Framed field experiments with heterogeneous frame connotation

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Abstract

We study label framing effects in linear public goods games. By accounting for heterogeneous frame connotation, we can identify individual framing effects. We test for such effects in a field experiment on irrigation management in India. Using membership of the water users association as a proxy for frame connotation, we find a differential impact on contributions in the game. Members contribute relatively more under the irrigation frame than non-members as compared to an alternative, neutral, frame. We conclude that experimental behaviour is sensitive to framing at the individual level but that such individual effects may cancel out on average, which explains previous studies that find mixed or only weak effects of framing.

Keywords: Framing effects; field experiment; public goods game; frame connotation; irrigation management

JEL classification: C93; H41; Q15

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1 Introduction

Experimental evidence suggests that context matters for economic behaviour in a large range of situations. For example, subjects contribute more to a public good when they are given the opportunity of cheap talk or voting, or when the context triggers a social norm of contributing (Messer et al., 2007). Levitt and List (2007) find that, in economic experiments, context matters and they provide a list of relevant contextual factors: *"relational situations, social norms, frames, past experiences, and the lessons gleaned from those experiences"*. As a consequence, small changes in the framing of a game may induce deviations in behaviour, even if such changes do not alter the material incentives in the game.

Typically, this framing effect has been studied in the context of social preferences, where one game was framed as a 'community' game and another as a 'business', 'stock market', or 'Wall Street' game (Elliott et al., 1998; Liberman et al., 2004; Rege and Telle, 2004). This type of framing is called label framing as it only changes the wording of the instructions. Valence framing, which is closely related, changes the reference point of the game (Dufwenberg et al., 2011). Both types of framing have been studied extensively in public goods games where subjects would either 'give' resources to a common stock or 'take' resources from such a stock (Andreoni, 1995; Cookson, 2000; Cubitt et al., 2011). A general result is that framing induce higher contributions under frames with a positive connotation. Dufwenberg et al. (2011) conclude that framing gives subjects a cue about a comparable social situation, and that based on this situation they form their beliefs, which affects their behaviour. For instance, when a 'business' frame is perceived negatively, this is likely to affect both first-order and second-order beliefs about others' contributions. As a result, contributions to the common stock may be lower than under an alternative frame. Building on this insight, Ellingsen et al. (2012) test whether framing affects preferences or beliefs, using Prisoners' dilemma experiments. Their results support the belief-hypothesis. Specifically, they demonstrate the presence of coordination-based framing in which framing induces players to coordinate on frame-specific equilibria (see also Dreber et al., 2013).

There are also studies that report mixed or only weak effects of framing (e.g. Levin et al., 1998; Rege and Telle, 2004; Brandts and Schwieren, 2009; Cubitt et al., 2011). In line with the theory that framing induces players to coordinate

on frame-specific equilibria, there are two possible explanations for such effects. One is that the frame is not sufficiently strong to trigger a framing effect. The other explanation is that subjects' connotation to the frame may be heterogeneous, which causes individual framing effects to cancel out on average. In this paper we will focus on this second explanation. When subjects are heterogeneous with respect to their frame connotation, the effects of framing are likely to be differential, with those who perceive the frame positively behaving differently from those who perceive the same frame neutrally or negatively. Park (2000), for instance, shows that the impact of valence framing differs per subject. In his experiment, the 'take' frame affects the contributions of individualistically-oriented subjects, whereas cooperation-oriented subjects are hardly affected. Carpenter and Cardenas (2011), in explaining why they do not find label framing effects, state that individual effects of framing may cancel out due to subject heterogeneity.

We test this heterogeneous-framing effects hypothesis in a field experiment, in which we control for heterogeneous frame connotation. We have two reasons for going to the field. The first reason is that in conventional lab experiments, the subject pool may not be familiar with the context provided in the frame, so that a frame connotation is absent. For instance, it is not clear whether and how subjects in the lab relate to for instance a 'business' or 'Wall Street' frame. From this perspective, framing should be matched to a subject pool to which the frame applies. Cardenas (2003) and Hayo and Vollan (2012), for example, conduct common-pool resource experiments in the field with subjects who themselves are actual commons users. The second reason for going to the field is that the field context allows us to use endogenous heterogeneity in frame connotation. The effects of subject heterogeneity on contributions in linear public goods games has been studied before (cf. Cherry et al., 2005; Buckley and Croson, 2006; Reuben and Riedl, 2013). These studies, however, assess the effects of exogenously assigned heterogeneity in terms of e.g. endowments, contribution capacity, and marginal benefits. We take a different approach by using endogenous heterogeneity using a proxy for frame connotation, the proxy being inferred from behaviour in the field. This allows us to show the impact of normally unobserved heterogeneity on experimental outcomes.

Our field experiment is a linear public goods game which we implemented in the context of irrigation management in three villages along an irrigation canal in

the Indian state of Maharashtra. The label frame consisted of contributing to the water users association (WUA) in terms of user fees and maintenance. The alternative frame consisted of contributing to the village festival, which served as the neutral frame.[1] In Section 3 we introduce the two frames in detail. Our proxy for frame connotation is membership of the WUA, which reflects the position of villagers vis-à-vis the WUA and irrigation management in the village. Based on the framework of choice with frames introduced by Salant and Rubinstein (2008) and described in Section 2, we hypothesize that framing has a differential impact on contributions, with WUA members contributing relatively more under the WUA frame than non-members as compared to the festival frame. Our results largely confirm this hypothesis.

2 Theory and hypothesis

In terms of the taxonomy of field experiments introduced by Harrison and List (2004), our experiment is a framed field experiment. Compared with an artefactual field experiment, we introduce so-called field context to the information provided to the subjects. We interpret this field context as a frame, because we only change information which is seemingly irrelevant to the choices to be made by the subjects in the experiment (unlike e.g. Messer et al., 2007, 2013, who add context that potentially changes pay-offs). Despite this irrelevance, a large body of evidence points to the existence of framing effects. The dominant view is that behaviour is affected because the frame matches a situation that is common to the subjects. As Henrich et al. (2005) argue: *"experimental play often reflects patterns of interaction found in everyday life"*. More generally, Salant and Rubinstein (2008) argue that *"a frame triggers the use of a particular rationale by the individual while making a choice"*. We argue that this particular rationale is captured by a measure of so-called frame connotation.

[1]The village festival, suggested by our local counterpart SOPPECOM as the most suitable neutral frame, is an annual event to which all households in the village contribute and which has no direct link to contributions to the WUA. As a result, there is no reason to expect that WUA membership causes a specific connotation to the festival frame. Both frames are comparable in that they describe activities where households are expected to contribute to a common good. SOPPECOM (Society for Promoting Participative Ecosystem Management), based in Pune (Maharashtra, India), is a non-governmental organization working in the field of natural resource management, especially water, since 1991.

Based on our expectation that a positive frame connotation is positively related to contributions in a public goods game with an associated frame, we construct our main hypothesis. We do so in the context of the framework of choice with frames as developed by Salant and Rubinstein (2008). This framework extends the standard model of choice to situations where choice is affected by seemingly irrelevant information: the frame (see also Kahneman and Tversky, 1984; Bacharach and Bernasconi, 1997). A frame is used to construct an extended choice problem, which we will adapt to accommodate for frame connotation. Formally, an extended choice problem is a pair $\left(A, c_i^f\right)$, where A denotes the choice problem as a set of possible actions and c_i^f denotes the frame connotation of agent i to frame f with $f \in \{\text{WUA}, \text{FESTIVAL}\}$. Agent i chooses an action $a_i \in A$, which, in the context of our experiment, equals the selected contribution in the public goods game. Agents' actions are stacked in the vector $\mathbf{a} = (a_1, \ldots, a_n)$. We denote by $\pi_i(\mathbf{a})$ the material pay-off to agent i in the game.

We allow for social preferences so that each agent has a utility function of the form

$$u_i = \pi_i(\mathbf{a}) + g_i\left(c_i^f, \pi_{-i}(\mathbf{a})\right). \tag{1}$$

The function $g_i()$ assigns to any composition of the other agents' pay-offs $\pi_{-i}(\mathbf{a})$ a non-negative value. This value is increasing in the sum of contributions by others, but not necessarily in each of its elements, and may be transformed by c_i^f. This notation allows for a wide range of possible social preferences, including aspects such as altruism, reciprocity, and fairness considerations (cf. Bolton and Ockenfels, 2000; Croson, 2007). In addition, our functional form allows to model both preference- and coordination-based hypotheses of framing effects (Dufwenberg et al., 2011; Ellingsen et al., 2012) as discussed in Section 1, and illustrated in the following two examples.

Example 1 (Preference-based framing)**.** Denote positive and negative frame connotations by $c_i^f > 0$ and $c_i^f < 0$ respectively. One possible specification of (1) for preference-based framing effects is

$$u_i = \pi_i(\mathbf{a}) + c_i^f \cdot g_i\left(\pi_{-i}(\mathbf{a})\right). \tag{2}$$

Under a positive frame connotation, agent i puts a larger value on social prefer-

ences and adjusts his own action accordingly, and vice versa.

Example 2 (Coordination-based framing)**.** Similarly, a possible specification of (1) for coordination-based framing effects is

$$u_i = \pi_i(\mathbf{a}) + g_i\big(\pi_{-i}(\mathbf{a})\big) \quad \text{s.t.} \quad a_i = a_j = h_i\big(c_i^f\big)\ \forall j \neq i \in N, \tag{3}$$

where the function $h_i\big(c_i^f\big)$ assigns to each level of frame connotation c_i^f a non-negative value (increasing in c_i^f). Under a positive frame connotation, agent i increases his expectation of the other agents' actions—through the 'belief'-function $h_i\big(c_i^f\big)$—and adjusts his own action accordingly, and vice versa. Depending on the existence of multiple equilibria in the game, this function acts as a coordination device to target a specific equilibrium.

Generally, using utility function (1) and given his connotation in the extended choice problem $\big(A, c_i^f\big)$, each agent chooses the u-maximal element $a_i \in A$. Our results do not allow to distinguish between e.g. (2) and (3) nor any other specification of (1). Instead, we focus on c_i^f as a measurement for individual framing effects in line with the objective of our paper.

We can now formulate our main hypothesis which states that framing has a differential impact on contributions. Denote by M the set of WUA members and by N the set of non-members. Using WUA membership as a proxy for frame connotation we obtain $\mathrm{E}\big[c_i^{\mathrm{WUA}}\big] > 0$ and $\mathrm{E}\big[c_i^{\mathrm{FESTIVAL}}\big] = 0$ for all $i \in M$. That is, we expect WUA members to have a strictly positive frame connotation under the WUA frame and a neutral frame connotation under the festival frame. Similarly, we obtain $\mathrm{E}\big[c_j^{\mathrm{WUA}}\big] \leq 0$ and $\mathrm{E}\big[c_j^{\mathrm{FESTIVAL}}\big] = 0$ for all $j \in N$. That is, we expect non-members to have a neutral or negative frame connotation under the WUA frame and a neutral frame connotation under the festival frame. Driven by this heterogeneity in frame connotation c_i^f we expect the following relation between contributions in the public goods game:

$$\mathrm{E}\left[a_i^{\mathrm{WUA}} - a_i^{\mathrm{FESTIVAL}} > a_j^{\mathrm{WUA}} - a_j^{\mathrm{FESTIVAL}}\right] \quad \forall \quad i \in M,\ j \in N. \tag{4}$$

Based on this inequality, our hypothesis is as follows.

Hypothesis. Framing has a differential impact on contributions, with WUA members contributing relatively more under the WUA frame than non-members as

compared to the festival frame.

We have two remarks on this hypothesis. First, the identified signs for all four frame connotations c_i^f suggest the possibility of making statements about *absolute* contribution levels under both treatments. For example, based on $c_i^{\text{FESTIVAL}} = 0$ for all $i \in M \cup N$, we could hypothesize that contributions under the festival treatment are equal for all subjects. Our hypothesis does not contain such statements. We acknowledge that there may be other, unobserved, factors that cause one group (i.e. M or N) to contribute more than the other under either frame. Instead, our hypothesis captures the relative difference in contributions between the two groups compared for both treatments.

The second remark is that we have no expectation about the average framing effect. There is no obvious reason to expect that, *on average*, subjects will contribute more under the WUA or the festival frame. This observation is, in fact, related to the core message of our paper. By accounting for heterogeneous frame connotation, we can identify individual framing effects.

3 Experimental design

Some background information on the setting of the field experiment is necessary in order to understand the type of framing we applied. We conducted our experiments in three villages—Panumbre, Manadur and Kalundre—at the head of the Warana basin in the Indian state of Maharashtra. The three villages are homogeneous in terms of caste (Kunbi Maratha), religion (Hinduism), land ownership (quite frequent and homogeneous among land owners) and income (most households have both farm and off-farm income). Each village has a command area of canal-irrigated land ranging from 200-400 ha. A major irrigation canal downstream of the Chandoli dam serves minor canals of several villages. In the three villages assessed in this paper, WUAs were established (around 2002) as part of the Cooperative Societies Regulation which supported voluntary decentralisation of irrigation management. A WUA is established when a majority of households who own canal-irrigated land is in favour of doing so. The incentives for establishing a WUA are: (i) up to 20% discount on abstracted water from the major canal, (ii) a formal acknowledgement of water entitlements to the WUA, (iii) a one-time system maintenance upgrade, and (iv) formal freedom from prescribed cropping

patterns by the Irrigation Department (although non-compliance was common).

Responsibilities of the WUA are threefold: (i) collecting seasonal water demand forms and developing the water distribution plan accordingly, (ii) maintenance of the minor canal (field channels are the farmers' responsibility), and (iii) collection of water charges, which consist of an an annual irrigation charge set by the WUA and a surcharge (of up to 30%) in case the household is not a member of the WUA. WUA members are primarily responsible for these tasks, through the elected management committee of the WUA (consisting of rotating WUA members), which oversees all its affairs. Besides these responsibilities, the only difference between WUA members and non-members is that members do not pay the surcharge. Any household that owns land in the canal command area can become a WUA member at a one-time small membership charge. As shown in Section 4, only slightly more than half of the households are WUA members. This low membership rate can be explained by a combination of three factors: (i) the water charge is very low, so that the surcharge is not considered problematic as compared to the responsibilities and paperwork that come with WUA membership; (ii) there is a widespread belief in the villages that they are not capable of managing the irrigation systems themselves; and (iii) WUAs are not allowed to refuse water to non-members or impose any other sanctions solely on the basis of their non-membership.

A team of facilitators from SOPPECOM and VU University Amsterdam conducted the field experiments in December 2011. A couple of days prior to the experiment, SOPPECOM members invited household heads to participate using a random sample of households owning canal-irrigated land from each village. The only information provided upon invitation was that they were going to participate in a game in which they could earn money. Prior to the experiment no further information about the game or the context of the research project was provided. Upon arrival, facilitators registered the subjects and randomly assigned them to one of two treatments, as discussed below. Because of possible illiteracy problems, game instructions (see Appendix) were read out loud and were also acted out. We tested the subjects' understanding of the game by asking control questions.

The experiment is based on a standard linear public goods game in which subjects are anonymously grouped in groups of size 4, using a fixed matching protocol. At the start of each round, each subject received 20 tokens and each

token was worth 1 Indian Rupee (1 INR = USD 0.02). Subjects were given the option to contribute tokens to the group account. Contribution decisions were made simultaneously and in private. Based on the contribution decisions of all subjects in one group, pay-off $\pi_i(\mathbf{a})$ to subject i in a given round equals

$$\pi_i(\mathbf{a}) = 20 - a_i + 0.4 \cdot \left(\sum_{j=1}^{4} a_j \right), \tag{5}$$

where a_i denotes the contribution in tokens of subject i to the group account. This pay-off function reflects a social dilemma, in which contributions by other group members positively affect own pay-offs. The individually optimal decision is to contribute $a_i = 0$, while the socially optimal decision is for each subject in the group to contribute $a_i = 20$ (each subject earning 32 tokens). Parameter values of pay-off function (5) correspond with previous studies that played the linear public goods game with groups of size 4 (e.g. Fehr and Gächter, 2000).

Contribution decisions were made using cards that were put into coded envelopes. In each round, envelopes with extraction decisions were collected and envelopes with feedback were returned by one of the facilitators. Feedback included individual contributions a_j of each group member j, the resulting group account $\sum_{j=1}^{4} a_j$, and individual pay-off π_i in this round. This procedure assured double-blind interaction. The field setting of our experiment implies that we were forced to make one major simplification to the standard linear public goods game. We constrained the contribution decisions by subjects to multiples of 5 tokens. This decision was based on our experience during pre-tests that the game puts a heavy cognitive load on many subjects. This simple alteration of the game eased the subjects' contribution decisions, as it limits their choice set while simultaneously increasing the differences in pay-off between their possible choices. The game was repeated for five rounds, with no history (i.e. no remaining tokens from earlier rounds).[2] In addition to the show-up fee of 50 INR, the maximum individual pay-off over five rounds equalled 190 INR. On average and including the show-up fee, subjects earned 189 INR (approximately equal to twice the daily wage), with

[2] The main reason for playing five rounds was the field experiment context, where there is less control compared with the lab. By playing more than one round, we can compare contributions across rounds to check whether subjects have understood the game already in the first round. This is the case here, with the usual pattern of decreasing contributions over rounds. Nevertheless, we focus our analysis on first-round contributions only; for a discussion on effects of multiple rounds in the context of framing, see e.g. Cubitt et al. (2011) and Ellingsen et al. (2012).

a standard deviation of 22 INR. The experiment lasted approximately one hour, and including a survey and waiting time the activity took 2.5 hours in total.

Subjects were assigned to one of two treatments: the WUA frame or the village festival frame. We designed a festival frame, rather than a neutral frame with abstract wording, in order to have control over the context that subjects might impose on the game themselves (Harrison and List, 2004). There are two differences between treatments. One is that, depending on the frame, the game instructions contained three instances of frame-specific wording (see Appendix). For example, in the WUA treatment, contributions were labelled as *"contributions to irrigation system maintenance"* while in the festival treatment they were labelled as *"collective effort of organizing the village festival"* (translated back from Marathi). The second difference is unavoidable given the field setting of our experiment. To prevent communication between subjects in different treatments, subjects in the festival treatment had to wait in a separate room for the subjects in the WUA treatment to finish the experiment. We used this waiting time to have these subjects fill out a survey (cf. Bouma and Ansink, 2013). In addition to standard demographic items, this survey also contained items on various aspects related to WUA membership, WUA performance, and perceived legitimacy of the WUA. We argue that there is no *ex ante* expected difference in game behaviour between having been isolated without a survey or having used this idle time to fill out a survey. This timing of survey and experiment introduced additional framing to the WUA treatment, while it did not interfere with the festival framing. Hence, in the WUA treatment, the survey was conducted before the experiment and in the festival treatment afterwards.

In total, our sample size consisted of 88 subjects, grouped in 11 WUA frame-groups and 11 festival frame-groups: 3 of each in Panumbre and 4 of each in both Manadur and Kalundre.[3]

[3]We ran two additional sessions in two villages where no WUA was formed in order to analyse the effects of WUA formation and the perceived legitimacy of both the WUA and the Irrigation Department in combination with the experimental results. We report on these additional results in a companion paper (Bouma et al., 2013).

4 Results

Summary statistics of our sample are provided in Table 1. All subjects were household heads, which explains both the relatively high average age (50) and the low percentage of female subjects (11%). The level of illiteracy is high (33%) and a quarter of the sample is income poor (i.e. income per capita below 740 INR/month, the official Maharashtra poverty threshold).[4] We have two sources of WUA membership data: (i) stated membership from the survey, and (ii) official membership records from the three WUAs. Because the two data sets were quite different, and because we are interested in framing effects, we only use the survey data.

We focus our analysis on first-round contributions only (see Footnote 2). Figure 1 shows the average first-round contributions separated by frame. Contributions are relatively high, with a mean contribution in the first round of 11.98 tokens, equivalent to 60% of the maximum possible contribution. The Mann-Whitney sample statistic does not reject the hypothesis that contributions under both treatments stem from the same distribution ($z = 0.525$, $p = 0.600$). Clearly, we do not observe a framing effect when we do not take into account frame connotation. Recall from Section 2 that we had no expectation which of the two frames would perform better *on average*.

We proceed to take into account frame connotation by separating out the first-round contributions by both frame and WUA membership, evaluating four different groups. Figure 2 shows the average first-round contributions for each of these groups. A Kruskal-Wallis test, corrected for tied ranks, rejects the hypotheses that contributions for all four groups stem from the same distribution ($\chi^2 = 9.02(3)$, $p = 0.029$). Clearly, when taking into account heterogeneous frame connotation, we observe an interaction effect with respect to the two framing treatments.

We further analyse this effect by evaluating pairwise differences between the four groups using Mann-Whitney sample statistics. Doing so, we find that most of the difference is due to (i) non-members contributing more under the festival frame than members ($z = -2.82$, $p = 0.005$); and (ii) non-members contributing more under the festival frame than under the WUA frame ($z = -2.15$, $p = 0.032$). The other two pairwise differences were insignificant with (iii) members *not* con-

[4] From Table 1, literacy and WUA membership seem to be correlated. Although literate subjects are more likely to be WUA members, replacing membership by literacy in our main regressions, reported in Table 3, we find no relation between literacy and experimental outcomes.

tributing more under the WUA frame than non-members ($z = -0.62$, $p = 0.537$); and (iv) members *not* contributing more under the WUA frame than under the festival frame ($z = 1.37$, $p = 0.171$). Table 2 summarises the results.

To test econometrically whether frame connotation affects contributions, we estimated four models. In addition to standard OLS, we used random effects Tobit because we observe corner solutions at contribution decisions of 0 (4 observations) and 20 (19 observations), see the histogram in Figure 3. With censored data, OLS may lead to inconsistent estimates of the coefficients, which is corrected in Tobit. Nevertheless, Merrett (2012) shows that for public goods game data, Tobit may create a bias compared to OLS because the simulated Tobit distribution may differ substantially from the common distribution pattern of contributions in a public goods game. We will show results for both specifications.[5] In models (1) and (3), the dependent variable is first-round contributions and the main explanatory variables are treatment (WUA vs. festival frame), frame connotation (members vs. non-members) and an interaction variable. In models (2) and (4), additional control variables were included: age, gender, illiteracy, and a dummy when the household is income poor. Our hypothesis corresponds to a positive coefficient for the interaction effect between WUA frame and WUA membership. Results are shown in Table 3.[6]

Table 3 shows that sign, effect size and significance of the explanatory variables are consistent across the four models. The inclusion of control variables does not affect the sign, effect size or significance of the main explanatory variables. In addition, all coefficients for the control variables are economically and statistically insignificant. In assessing the results, the OLS and Tobit coefficients should be interpreted differently. The coefficients in OLS models (1)–(2) are marginal effects on the observed outcomes of first-round contributions while the coefficients in Tobit models (3)–(4) are marginal effects on the uncensored latent variable. This difference confirms that the Tobit coefficients may be biased upward and the OLS

[5]Given the limited number of contribution options (subjects were constrained to contribute multiples of 5 tokens which creates 5 choice categories), we have also estimated an ordered probit model. Results were consistent, with signs and significance of the explanatory variables being identical to the OLS and Tobit results. Merrett (2012) discusses estimation approaches for public goods game data and finds that continuous estimation approaches outperform discrete approaches such as ordered probit.

[6]The models reported in Table 3 are extended with legitimacy indicators in the companion paper (Bouma et al., 2013).

coefficients downward.

Our main explanatory variable of interest, the interaction effect WUA frame × WUA membership, has the expected positive sign and is both statistically and economically significant. The OLS and Tobit results indicate that having a positive frame connotation (as measured by WUA membership) under the associated frame (WUA) accounts for an increase in first-round contributions of about 7–8 tokens, out of 20 available tokens. This result implies that, by accounting for heterogeneous frame connotation using WUA membership as a proxy, we have identified individual framing effects. WUA framing and WUA membership both have a negative effect on contributions. Recall that we did not have any expectation on the sign or magnitude of these two coefficients. The negative signs of these coefficients suggest that (i) an unobserved characteristic causes WUA members to contribute less in general, as speculated in Section 2; and (ii) the WUA frame induces a negative rather than a neutral frame connotation to non-members. In general, our econometric results provide strong support for our main hypothesis that framing has a differential impact on contributions. Combined with the sample comparisons from the beginning of this section, these results show that WUA members contribute relatively more under the WUA frame than non-members as compared to the festival frame.

5 Final remarks

We find a clear differential framing effect on contributions in a public goods game when taking into account heterogeneous frame connotation. These individual effects cancel out on average. This difference may explain mixed or only weak effects of framing found in previous studies, as discussed in Section 1. Our results show that individual contributions under one frame may not be informative about contributions under another. One implication is that heterogeneous frame connotation should be considered in studies of framing effects, or, more generally, that subject heterogeneity matters (cf. Voors et al., 2011). As a consequence, a second implication is that the external validity of field experiments is sensitive to framing. Levitt and List (2007) explain in their comparison of field and lab experiments the possibility that *"subjects view one situation as relevant to social preferences and the other as irrelevant"*. Our paper shows that the experimental

frame affects this relevance, depending on subjects' individual frame connotation.

Whether frame connotation triggers preferences or beliefs is something we can only speculate about. In the debate about the impact of framing on game behaviour this element is lacking, possibly because most of the framing literature is conducted with relatively homogeneous Western undergraduate students in the lab. Further research is required to investigate what drives frame connotations and resulting behaviour in public goods games.

Appendix: Game instructions

(*Translated back from Marathi. Phrases with WUA framing are displayed in bold font, followed by the corresponding festival framing in parentheses.*)

Greetings and welcome to all of you. My name is (. . .) and I work for the VU University in Amsterdam, the Netherlands (*introduce team*). For my research **about participatory irrigation management** (about household participation in community cooperation). I would like to play a few games with you. Depending on the decisions made by you and others in these games you can earn some money. The payment that you receive for these games is not from my pocket but from a European university research fund.

Before playing the game we will give you instructions. It is very important that you listen to these instructions carefully. In case you do not understand the instructions please raise your hand and ask for clarification. You are not allowed to communicate during the game. If you violate this rule, you will be dismissed from the game and will not earn any money.

Now I will start explaining the game. At the start of the game we randomly divide you into groups of four. You will play the game with these four people, the groups will remain the same throughout the game. Except for me, nobody will know who is in which group. Neither before, nor after the game, will you learn with whom you played the game. Thus, your actions are anonymous, and nobody will come to know your identity.

We will play the game five times, each time with the same group. At the beginning of each game you will each receive 20 tokens. Your task is to decide how much of the tokens you want to contribute to a group account and how many tokens you want to keep for yourself. You can see the group account **as a shared fund of**

resources, like for example the irrigation system: when you contribute to irrigation system maintenance this will benefit the whole group (as a shared fund of resources, like the collective effort of organizing the village festival: when you contribute to the organization of the village festival this will benefit all). Each token has a value, i.e. 1 token = 1 INR. You can contribute 0, 5, 10, 15 or 20 tokens to the group account. Every 5 tokens that you contribute to the group account is multiplied by 1.6. For example, when you contribute 5 tokens we add 8 tokens to the group account, which will be evenly shared by the members of your group. Clearly, the pay-offs **to contributing to irrigation system maintenance are non-monetary** (to investing effort in organizing the village festival are non-monetary), but the principle that collaborative investments in a collective resource generate higher returns is the same. Every 5 tokens that you keep for yourself raises your own earnings with 5 INR. Thus, every token that you keep raises your own earning and every token that you contribute raises the earnings of your group members as well. Also, you get earnings for each token that is contributed by other members of your group to the shared group account.

In the envelope which you received you will find pieces of paper with the numbers of tokens that you can contribute to the group account (*show envelope*). Please, leave only the number of tokens that you would like to contribute in the envelope. For example, if you want to contribute 5 tokens, you leave the number 5 in the envelope. You then close the envelope and hand the envelope to my assistant. Do not show the remaining numbers to the other players, remember that you may be disqualified for doing so and thus not receive any money at the end of the game. Once all the group members have decided how much they want to contribute to the group account you will be informed about the contributions of all group members and how much tokens there are in the group account with the following sheet (*show sheet*).

Are there any questions? Then we will now show you some examples to help you gain understanding about the calculation of your earnings.

1. If all four group members decide to contribute nothing, there are no contributions to the group account and each member earns 20 tokens (20 INR)

2. If all four group members decide to contribute all tokens to the group account, there are 80 tokens in the group account. Total earnings are $80 \times 1.6 =$

128 tokens, which are equally divided so that each member receives 32 tokens (32 INR)

3. If you contribute all 20 tokens to the group account, the second member contributes 10 tokens, the third member contributes 15 tokens and the fourth member does not contribute anything, there are 45 tokens in the group account. Total earnings from the group account are $45 \times 1.6 = 72$ tokens (or 18 tokens per member) and the different members earn different amounts:
   You earn: $0 + 18 = 18$ tokens;
   Member 2 earns: $10 + 18 = 28$ tokens;
   Member 3 earns: $5 + 18 = 23$ tokens;
   Member 4 earns: $20 + 18 = 38$ tokens.

4. If the other three members contribute all 20 tokens to the group account but you do not contribute any token, there are 60 tokens in the group account. Total earnings from the group account are $60 \times 1.6 = 96$ tokens (or 24 tokens per member) and the different members earn different amounts:
   You earn: $20 + 24 = 44$ tokens;
   Member 2 earns: $0 + 24 = 24$ tokens;
   Member 3 earns: $0 + 24 = 24$ tokens;
   Member 4 earns: $0 + 24 = 24$ tokens.

Is this clear? Are there any questions?

For the next round of the game you again receive 20 tokens, and you play the game another time with the same group. After playing the game 5 times, the total amount of tokens that you earned will be converted and we will pay this amount to you in real money. So if you, for example, earn 10 tokens in each round of the game your earnings are 50 tokens and you are paid 50 INR. You will only receive your money in the end, i.e. after the game is played 5 times. We will keep a record of your earnings to make sure you receive the correct amount.

If you have any remaining questions please raise your hand. Before we start the game we will test your understanding of the game individually by asking each of you a couple of questions (*Control questionnaire*).

1. There are 80 tokens in the group account. How much can you maximally extract? How much can you minimally extract? (*Answer: 20, 0*)

2. If you extract 10 tokens from the group account, what are your earnings from the first stage? (*Answer: that depends on what the others do*)

We will now start the game. Please be silent and do not communicate or exchange with others during the game. If you have any questions please raise your hand and we will come to you. Remember that you are not allowed to communicate during the game and that if you violate this rule you will be dismissed from the game and will not earn any money.

(*Exit part*) We have now come to the end of the game. Please remain seated and do not communicate with others until you have left this room. (*Please also do not talk with the group waiting outside: they will play a different game so you will confuse them if you tell them about the game you played. Outside we will ask you to fill in a short survey and wait until the next group finishes the game. After they have finished we will call you back inside.*)

We will call you one by one to go to the experimenter, hand in your identification tag, and learn about your total earnings. We will then ask you to sign a receipt for the payments and you will receive your earnings and the show up fee in a closed envelope. You are then free to go home. Do not tell others what you have earned in the game, this is private information and nobody needs to know how you played the game. I would like to thank you for your participation in this game.

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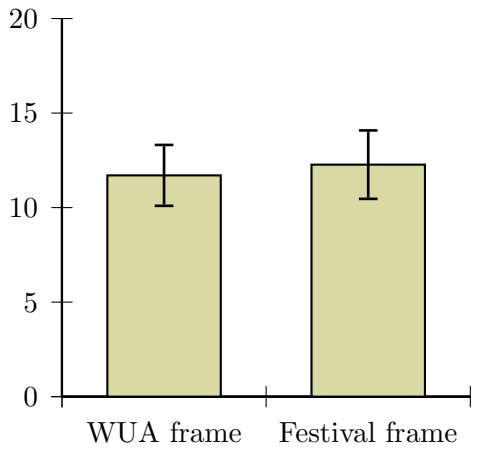

Figure 1: First-round average contributions (and confidence intervals), separated by treatment.

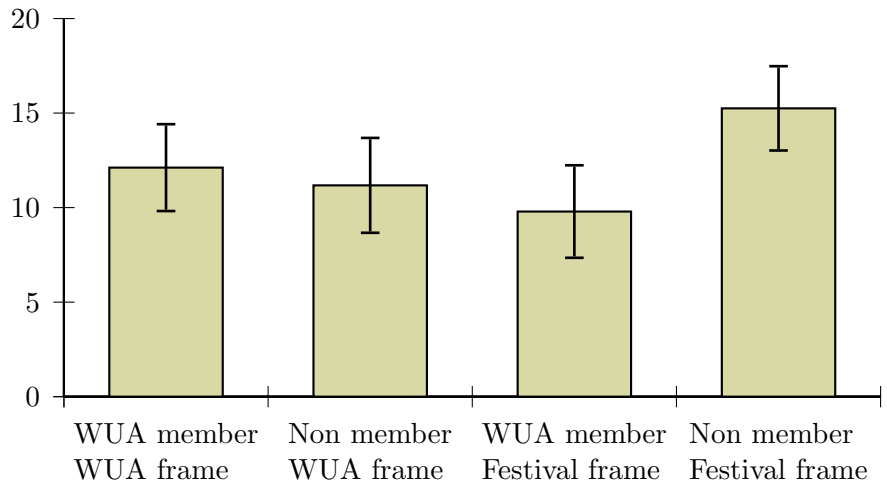

Figure 2: First-round average contributions (and confidence intervals), separated by treatment and frame connotation.

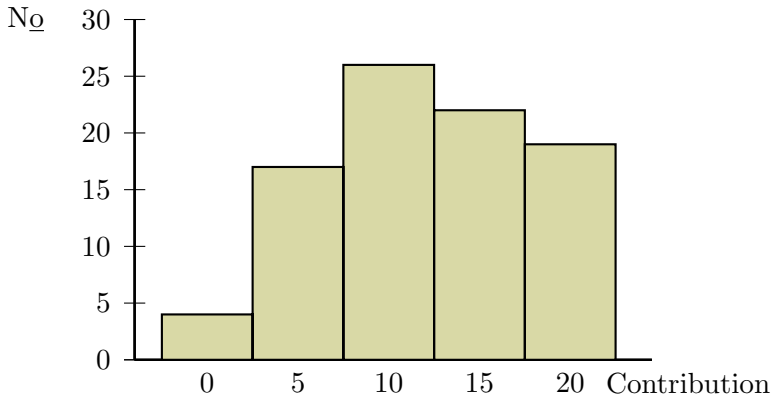

Figure 3: Histogram of first-round contributions.

Table 1: Summary statistics.

	Member	Non-member	Total
Average age	48	52	50
Female subjects	6%	19%	11%
Illiterate	20%	51%	33%
Income per capita below 740 INR/month	28%	19%	25%
# Observations	50	37	87

Notes: We have one missing observation of WUA membership.

Table 2: Summary of contribution differences by treatment and frame connotation.

			p-values of the test statistics
Overall	By treatment		0.600
Overall	By treatment and frame connotation		0.029
By treatment	WUA frame	Members vs. non-members	0.537
	Festival frame	Members vs. non-members	0.005
By frame connotation	Members	WUA vs. festival frame	0.171
	Non-members	WUA vs. festival frame	0.032

Table 3: Regression estimates of heterogeneous frame connotation on first-round contributions.

	OLS		Tobit	
	(1)	(2)	(3)	(4)
WUA frame	-4.07 **	-4.04 **	-5.83 **	-5.76 **
	(1.67)	(1.71)	(2.35)	(2.35)
WUA member	-5.46 **	-5.32 ***	-7.64 ***	-7.32 ***
	(1.66)	(1.78)	(2.45)	(2.57)
WUA frame × WUA member	6.40 ***	6.37 **	8.77 ***	8.62 **
	(2.37)	(2.47)	(3.18)	(3.25)
Control variables included?	No	Yes	No	Yes
Constant	15.25 ***	15.68 ***	17.42 ***	17.59 ***
	(1.11)	(2.48)	(1.90)	(3.45)
F	4.01 **	1.83 *	3.43 **	1.62
R^2	0.12	0.12	0.02	0.03

Notes: *** Significant at the 1 percent level; ** Significant at the 5 percent level; * Significant at the 10 percent level. Robust standard errors are given in parentheses. We have 87 observations for each model. Non-members under the festival treatment are the reference group. For Tobit we report pseudo R^2. Tobit models (3) and (4) have 4 left-censored, 64 uncensored, and 19 right-censored observations. The control variables in models (2) and (4) include age, gender, illiteracy, and a dummy when the household is income poor. All coefficients for the control variables are economically and statistically insignificant.