status to be more reluctant to openly protest against the distribution decisions of upstream users (hypothesis H2). This may translate into a lower likelihood of punishment or expressing dissatisfaction (and a higher likelihood of expressing satisfaction) relative to remaining silent. To control for the social status of the downstream user we use the social status variable calculated as described before. The influence of social status may also interact with the inequality of the distribution decision of the upstream user. To control for such an effect, we add an interaction variable between the individual social status and the inequality variables. Table 3 shows the results.

Table 3. Reaction of the downstream user

	Punishment	**Dissatisfaction**	**Satisfaction**
Social status	-2.131	0.401	0.224
	(1.491)	(1.090)	(0.976)
Disadvantageous inequality	2.087***	1.576**	-0.727
	(0.692)	(0.686)	(0.777)
Disadvantageous inequality * social status	0.910	0.210	-4.326**
	(1.430)	(1.393)	(1.891)
Advantageous inequality	-30.356***	-0.448	0.273
	(0.604)	(0.289)	(0.244)
Advantageous inequality * social status	3.678**	0.133	-1.062**
	(1.665)	(0.710)	(0.519)
Constant	-0.735	0.284	1.170*
	(1.027)	(0.818)	(0.676)
Wald chi2	56251.75		
Prob > chi2	.0000		
Pseudo R2	0.3695		

Notes. Multinomial logistic regression with fixed effects for irrigation sites and rounds. 'Remaining silent' as base outcome. N = 620. Robust standard errors to correct for intra-pair dependencies. Significance levels two-sided: * = 10%, ** = 5%, *** = 1%. According to a Small-Hsiao test the assumption of "independence of irrelevant alternatives" which is a necessary condition for valid estimations in the multinomial logit model cannot be rejected: Punishment category omitted: chi-sq. 33.665 (P-value = .670); Dissatisfaction category omitted: chi-sq. 34.337 (P-value = .640); Satisfaction category omitted: chi-sq. 34.297 (P-value = .641).

As the mean of the social status variable is equal to zero, the coefficients of advantageous/disadvantageous inequality indicate the influence of inequality for downstream users with average social status. We observe that for downstream users with average social status a one hour increase in disadvantageous inequality increases the log of the ratio of the probability of punishment or expressing dissatisfaction over the probability of remaining silent by 2.087 and 1.576, respectively. In the third column we observe a significant negative coefficient of the interaction effect of the disadvantageous inequality and the social status variables. This indicates that the likelihood of expressing satisfaction relative to remaining silent is lower (higher) for people with higher (lower) than average social status.

When inequality is advantageous for the downstream user, larger inequality of the distribution leads to a lower likelihood of choosing the punishment strategy relative to the option of remaining silent. The positive coefficient of the interaction with the social status variable indicates that this reduction in the likelihood is lower (higher) for downstream users with higher (lower) social status.

The results presented in Table 3, however, do not give us a clear picture of the size of the effects on the probability of each of the possible reactions, as the results need to be interpreted with reference to one of the categories. To obtain a better insight into the results it is helpful to calculate predicted probabilities on the basis of the estimated regression coefficients. Table 4 presents the predicted probabilities of each of the strategies under different allocations and for downstream users with different social status. We did so separately for three levels of social status: low social status equal to one standard deviation below the average, average social status, and high social status equal to one standard deviation above the average. The following differences are statistically significant between the different social status categories.

Table 4. Predicted probabilities of strategies under different allocations and social status

	Low social status (-0.343)			Average social status (0.000)			High social status (0.343)		
		10% conf. interval			10% conf. interval			10% conf. interval	
		Lower	Upper		Lower	Upper		Lower	Upper
Disadvantageous inequality = 3									
Satisfaction	19.2%	9.9%	27.3%	0.2%	0.0%	0.9%	0.0%	0.0%	0.0%
Silent	0.7%	0.0%	2.3%	0.7%	0.0%	2.6%	0.5%	0.0%	3.2%
Dissatisfaction	45.1%	36.8%	55.7%	59.4%	53.0%	67.7%	63.1%	55.0%	72.1%
Punishment	35.0%	25.1%	45.2%	39.8%	31.3%	46.1%	36.4%	27.3%	43.9%
	100.0%			100.0%			100.0%		
Disadvantageous inequality = 2									
Satisfaction	35.1%	25.5%	44.5%	2.5%	0.3%	7.0%	0.1%	0.0%	0.8%
Silent	2.8%	0.1%	5.9%	3.6%	0.1%	8.3%	3.1%	0.0%	9.4%
Dissatisfaction	39.0%	31.4%	49.3%	67.0%	61.3%	76.1%	76.1%	69.1%	85.0%
Punishment	23.1%	14.8%	30.5%	26.9%	18.9%	31.8%	20.7%	12.8%	25.6%
	100.0%			100.0%			100.0%		
Disadvantageous inequality = 1									
Satisfaction	51.8%	44.8%	62.0%	20.1%	8.2%	29.9%	5.3%	0.8%	11.5%
Silent	8.6%	0.8%	12.6%	13.7%	3.1%	19.4%	14.8%	1.7%	21.3%
Dissatisfaction	27.3%	19.5%	35.6%	53.3%	46.0%	67.8%	70.8%	63.0%	84.8%
Punishment	12.3%	6.1%	17.2%	12.9%	7.7%	17.0%	9.1%	4.4%	12.6%
	100.0%			100.0%			100.0%		
Equal split									
Satisfaction	59.1%	51.6%	73.3%	61.2%	55.8%	77.4%	62.3%	54.9%	77.7%
Silent	21.0%	1.3%	27.9%	20.2%	1.0%	25.2%	19.0%	0.8%	25.9%
Dissatisfaction	14.8%	8.7%	21.1%	16.2%	11.4%	20.7%	17.6%	10.3%	23.7%
Punishment	5.1%	2.1%	7.5%	2.4%	1.0%	3.2%	1.1%	0.3%	1.7%
	100.0%			100.0%			100.0%		
Advantageous inequality = 1									
Satisfaction	78.8%	73.5%	90.5%	72.5%	68.9%	83.9%	64.9%	59.5%	84.2%
Silent	14.8%	3.1%	19.6%	18.2%	7.0%	21.9%	21.7%	1.0%	27.2%
Dissatisfaction	6.4%	2.5%	9.6%	9.4%	5.3%	12.3%	13.4%	7.8%	17.4%
Punishment	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	100.0%			100.0%			100.0%		

Note. Confidence intervals were calculated using the percentile bootstrap method with 1000 replications and implemented with the prvalue command in Stata (Xu and Long, 2005).

First, in case distributions are disadvantageous for the downstream user, downstream users with different social status do not differ on their inclination to choose the punishment strategy. However, they do strongly differ on the likelihood to express satisfaction. For instance, when upstream users only allocate 3 hours water access to downstream users (i.e., disadvantageous inequality = 3), 19.2% of the downstream users with low social status still express satisfaction. In contrast, almost none of the downstream users with average or high social status will do so. These results indicate that downstream users with low social status make very little use of the non-punishment protest options (expressing dissatisfaction or remaining silent are considered to be forms of protesting, as the only other alternative is expressing satisfaction). They either protest with the punishment option or they do not protest at all. A possible reason for this lies in their higher conflict aversion. They are reluctant to run the risk of entering into conflict without having the guarantee that it reduces inequality.

Second, when resources are equally distributed, the probability of expressing satisfaction does not differ between downstream users of different social status. The likelihood of punishment however, is higher for upstream users with low social status. This contradicts hypothesis H2. It is however consistent with the hypothesized self-serving bias in fairness conceptions (with low social status players focusing on correcting initial wealth inequality and high social status players on equally sharing the additional resources). For the situation where downstream users get 7 hours water access (advantageous inequality = 1), no differences are found among downstream users of different social status. We summarize the main observations on the downstream user's strategy choice in the following result.

Result 1: Downstream users' strategy choices

Downstream users' propensity to choose the punishment option significantly increases with higher disadvantageous inequality. Downstream users with low social status, however, have a higher tendency of expressing satisfaction when they receive lower than equal shares. When water is equally distributed downstream users with low social status have a slightly but significantly higher likelihood to choose the punishment option.

4.3. Distribution behavior of upstream users

We will now investigate the strategies followed by the upstream user. In particular, we study the state dependence of upstream users' strategy choice, how strategies are changed in response to the reaction of downstream users, and how all this may depend on the social status of the upstream user. For the sake of simplifying the analysis and given the importance of the equal split distribution as reference, we group the distribution decisions made by the upstream users into the following three strategies: 1) 'Altruistic' distributions, where the upstream user makes less use (in number of hours) of the water flow than the downstream user; 2) 'equal split' distributions, where both users make equal use of the water flow; and 3) 'selfish' distributions, where the upstream user makes more use of the water flow than the downstream user.

To have a first idea of the frequency of strategy changes, we elaborate a transition matrix. In Table 5, we observe a considerable proportion of strategy changes from altruistic distributions to selfish distributions (27.6%), and a lower proportion of changes in the other direction (15.3%). Part of these strategy changes is probably the result of a deliberate rotation strategy. More detailed analysis below will shed light on this. Remember that rotation in our distribution game can substantially increase the total pie while maintaining equal sharing over time. Furthermore, it is remarkable that changes from altruistic into selfish distributions are more frequent than in the other direction. A similar but less pronounced pattern is observed for the equal split distributions. Strategies are frequently changed from the equal split to selfish distributions (20.0%), whereas less frequently in the other direction (14.2%). This indicates that apart from possible rotation there is a certain tendency in favor of the selfish strategy.

Table 5. Frequency of strategy changes

	Altruistic (t)	Equal split (t)	Selfish (t)	Total
Altruistic (t-1)	61.9%	10.5%	**27.6%**	100.0%
Equal split (t-1)	8.1%	71.9%	**20.0%**	100.0%
Selfish (t-1)	**15.3%**	**14.2%**	70.5%	100.0%

We will now elaborate an explanatory model of strategy choice that controls for state dependence, the influence of punishment by the downstream user and the interaction with social status. We denote the strategy choice of the upstream user by $y_{i,r} = j \in \{0,1,2\}$ with *j* referring to each of the three possible strategies (0 = equal split, 1 = altruistic, 2 = selfish), index *i* to the individual and *r* to the round. We will estimate a multinomial probit regression with the equal split as the reference strategy.[12] In particular, we associate each outcome variable $y_{i,r} \in \{0,1,2\}$ to three latent variables $v_{i,j,r}$ for j = 0, 1, 2 through the following link function:

$$y_{i,r} = j \quad with \quad v_{i,j,r} = \max\{v_{i,0,r}, v_{i,1,r}, v_{i,2,r}\} \quad and \quad v_{i,0,r} = 0 \qquad (1)$$

The outcome corresponds to whichever latent variable is greatest, the idea being that we do not observe the latent values of each individual choice made in each round, but only the choices made ($y_{i,r}$). This is equivalent to observing the largest element of $v_{i,j,r}$ for j = 0, 1, 2 (Imai and van Dyk, 2005, Jackman, 2000).

We assume a multivariate normal distribution on the latent variables. In our case, this is essentially a bivariate normal distribution with zero mean for both dimensions and an unknown 2x2 variance-covariance matrix. Furthermore, our latent variables are assumed to be determined by state dependence, the influence of punishment by the downstream user and the interaction with social status. More in particular, we use the following explanatory variables.

First, upstream users may take account of the strategy they chose in the previous round. For instance, they may stick to the same strategy, or they may follow certain rotation. To control for this we use the dummy variables $y_{i,1,r-1}$ and $y_{i,2,r-1}$, which are equal to one when the strategy chosen in the previous round was the altruistic strategy and the selfish strategy, respectively (using the equal split as reference category). Second, it may be important whether the strategy in the previous round resulted in punishment. To control for this, we split up the dummy variables for the strategy chosen in the previous round in dependence of whether or not this strategy made the downstream user opt for punishment, i.e. $p_{i,r-1} = 1$ in case of punishment. As with the altruistic and equal split strategies punishment is very uncommon[13], we only did so for the selfish strategy. This allows us to study the effectiveness of punishment in making the upstream user abandon the selfish strategy. Third, upstream users with varying social status may focus on different distributions (hypothesis H1). This may translate into differences in the likelihood of each distribution strategy between upstream users of varying social status, for which we test by adding the social status variable (x_i). It may also translate into differences in *state dependence* of the upstream users' strategy choice. To test the latter,

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[12] A probit regression has the advantage that it is not constrained by the independence of irrelevant alternatives (IIA) property that is characteristic of the multinomial logistic model.

[13] Whereas the punishment rate is 32.1% when the selfish strategy is followed, punishment rates are only 4.7% and 2.0% when respectively the altruistic and equal split strategies are followed.

we add interaction terms between the social status variable and each of the three above defined dummies (selfish strategy - punishment; selfish strategy - no-punishment; altruistic strategy). We also include the rounds and irrigation sites as fixed effects. Hence, $d_{i,r}$ is a dummy variable that takes the value of one if round is r for individual i. Similarly, $s_{i,k}$ is a dummy taking the value of one if individual i belongs to irrigation site k. This results in the following model for the latent utility model:

$$v_{i,j,r} = \gamma_{0j} + \gamma_{1j} \cdot y_{i,1,r-1} + \gamma_{2j} \cdot y_{i,2,r-1} \cdot p_{i,r-1} + \gamma_{3j} \cdot y_{i,2,r-1} \cdot \left(1 - p_{i,r-1}\right) + \delta_j \cdot x_i + \beta_{1,j}\left(y_{i,1,r-1}.x_i\right)$$
$$+ \beta_{2,j}.\left(\left(y_{i,2,r-1} \cdot p_{i,r-1}\right).x_i\right) + \beta_{3,j}.\left(\left(y_{i,2,r-1}\left(1 - p_{i,r-1}\right)\right).x_i\right) + \rho_{j,r} d_{i,r} + \sigma_{j,k} s_{i,k} + \mu_{i,j,r} \qquad (2)$$

for $j = 1, 2$ and *γ, δ, β, ρ and σ* are all parameters to be estimated.

As we have an autoregressive part in our model, we cannot use standard methods to estimate the equation. This can be observed by decomposing the residual $\mu_{i,j,r}$ in equation (2) in an unobserved individual specific effect that is time-invariant $\alpha_{i,j}$ and a time-dependent error term $\varepsilon_{i,j,r}$. It is easy to see there is potential correlation between (a function of) the lagged dependent variable and the composed error term $\mu_{i,j,r}$ through the individual specific effects. The estimation of this dynamic model requires an assumption about the relationship between the observations $v_{i,j,1}$ in round r = 1 and the unobserved heterogeneity $\alpha_{i,j}$ and observables x_i (being the social status of the upstream user in our specification). A first option is to assume that the initial observations are exogenous. In this case a standard random effects model can be estimated, since the likelihood can be decomposed into two independent factors and the joint probability for r = 2, . . . , T maximized without reference to that for r = 1 (Stewart, 2006). This assumption is plausible if the start of the process coincides with the start of the observation period for each individual.

However, as we only take the observations of the scarcity treatment for the analysis, the start of the observations does not coincide with the start of the process. People have played another treatment before, and with the same people as the pairs of upstream and downstream users remain fixed. Therefore, a standard random effects model might not be appropriate. An alternative approach suggested by Heckman (1981) is to use a reduced form approximation to the initial observations. In particular, we will add the following equation to the estimation (again associated to latent variables in a similar way as equation 1):

$$v_{i,j,1} = \gamma_{0j}^{1} + \delta_{j}^{1} \cdot x_i + \alpha_{i,j} + \varepsilon_{i,j} \qquad \text{for } j = 1, 2 \qquad (3)$$

In this model, the random effects are assumed to arise from a multivariate distribution. To obtain the marginal distribution of the response it is necessary to integrate out the random effects. This integration, however, does not have a closed-form solution when the random effects are multivariate normal. Methods for performing numerical integration to approximate the marginal distribution are computationally intensive. Moreover, inference in the random effects multinomial probit model is complicated because it requires evaluation of multi-dimensional integrals. An alternative approach uses Markov chain Monte Carlo (MCMC) simulation to estimate parameters of such model (Haynes et al., 2008). We implemented such approach using WinBUGS software (Spiegelhalter et al., 1998) which implements MCMC simulation with the Gibbs Sampler. Model 1 in Table 6 presents the results of this estimation. For documentation purposes, we also include Model 2, which presents the estimation results of equation (2) for all observations without the simultaneous estimation of equation (3). As the exogeneity assumption of the initial observations behind Model 2 is not fulfilled, we will only focus on the results of Model 1.

Looking at the upper part of the table that presents the regression results of equation 3 (i.e. with only the initial observations), we observe that in the first round upstream users with lower (higher) than average social status are more (less) inclined to opt for the altruistic strategy relative to the equal split strategy. The lower part of the table shows the estimation results of equation 2 that uses the observations from round 2 onwards. To discuss these results we will structure the presentation according to the strategy chosen in the previous round, as indicated by the different explanatory variables.

We first look at state dependence when having chosen the equal split strategy in the previous round, i.e. when setting all dummy variables in the equation equal to 0. Based on the significant coefficient of the social status variable in the second column, we can conclude that when having chosen the equal split strategy in the previous round the likelihood of switching to the selfish strategy instead of sticking to the equal split strategy is lower (higher) for people with higher (lower) than average social status.

Table 6. Strategy choice of the upstream user

	Model 1		Model 2	
	Altruism	Selfish	Altruism	Selfish
***(r = 1)* – equation 3**				
Social status	-1.367*	-0.432	–	–
	(0.730)	(1.753)	–	–
Constant	8.808	11.630	–	–
	(6.210)	(11.240)	–	–
***(r > 1)* – equation 2**				
Social status	-1.077	-2.233**	-1.819*	-2.454*
	(0.716)	(0.995)	(0.943)	(1.266)
(Altruism) (r-1)	1.391***	0.413	0.878**	0.399
	(0.317)	(0.399)	(0.366)	(0.441)
(Altruism) (r-1) * social status	0.639	3.244***	0.465	3.093**
	(0.861)	(1.212)	(0.927)	(1.365)
(Selfish + not punished) (r-1)	0.778**	0.745*	0.451	0.592
	(0.308)	(0.399)	(0.335)	(0.408)
(Selfish + not punished) (r-1) * social status	1.175	1.383	1.105	1.048
	(0.878)	(1.028)	(0.950)	(1.218)
(Selfish + punished) (r-1)	1.038***	0.645	0.732	0.345
	(0.397)	(0.518)	(0.454)	(0.531)
(Selfish + punished) (r-1) * social status	2.955***	3.235***	3.159***	3.222**
	(1.045)	(1.235)	(1.177)	(1.442)
Constant	8.002	11.590	-0.589	-1.848
	(6.154)	(11.140)	(2.903)	(2.805)
Sigma (estimated means of random effects)	1.843**	4.395***	3.688**	7.108***
	(0.830)	(1.465)	(1.443)	(2.048)
Estimated variances of sigma	-10.050	-12.700	-1.545	0.507
	(6.186)	(11.120)	(3.048)	(2.682)
D = - 2 * sum of log likelihood contributions	472.300		419.200	
	(33.080)		(26.810)	

Notes. Multinomial probit regression with fixed effects for irrigation sites and rounds. Equal split as base category. N = 666. Significance levels two-sided: * = 10%, ** = 5%, *** = 1%. We use diffuse normal priors for the estimated parameters and diffuse gamma priors for the standard errors of the random effects. All parameters have 0 as initial values, while the standard errors of the random effects have initial values of 0.2. We ran one chain for 300000 iterations, with a burn-in period of 4000.

Second, we look at the effect of having chosen the altruistic strategy in the previous round instead of the equal split strategy. We observe in the first column a significant and positive coefficient of the dummy variable that indicates whether or not the upstream user chose the altruistic strategy in the previous round. This indicates that upstream users of average social status who chose the altruistic strategy in the previous round have a higher likelihood of choosing this strategy again relative to choosing the equal split. In the second column of the model we also observe a significant and positive coefficient of the interaction of the social status variable and the dummy variable that indicates whether or not the upstream user chose the altruistic strategy in the previous round. This indicates that for upstream users with a higher than average social status (i.e. with the social status variable larger than zero) having chosen the altruistic strategy in the previous round increases the likelihood of choosing the selfish strategy relative to the equal split strategy.

Third, we look at the effect of having chosen the selfish strategy in the previous round instead of the equal split strategy without being punished. We observe in both the first and the second columns of the model a significant and positive coefficient of the dummy equal to one when having chosen the selfish strategy without punishment. This indicates that for upstream users with average social status having chosen the selfish strategy without being punished increases the relative likelihood of both the altruistic and the selfish strategy relative to the equal split strategy.

Fourth, things are different when upstream users are punished after choosing the selfish strategy. In the first column of the model we observe that both the dummy variable that indicates whether the upstream user chose the selfish strategy and was punished in the previous round and the interaction effect of this variable with the social status variable are positive and statistically significant at the 1% level. The coefficient of the dummy variable indicates that upstream users with average social status have a higher likelihood of choosing the altruistic strategy relative to the equal split strategy when having chosen the selfish strategy and being punished instead of having chosen the equal split strategy. The coefficient of the interaction term indicates that this effect is stronger for upstream users with higher than average social status whereas the likelihood of choosing the altruistic strategy relative to the equal split strategy actually reduces for upstream users with a lower than average social status. (i.e. with negative social status variable). The coefficient of the interaction term is also positive and significant in the second column. This indicates that being punished after having played the selfish strategy reduces the likelihood of choosing the selfish strategy instead of the equal split strategy for upstream users with lower than average social status, but increases this likelihood for upstream users with higher than average social status.

Table 7. Predicted probabilities of strategies, subject to social status and strategy (r-1)

	Low social status (-0.343)			Average social status (0.000)			High social status (0.343)		
		10% conf. interval			10% conf. interval			10% conf. interval	
r = 1		Lower	Upper		Lower	Upper		Lower	Upper
Altruistic	26.8%	6.4%	42.4%	17.2%	14.8%	43.3%	9.6%	0.8%	29.4%
Equal split	19.0%	2.5%	48.4%	27.9%	3.8%	37.2%	35.8%	10.7%	57.7%
Selfish	54.5%	42.8%	60.5%	54.9%	45.6%	56.9%	54.6%	40.1%	64.7%
	100.0%			100.0%			100.0%		
r > 1									
(Equal split) (r-1) = 1									
Altruistic	11.4%	4.6%	19.7%	6.5%	3.08%	12.03%	3.0%	1.05%	7.37%
Equal split	23.80%	13.8%	34.5%	49.2%	41.34%	56.12%	72.2%	65.17%	77.83%
Selfish	64.8%	55.4%	72.7%	44.3%	37.50%	51.23%	24.8%	18.63%	31.84%
	100.0%			100.00%			100.00%		
(Altruism) (r-1) = 1									
Altruistic	45.3%	31.0%	54.3%	37.7%	28.09%	44.40%	30.5%	16.43%	38.69%
Equal split	13.7%	5.7%	26.0%	11.8%	5.96%	20.28%	9.7%	2.67%	23.11%
Selfish	41.0%	34.2%	46.6%	50.5%	45.07%	54.93%	59.8%	50.45%	66.24%
	100.0%			100.00%			100.00%		
(Selfish + not punished) (r-1) = 1									
Altruistic	17.3%	9.5%	23.9%	19.6%	13.41%	25.31%	21.7%	12.32%	30.83%
Equal split	13.0%	6.2%	22.1%	17.6%	11.59%	24.56%	22.9%	13.35%	33.80%
Selfish	69.7%	62.4%	75.3%	62.8%	57.63%	67.32%	55.4%	47.67%	62.07%
	100.00%			100.00%			100.00%		
(Selfish + punished) (r-1) = 1									
Altruistic	12.7%	4.5%	24.3%	26.4%	15.98%	34.50%	37.8%	24.51%	43.54%
Equal split	34.8%	21.3%	47.9%	14.7%	6.89%	25.47%	3.0%	0.39%	12.30%
Selfish	52.5%	41.5%	62.5%	58.9%	51.37%	64.79%	59.2%	51.55%	64.25%
	100.00%			100.00%			100.00%		

An important limitation of multinomial regression models is that the likelihood of each of the outcomes needs to be interpreted with reference to one of the outcome categories. It is therefore not straightforward to get an idea of the size of the effects on the likelihood of the individual strategies. In order to obtain a clearer picture of the size of the identified effects of social status we calculated predicted probabilities. Table 7 presents the predicted probabilities of each strategy conditional on the strategy chosen in the previous round and the social status of the upstream user. We did so separately for three levels of social status: upstream users with low, average and high social status. In the description of the results we will focus on the influence of the social status of the upstream user. We will comment where the differences between the different social status categories are statistically significant, as indicated by the confidence intervals.

In the first round (r = 1), we observe that more than half of the upstream users choose the selfish strategy, without any significant differences between the different social status categories. From round 2 onwards, the predicted probabilities indicate that upstream users with high social status have a higher tendency of sticking to the equal split. If they chose the equal split in the previous round they have a 72.2% probability to choose this strategy again. Upstream users with low social status, in contrast, only have a 23.8% probability. Instead of choosing the equal split strategy again they tend to move to the selfish strategy. The probability of switching to the selfish strategy is 64.8% for upstream users with low social status, whereas upstream users with high social status have only a 24.8% likelihood. Considering the confidence intervals of the estimated probabilities, these differences are statistically significant.

We also observe that upstream users with high social status have a higher likelihood to rotate between selfish and altruistic allocations. This is confirmed by the observation that upstream users with high social status have a higher probability to switch to the selfish strategy after having chosen the altruistic strategy in the previous round (59.8%) in comparison with upstream users with low social status (41.0%). When looking at the strategy choice after having chosen the selfish strategy we need to distinguish the situation where the selfish strategy resulted in punishment from where this strategy was not answered by a punishment decision by the paired downstream user. First, when no punishment occurred, we observe that the likelihood to stick to the selfish strategy is lower for upstream users with high social status (55.4%) than it is for low social status players (69.7%). Upstream users with high social status have a lower tendency to stick to the selfish strategy. Second, in case the upstream user is punished, upstream users with high social status have a 37.8% probability of switching to the altruistic strategy, whereas low social status users only have a 12.7% probability.

Taking together these results, we can conclude that that upstream users with high social status focus on equal distributions (by either sticking to the equal split or rotating between selfish and altruistic strategies), whereas upstream users with lower social status aim at correcting initial wealth inequality by following a selfish strategy. This confirms hypothesis H1.

The results also indicate that upstream users with different social status react differently to being punished. As indicated above, when punished upstream users with low social status have a higher tendency to switch to the equal split strategy (34.8%) in comparison with upstream users with high social status (3.0%). When they are punished upstream users with high social status tend to move to either the altruistic or the selfish strategy. Whereas the estimated probabilities of the selfish strategy do not differ between the different categories of social status, the probability of switching to the altruistic strategy is substantially higher for upstream users with high social status (37.8%) than upstream users with low social status (12.7%). We summarize these observations in a second main result.

Result 2: Upstream users' strategy choices

After choosing the equal split strategy upstream users with high social status are more likely to stick to this strategy, whereas low social status users have a tendency to move to the selfish strategy. When not choosing the equal split strategy, however, upstream users with high social status show a higher propensity to rotate between selfish and altruistic strategies. When punished after choosing the selfish strategy low social status players tend to move to the equal split, whereas high social status players tend to move to the altruistic strategy.

Two elements merit further discussion. First, we observed that upstream users with low social status over time move from the equal split to the selfish strategy but move back to the equal split when they are punished. This indicates that they play strategically. They want to move to their focal point (selfish strategy) but are aware that downstream users may prefer at least an equal share of the resources. Also upstream users with high social status show some strategic behavior, as they tend to move to the altruistic strategy when they are punished.[14]

Second, it is not entirely clear why upstream users with high social status move to the altruistic strategy when punished, whereas upstream users with low social status switch to the equal split. Different explanations are plausible. Assuming that upstream users can make

[14] It should be noted that this positive influence of punishment on pro-social behavior is in contrast with results from lab experiments with college students. D'Exelle and Riedl (2008), for example, found in a repeated distribution game with fixed matching that distributors actually become more selfish when punished, to compensate for the lost income. This difference is likely due to the larger conflict aversion of people in small-scale societies where, being economically dependent on each other, conflicts can have large economic consequences.

inferences about the social status of their opponent it is likely they try to avoid further punishment by switching to the focal point of their opponent. Upstream users with high social status, for example, expect downstream users to have equal or lower social status. They may anticipate that because of biases in fairness conceptions it is very likely that their opponent demands a higher than equal share. Another explanation may be related to different weights attached to efficiency considerations. As far as social status is associated with leadership in the village which gives certain responsibility for the collective welfare, upstream users with higher social status may prefer the altruistic strategy instead of the equal split distribution because it leads to large efficiency gains. Additional research is needed to verify these explanations.

4.4. Efficiency implications

It is worthwhile to look at the efficiency implications of the results. Efficiency is affected by punishment and equal split distributions. If a downstream user punishes the upstream user punishment costs reduce the total amount of resources available, affecting efficiency. On the other hand, efficiency is increased by deviating from the equal split, as this makes that one of both players receives a water share above the production threshold. Taking both elements together, it is clear that the altruistic strategy leads to the most efficient outcome. Not only does it lead to zero punishment; it also results in a substantial efficiency increase because more than the minimum threshold is allocated to one of the water users. The selfish strategy is less optimal as it has a considerable likelihood of being followed by punishment. In Table 4 we observed that the probability of punishment increases with larger disadvantageous inequality. The probability of punishment averages around 9-12% when the upstream users allocates 7 hours water access to herself (disadvantageous inequality = 1), whereas with 9 hours (disadvantageous inequality = 3) this increases up to 35%. The selfish strategy, however, may be preferred above the equal split where the likelihood of punishment is almost non-existent but where efficiency gains are limited as both water users receive a water share below the critical production input. Nevertheless, we observe that equal sharing remains a commonly chosen strategy, despite the high foregone efficiency gains.

What do our results tell us about the efficiency implications of the social status of upstream and downstream users? To study this, we compare the frequencies of the strategies between upstream users of high and low social status (with high >= 0 and low < 0). According to a Pearson F-statistic, differences are not statistically significant (F = 0.962; two-sided P =

.384).[15] We also have previously seen that the likelihood of punishment does not differ between downstream users of different social status. Taking both results together, we can conclude that the social status of upstream and downstream users is not important for efficiency. It should be noted that for equality, in contrast, it surely matters who assumes the upstream user's role. Upstream users have a first mover advantage, which explains the considerable proportion of selfish strategies. Giving the role of upstream user to users of low social status instead of high social status, therefore, tends to correct the initial wealth inequality between users of different social status.

5. Conclusion and discussion

Bilateral bargaining in developing countries may be very different from what existing economic theory predicts. The settings people in developing countries are confronted with differ in at least two important ways from those simulated in existing literature. People in developing countries are often confronted with resource scarcity and most of them live in close-knit small societies where elements of social status are important determinants of social and economic interaction, including bargaining. The existing economic literature on bilateral bargaining, however, has remained silent so far on how both elements shape bargaining behavior. The main purpose of this paper is to produce experimental evidence to test bargaining models appropriate for these settings. Better knowledge about the influence of social status on how individual agents deal with equity and efficiency issues, allows us to derive implications for better policy design. For example, knowing the individual social status of people bargaining with each other, one could intervene in settings where bargaining outcomes with large foregone efficiency gains are expected.

To study the influence of social status on bilateral bargaining in a situation of resource scarcity, we brought a group of people heterogeneous on social status to the field lab and let them participate in an anonymous bargaining experiment. As pay-offs are the same for all participants behavioral differences in the experiment could only be attributed to non-payoff asymmetries, such as heterogeneity in real-life social status. Our results show that at least part of the influence of social status on bilateral bargaining works through self-serving biases in fairness conceptions. Whereas distributors with high social status (who generally face better economic conditions) have a tendency to share resources equally, low social status

[15] The chi-square test is converted into a Pearson F-statistic after correcting for dependencies of observations due to multiple observations per upstream user.

distributors aim at receiving higher than equal shares to correct for initial unequal conditions. Upstream users with higher social status not only have a higher propensity to choose the equal split strategy; they are also more inclined to rotate as to who receives a share above the production threshold. This is an important observation as such rotation makes it possible to obtain efficiency gains while guaranteeing equal sharing *over time*. Finally, there is evidence that people play strategically. Upstream users with low social status over time move to their focal point (i.e. a higher than equal share), but when punished switch back to the equal split distribution. Upstream users with high social status switch to altruistic distributions when punished.

We end with extending on how our study links up with two important strands of literature and we make suggestions for further extensions to our study. First, our study is related to the discussion on the economic implications of egalitarian sharing norms in small-scale societies in Sub-Saharan Africa. Platteau (2000) argues that strong egalitarian norms may lead to considerable efficiency losses in terms of lost opportunities for individuals and the wider society, and consequently hamper economic growth. This is confirmed in our distribution experiment by the considerable proportion of equal split distributions despite the large foregone efficiency gains. At the same time, however, our study also shows considerable heterogeneity in social preferences, which are considered to be crucial to enforce social norms (Fehr and Camerer, 2004), including sharing norms. In this way, it suggests that egalitarian norms may actually be much weaker, especially when resources are scarce as simulated in our study. One could doubt of course whether our results are robust to giving up anonymity in our game. We know that access to information on heterogeneity created by differences in outside options or conversion rates may influence bargaining behavior (Schmitt, 2004), and that people tend to behave strategically when they have the possibility of hiding information about themselves (Boles et al., 2000). This links up with a debate on whether people have an intrinsic preference for behaving according to the social norm or they only want to appear as if they are doing so. To control for a possible social distance effect it could therefore be interesting to extent our distribution game to allow for different amounts of information people have about each other.

Second, our study also contributes to the debate on the external validity of bargaining games. From a comparison of ultimatum games in 15 different cultural environments Henrich et al. (2001) found considerably more behavioral variability across groups than had been found in previous cross-cultural research. They found that ultimatum game offers increase with two important characteristics of small-scale societies: the ‘Payoff to Cooperation’ and

‘Market Integration’. In this respect, it would be interesting to replicate our research in environments that differ on these dimensions. In the same study, Henrich et al. (2001) also concluded that individual-level economic and demographic variables do not explain behavior either within or across groups. However, as the results of our study have clearly shown, this is surely not the case in a repeated bargaining setting with resource scarcity, where variation in bargaining correlates with differences in socio-economic status.

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Appendix A. Experimental procedures and instructions

[When people enter the meeting room, they are asked for their name. We have a list of invited candidates, a random sample of all irrigation users. Their name is marked and they are given a sticker with an identity letter, which we ask them to stick on their shirt. It is explained that this identity letter is unique and allows us to identify them during the exercise while guaranteeing complete confidentiality. This is important, as they are able to earn real money in the exercise. They are asked to take a seat in the meeting room. Further instructions are given once sufficient people have shown up.]

"Thanks for your interest. We are from the universities of Gent and Antwerp (Belgium) and we are making a study on local economic development and poverty. This study is important as it might help policymakers who are interested in combating poverty and stimulate economic development".

"You are invited to participate in an exercise, which allows you to earn real money. How much you earn depends on the decisions you will be asked to make, as well as the decisions of the other people."

"Participation is voluntary. Your decisions will be dealt with in a confidential way, i.e. nobody in the village will ever know your individual decisions, or the money you will have earned. The money you earn will be paid out to you privately and confidentially after the exercise. During the whole exercise, you are not allowed to communicate with the other participants."

Part one – Water abundance treatment (5 rounds)

"In part 1 of the exercise, you are matched with one other person. Imagine that you and the other person are both connected to the same irrigation channel. One person is located immediately 'upstream' of the other person. We call the first person the 'upstream person', whereas we refer to the second person as the 'downstream person'. Later we will inform you whether you are an upstream or a downstream person. It is important that you realize that you will never get to know the identity of this other person you are matched with. Nor will the other person ever get to know your identity."

"As the water flow passes first by the upstream person, this person has the possibility to distribute the water flow between him/herself and the downstream person. He/she does this in the following way. We assume there is a constant flow of water and the upstream person has to decide how many hours he/she will extract water from the irrigation channel, from a total of 12 hours per day for each day of the month. It is important to realize that the downstream user cannot make use of the irrigation channel while the upstream user makes us of it. This means that the downstream user can only make use of the irrigation channel during the hours the upstream user does not make use of it. For instance, if the upstream user decides to use the water channel during 10 hours every day of the month, the downstream user will only be able to make use of the water channel during the remaining 2 hours."

[Distribute decision cards for first exercise. Stick flipchart with decision card on the wall]

"To make decisions in the exercise you will make use of decision cards. On the decision card you received we will do a first exercise together. We pretend you all are an upstream user now, and you have to decide on the number of hours to make use of the water in the irrigation channel. On the decision card, you observe 12 dots, representing the maximum number of hours one can make use of the irrigation channel. To make a decision you need to color the number of dots equal to the number of hours during which you wish to make use of the irrigation channel."

[They keep the decision card. Distribute the production table for the abundance treatment. Stick flipchart with production table on the wall]

"The hours of water and thus the amount of water one is able to extract from the irrigation channel to irrigate his/her plot determines his/her income. The more water one uses on his/her plot, the more s/he can harvest and earn. How much one can earn is indicated in the production table. You observe three columns. In the first column, you observe the entire range of decision options for the upstream user. He/she can choose between 0 and 12 (included) number of hours (number of black dots) making use of the irrigation channel. The second column indicates the harvest and profit of the upstream user for a chosen number of hours. For instance, if the upstream user decides to make use of the irrigation channel during 8 hours, s/he will obtain an income of 425 TSH from the harvest of the irrigated field. This means that the downstream user can only make use of it during the remaining 4 hours and will obtain an income of 175 TSH. Another example: if the upstream user takes water during 6 hours every day, the downstream user will remain with 6 hours per day in that month. The upstream user will then earn 325 TSH, the downstream user 325 TSH. It is important that you realize that you can earn real money. The total you earn will be paid out to you after the end of the exercise."

"In the production table, you also observe that there is a minimum required amount of water, equal to a flow of 4 hours per day, below which harvest is extremely low. In other words, if any of both users uses less than the minimum required water quantity, his/her production will be very low; he will only get 50 TSH. Above this threshold, harvest drastically increases, and the more water one uses, the higher his/her income."

"Now look at the decision card: chose a number of hours of water you want to use and color the number of dots. Look on the production table how much the upstream user can earn if s/he gets that number of hours of water, and write this on the decision card."

[They color dots on the decision card to choose hours of water and write the earnings of the upstream user on the same decision card]

"Now look at the third column of the production table which indicates the harvest and profit the downstream user will obtain. Write down the earnings of the downstream user on the decision card now."

[Show the second part of the decision card on flip chart].

"After the upstream user made the decision on the hours of water he/she will use and filling in his/her earnings and the earnings of the downstream user on the decision card, the decision card will be given to the downstream user. He/she will then know the decision made by the upstream user. The downstream user knows that next month the upstream user will have to make a new distribution decision again. So, the downstream user may find it important to give his/her reaction regarding the decision made by the upstream user. The downstream user needs to choose between the following four reactions. First, he/she may decide to communicate to the upstream water user that he/she is satisfied with the amount of water and with the harvest he/she obtains. Second, he/she may decide to do nothing. Third, he/she may decide to communicate to the upstream water user that he/she is dissatisfied with the amount of water and with the harvest obtained. Fourth, the downstream user may decide to go to a mediator who punishes the upstream water user. The mediator punishes the upstream person by giving him/her a fine, which reduces his/her earnings by 100 TSH. The downstream user, however, has to pay a cost for resorting to the mediator (such as transport costs, 'judicial' cost, time…), of 30 TSH."

"After the downstream user decides on his/her reaction to the upstream user, the decision card is returned to the upstream user. This person will look at it and then make a decision on the water distribution for the next month.

[Distribute an 'example' decision card with 8 dots colored]

"We now distributed an example of a decision card. Imagine that you are a downstream user and, this month, the upstream user left a certain number of hours of water per day for you, the downstream user. You know that the upstream user will distribute water again next month. Now decide on your reaction to the distribution made by the upstream user. Mark an X under the action you want to take."

[Distribute 'example' decision card with 12 dots for the upstream user and where a downstream user decided to punish the upstream user via the mediator]

"We now distributed an example of a decision card where an upstream user decided to use 12 hours of water. The downstream user was not happy with this. He/she called in a mediator for which he paid 30 TSH which he/she has to pay from his/her earnings. Calculate now how much remains for this downstream user."

"At the same time, the upstream user was given a fine of 100 TSH which will be deduced from his/her earnings. Calculate now how much remains for the upstream user."

Before the start of the experiment

[Distribute ID cards, which show ID letter and upstream/downstream role]

"On the ID card you received you see your ID letter, the same as on your sticker, and you see if you are an upstream or a downstream user. Upstream users will have a triangle symbol on their ID cards, downstream users a square symbol."

"Before starting with the exercise, we emphasize once again that it is important that you realize that you will never get to know the identity of the other person you are matched with, nor during nor after the exercise. Nor will the other person ever get to know your identity. We also ask you to give each other sufficient privacy, when taking decisions. Make sure that other people do not see the decision you write on the decision cards. Communication is not allowed during the exercise. If you have a question, please raise your hand, so that one of us can come to you to answer your question in private."

"You will now do the same exercise as we did together: some of you are upstream users, others are downstream users. You will be so for the rest of the exercise. Each upstream user is matched with one downstream user. You will be matched with the same person during the rest of the exercise. Each upstream user will decide on the number of hours he/she will use water from the irrigation channel. He/she will write down his/her earnings and the earnings of the downstream user. Thereafter, the downstream user receives the decision card and will then decide on how to react to the decision made by the upstream user. After that, the decision card will go back to the upstream user, so that he/she will get to know the reaction of the downstream user. Thereafter, the upstream user will decide again on water distribution. This exercise will be repeated several times."

"The upstream users (those with a triangle symbol on the ID card) are now asked to take a seat on the other side of the room. After everyone is seated again we will give you further instructions."

[Upstream and downstream users are seated back-to-back. We assure that there is sufficient space between each participant to guarantee privacy and to prevent copying. Once everybody is seated again, we start with the first round of the experiment.]

Part two – Water scarcity treatment (10 rounds)

[Distribute new production table and collect the old ones].

"We now inform you that rainfall has dropped drastically, which results in water scarcity. This means that from now on the water flow has drastically decreased. Consequently, people will need more time for the same amount of water to flow to their plot, and thus you need more hours per day to get a good harvest and high earnings. It also means that you need at least 7 hours to obtain a good harvest and high earnings. All these differences are taken up in the new production table."

Appendix B. Social status ranking exercise

For the social status ranking exercise, we started with explaining the participants that there may be differences among people with respect to social status. One's individual social status in society might influence one's capability to attain his/her needs and influence others'. 'Hadhi ya jamii' and 'uwezo' were used as Swahili translations for social status. 'Hadhi ya jamii' literally means 'status in society'. 'Uwezo' not only means economic ability but also the ability to attain what one wants, to influence others and to be respected. The notion of power is present in the term 'uwezo'.

The concept of a hierarchy according to social status was represented by a ladder. If one is high on the ladder one has a high social status, low on the ladder means one is low in the social status hierarchy. An example of a ladder with four rungs was presented on a flipchart, indicating 'high' on top, and 'low' below[16].

The participants, divided in four randomly composed mixed groups, were then asked to rank all individuals that were identified cultivating a plot in the irrigation scheme according to their social status. For that purpose, the names of all irrigation users were copied on four sets of cards, and four flipcharts with ladders were distributed. As an illustration, the facilitator ranked the members of the research team on the ladder on the example flipchart, attaching a hypothetical status to each member. After this example, the four groups separately ranked all members of the irrigation scheme by putting the cards of the respective farmers on the 'social status ladder' on the rungs matching their relative social status. To avoid embarrassment, overestimation or underestimation of one's own social status, the participants were not expected to rank themselves. Therefore, in each group, the cards with names of the group members were put aside and not ranked. The research team members monitored each group to check if the exercise was well understood and if all understood the 'social status' concept as defined. They also made sure that nobody dominated the group and every group member could participate. When a group finished, one research team member collected the piles the group had put on the ladder, indicating the rung on the cards.

[16] During the ranking the groups were allowed to neglect some rungs when they thought less than four categories where distinguishable according to social status. They were also allowed to add more rungs, i.e. categories.

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