MINIMUM LEVELS AND FRAMING IN PUBLIC GOOD PROVISION

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Using a laboratory experiment in the field, we examine how the framing of a social dilemma, give to or take from a public good, interacts with a policy intervention that enforces a minimum contribution level to the public good. We find significantly higher cooperation in the give frame than in the take frame in our standard public goods experiment. When a minimum contribution level is introduced, contributions are crowded out in the give frame but crowded in in the take frame. Our results show the importance of choosing the frame when making policy recommendations. (JEL C91, H41)

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I. INTRODUCTION

This paper focuses on the design of institutions that foster cooperation in the provision of local public goods.\textsuperscript{1} Using lab-in-the-field experiments, we investigate the role of minimum levels and framing in public good provision in rural Ethiopia. Both of them are prominent institutional factors that policy makers can use in their role as choice architects.\textsuperscript{2} Although previous experiments have shown that other institutions such as monetary punishment and exclusions are promising to increase cooperation (e.g., see overviews in Chaudhuri, 2011; Ledyard, 1995; Zelmer, 2003), minimum levels and framing are institutions that are feasible and cost-efficient to implement by policy makers, especially in developing countries. The objective of our paper is to investigate the interaction effects between minimum levels and framing in a non-student and non-Western subject pool.

Minimum levels are often imposed in order to secure some provision of a public good and probably the most obvious example in developed countries is taxation to fund the provision of public goods. In developing countries, it is common to provide local public goods at the community level. Examples of projects of the public goods nature include rural road projects (e.g., improving road quality and building a bridge that are typically co-financed by aid organizations), maintenance of community forests, irrigation systems and common grazing lands. To ensure a minimum level of provision, it is often made mandatory for all households or all fit adults and the youth in a community to participate at least during some pre-determined workdays,

\textsuperscript{1} See for example Kocher et al. (2018) and Fellner and Lünser (2014) for discussion on the provision of global and local public goods.
\textsuperscript{2} A neutral design does not exist. Any design choice a decision maker makes influence people’s behavior, from the order of food choices on a menu to whether CO2 compensation of a flight is by default included or not included in the flight price.
and any additional workdays corresponds to an individual’s investments in a public good. For example, in the Ethiopian highlands, such community labor mobilization approaches have been applied in the rehabilitation of degraded hillsides through land and water conservation (e.g., Hagos and Holden, 2006; Kato et al., 2011). A minimum level should increase the total provision of the public good since any free rider is forced to contribute at least the announced minimum level, and this in turn might make conditional cooperators increase their contribution since they want to cooperate if others cooperate and vice versa (e.g., Fischbacher et al., 2001). However, the minimum level could also result in crowding out, i.e., that individuals contribute less to the public good when the minimum level is imposed than when it is not imposed because the minimum level might send a signal of distrust to intrinsically cooperative agents. In this case the minimum level entails a “hidden cost of control” (Falk and Kosfeld, 2006; Ziegmeyer et al., 2012). Results from previously conducted experiments of minimum levels using the standard give frame, i.e., subjects are asked to give to the public good, are mixed regarding the effect of minimum levels on public good provision.4

In their role as choice architects, policy makers can affect cooperative behavior by changing the frame of a given cooperation problem, by choosing whether the activity should be designed in terms of giving to or taking from a public good.5 Cartwright (2016) argues that frames can differ on several dimensions, in particular (i) whether the externality in a social dilemma is described in

3 See for instance Deci (1971, 1975) and Bowles and Polanía-Reyes (2012) for general discussions on crowding out of intrinsic motivation and control aversion.

4 For instance, Andreoni (1993) and Gronberg et al. (2012) find a positive effect of a minimum level on public good provision using concave payoff functions and Eckel et al. (2005) implement a dictator game with a charity as recipient and find that a minimum level crowds out donations to the charity when it is framed as a tax. Keser et al. (2017) investigate the effect of minimum levels in the presence of endowment heterogeneity and Kocher et al. (2016) finds instances of both crowding out and crowding in following the introduction of a minimum level in a linear public goods experiment.

5 Framing has for a long time been known to affect people’s behavior. For a classical example see Tversky and Kahneman’s study on the Asian disease problem (Tversky and Kahneman, 1981).
positive or negative terms, and (ii) whether the choices are defined in terms of giving or taking. Previous experimental studies that kept the latter dimension constant found strong framing effects, with more cooperation in the positive frame (Andreoni, 1995; Park, 2000), but the effect is more mixed for studies that instead only varied the choice dimension (e.g., Cookson, 2000; Dufwenberg et al, 2011; Fosgaard et al., 2014). Varying both dimensions simultaneously is probably the most natural way for subjects to understand differences between frames, i.e., to compare the act of giving, which is positive for the group, with the act of taking, which is negative for the group. Several studies varied both dimensions simultaneously and found more cooperation in frames where subjects give to a public good than in frames where subjects take from a public good (Cox, 2015; Gächter et al., 2017; Khadjavi and Lange, 2015).\(^6\) We follow this approach and frame public goods in terms of giving or taking to investigate the impact on cooperative behavior, using a linear public goods experiment that employs the strategy method based on the design in Fischbacher et al. (2001). Our focus is on the relevance of framing for interpreting results from public goods experiments and policy design, in particular concerning the interaction between framing and minimum levels in public good provision.

This paper makes two main contributions. First, we investigate the interaction between framing and minimum levels, and second we contribute to the small but growing literature on public goods experiments using a non-student sample. Our public goods experiment uses the Fischbacher et al. (2001) design, which is a one-shot experiment based on the strategy method. Since subjects are asked for both an unconditional contribution to a public good, as in standard public goods experiments; and a conditional contribution to the public good, given all possible average contributions (rounded to the nearest integer) of other group members, we obtain rich

\(^6\) For framing effects in dictator giving, see Bardsley (2008), List (2007), and Luccasen and Grossman (2017).
information on cooperative behaviour.\textsuperscript{7} We find strong effects of framing and minimum levels on cooperation. More precisely, we find that cooperation is significantly higher in the give frame than in the take frame in our standard public goods experiment. When a minimum contribution level is introduced, contributions are significantly higher in the take frame since contributions are crowded out in the give frame but crowded in in the take frame. Thus, these results demonstrate that interventions may be less efficient if the frame is not taken into account. Our results therefore show the importance of framing for the choice architecture of social dilemmas, and point to situations where policy makers can increase the efficiency of interventions with simple, feasible and cost-efficient techniques. These interventions are easier to implement than other institutional features such as different forms of monitoring followed by punishment.

Our results are based on lab-in-the-field experiments in rural Ethiopia, where the subjects were farm household heads actively engaged in a number of public-good-like decisions such as environmental rehabilitation and the maintenance of local infrastructure. We thus extend the conventional analysis of cooperation to a non-student and non-Western subject pool (e.g., Henrich et al., 2010), where Fosgaard et al. (2014) is an example using non-student but Western subjects. In contrast to our study, Fosgaard et al. (2014) varied only the choice dimension and found, in contrast to us, more cooperation in the take frame. However, studies by Cox (2015), Gächter et al. (2017), and Khadjavi and Lange (2015), who used the same simultaneous variation in framing as we did, i.e., comparing give-positive with take-negative, found higher contribution

\textsuperscript{7} The multi period public goods game and a one-shot public goods game using the strategy method have different pros and cons. The multi period public goods game accounts for repeated interaction where strategic behavior could be an essential motivation for behavior. The strategy method has its advantage in the richness of cooperative behavior that can be elicited, in particular that contributor types can be identified. In our case, we have in mind cooperative projects that do not take place on a daily or frequent basis, rather events that take place more rarely such as road projects, where the village is helping with the construction of roads or bridges, or maintenance of community forests, such as planting seedlings, digging firebreaks, or responsible harvesting, or cleaning irrigation systems. Another aspect is that the one-shot experiment is easier to implement in a field setting where computer cannot be used.
levels in the give frame, which is in line with our results despite using student samples. One important difference between student and non-student populations might relate to how their behavior is affected by the minimum level and framing. Social psychologist argue that people undergo moral development from being self-centered to understanding social norms (e.g., Kohlberg, 1973). For example, a self-centered individual probably interprets a minimum level as a sufficient contribution level, while a norm-oriented individual thinks that the norm has increased. Since moral development takes place over age, it is important to use an (older) non-student sample when investigating issues for policy recommendations. Moreover, societies across the world differ substantially in terms of social organization, trust, fairness norms, and also in the nature of day-to-day cooperation problems. Results from developing-country non-student subject pools such as ours could therefore be particularly important both in examining the generalizability of experimental findings and in drawing policy conclusions about social dilemmas prevalent in such places (e.g., Brent et al., 2016). The rest of the paper is organized as follows. Section II presents our theoretical framework, Section III describes the experimental design, Section IV presents the results, and we provide concluding remarks in Section V.

II. THEORETICAL FRAMEWORK

We build a simple behavioral theory based on insights from Krupka and Weber (2013). Our framework rationalizes important stylized facts from the framing literature and produces clear

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8 Previous studies that systematically compared student and non-student samples have generally found higher cooperation rates among non-students, using standard public goods experiments based on a give frame (Belot et al., 2015; Bortolotti et al., 2015; Gächter et al., 2004).

9 For a discussion on cross-cultural comparisons in economic experiments, see for example Bigoni et al. (2016), Bortolotti et al. (2015), Henrich et al. (2001), Herrmann et al. (2008), Kocher et al. (2012), and Vieider et al. (2015).
predictions for the interaction effect between framing and minimum levels, which are novel to our study.

Subjects in our experiment participate in a linear public goods experiment, framed either as give to or take from the public good. In each frame we then introduce a minimum contribution level, a policy aimed at increasing contributions to the public good (see Section III for details on experimental design and procedures). Using the framework of Krupka and Weber (2013), we assume that people care about their own monetary payoff and that they also want to adhere to social norms, defined as collective judgments (positive or negative ratings) of each action available to the decision maker. Formally, \( A = \{a_1, \ldots, a_K\} \) represents a set of \( K \) actions and the social norm \( N(a_k) \in [-1,1] \) assigns an “appropriateness rating” to each action. \( N > 0 \) means that the action is collectively recognized as appropriate, and \( N < 0 \) means that it is considered inappropriate. Conceivably, \( N(\text{contribute nothing}) < 0 \) in the context of public goods. The decision maker is assumed to weigh the relative importance of adhering to social norm \( N \) and her monetary payoff \( \pi \) according to:

\[
    u(a_k) = \pi(a_k) + \lambda N(a_k),
\]

where \( \lambda \geq 0 \) measures the extent to which the decision maker cares about the social norm. A greater \( \lambda \) makes the decision maker more willing (on the margin) to forego money in order to choose an action that is considered socially appropriate.

Krupka and Weber (2013) elicited the appropriateness of different actions in give and take dictator games. Their main findings were that (i) identical monetary outcomes were perceived as less appropriate in the take frame compared to the give frame, (ii) the largest differential in appropriateness rating was found on the extensive margin within the take frame, i.e. when the
status quo (take nothing) was overturned, and (iii) the difference in appropriateness rating on the intensive margin (taking $2 vs. taking $3 for instance) was smaller in the take frame. We assume that people follow a similar logic when making decisions in a public goods context. In the take frame, the status quo is to take nothing, which is the best possible outcome from a social point of view, and a marginal deviation from this outcome thus comes with a greater drop in social appropriateness compared to the give frame. This means that more people should stick with the best outcome in the take frame than in the give frame. However, it also means that a greater proportion of people that deviated from the best outcome will go all the way and implement the worst possible outcome in the take frame, since the drop in $N$ is smaller for each incremental step toward the own income-maximizing action in the take frame. We thus expect more extreme behavior in the take frame, i.e. that people are more likely to pool at the endpoints of the action space (take everything or take nothing). This is also a pattern that was found in several previous studies investigating framing effects (e.g., Dufwenberg et al., 2011; Fosgaard et al., 2014; Cox and Stoddard, 2015). For our purposes, the important part is that a greater number of people are expected to pool at the zero-contribution endpoint in the take frame, which is a consistent finding across previous studies (e.g., Andreoni, 1995; Park, 2000; Cox, 2015; Khadjavi and Lange, 2015).

**Prediction 1:** *A greater fraction of people will contribute nothing (take everything) in the take frame than in the give frame.*

Introducing the minimum level has two main effects. First, there is a positive effect (mainly on the extensive margin), driven by low-contributors who are forced to increase their contributions at least up to the stipulated minimum (they are crowded in). Second, there is potentially a negative effect on the intensive margin, because the minimum level might send a signal of
distrust to intrinsically cooperative agents (e.g., Falk and Kosfeld, 2006; Ziegelmeyer, 2012), resulting in crowding out, i.e. that some people reduce their contributions when the minimum level has been implemented. Given that more people are expected to contribute nothing (take everything) in the take frame (Prediction I), the fraction of people who are forced to increase their contribution will be greater in the take frame, and, conversely, the fraction who decrease their contribution will be smaller in the take frame. The relative strength of these two effects are difficult to pin down within each frame, but the prediction for the interaction effect between framing and minimum levels is clear:

**Prediction II:** Introducing the minimum level has a more positive effect on contributions in the take frame than in the give frame.

### III. EXPERIMENT

#### A. Design

The primary focus of our paper is to investigate the effect of (i) framing phrased as either give to (GIVE) or take from (TAKE) the public good combined with (ii) a minimum level. We begin with a description of the framing of the public goods and then we explain how the minimum level was implemented and finally how we tested for the effect on contributions to the public goods in both frames.

We implement a linear public goods experiment based on the design developed by Fischbacher et al. (2001), which in addition to eliciting unconditional contributions to public goods also uses the strategy method to elicit contributions to public goods conditional on others’ average
contributions.\textsuperscript{10,11} We begin with a description of the public goods using the give frame, i.e., how much a subject would like to give\textsuperscript{12} to a public good. This is the common way to phrase contributions in public goods experiments. Subjects are matched into groups of four, each with an endowment of 10 Ethiopian birr and the possibility to contribute any integer amount ($c$) from 0 to 10 Ethiopian birr to the public good. To facilitate understanding, we choose to use the real currency directly rather than an experimental currency.\textsuperscript{13} The marginal per capita return from the public good is 0.5, i.e., a contribution of one unit results in 0.5 units of income for each of the four group members. This can easily be explained to the subjects by explaining that the total amount contributed to the public good is doubled and then split equally between the subjects. Since the marginal per capita return is 0.5 and the social marginal return is 2, it is a dominant strategy for a payoff-maximizing individual to contribute nothing to the public good. However, it is socially optimal to contribute the whole endowment. The payoff ($\pi_i$) for subject $i$ is given by

$$\pi_i = 10 - c_i + 0.5 \sum_{j=1}^{4} c_j.$$  \hspace{1cm} (2)

The Fischbacher et al. design employs the strategy method. Subjects make two types of giving decisions, one unconditional and one conditional. In the unconditional decision, subjects decide

\textsuperscript{10} For a discussion on the validity of using the strategy method to elicit cooperative preferences, see, e.g., Fischbacher et al. (2012). For a general discussion on the policy implications of results from public goods experiments, see Gächter (2007). For other experiments based on this design, see, e.g., Fischbacher and Gächter (2010), Herrmann and Thöni (2009), Kocher et al. (2008), Martinsson et al. (2013), and Martinsson et al. (2015). See also Rustagi et al. (2010) and Kosfeld and Rustagi (2015) for interesting applications to the management of forest commons in Ethiopia.

\textsuperscript{11} We chose a design with linear rather than concave payoff functions (e.g., Andreoni, 1993) since it facilitates understanding and the use of the strategy method, which we think is important. This means that the minimum level is set above rather than below the Nash equilibrium of zero contribution, which makes the welfare effect of the minimum level more salient.

\textsuperscript{12} To facilitate understanding, we deliberately use the word “give” instead of “contribute” when we write about the GIVE and TAKE treatments.

\textsuperscript{13} In our Ethiopian case, this worked particularly well since the value of Ethiopian birr matched well with the opportunity cost we intended to use. The experiment with two stages was calibrated to give on average almost a daily salary (30 birr).
how much they wish to give to the public good without knowing anything about anybody else’s contributions. In the conditional decision, each subject decides on the amount to give conditional on the average amount given by the other three group members. This is implemented by each subject stating how much she/he would give to the public good for each possible average amount given (in integers) by the others in the group ranging from 0 to 10.

To make the decisions incentive compatible, the unconditional decision will be payoff relevant for three randomly selected group members, and by using the average unconditional amount given (rounded to the next integer) by them, the amount given by the fourth member is determined as his or her conditional giving matching that specific average amount. Payoffs are then calculated based on these amounts.

In the take frame, the decision is framed as how much a subject would like to take from the public good. In terms of the classification in Cartwright (2016) our approach is thus to compare a positive give frame with a negative take frame, similar to e.g. Cox (2015), Gächter et al. (2017), and Khadjavi and Lange (2015). In this treatment, subjects are not endowed with 10 Ethiopian birr as in the give frame. Instead, the public good consists of $4 \times 10 = 40$ Ethiopian birr and subjects decide on the (integer) amount ($w$) from 0 to 10 birr that they wish to take from the public good. The payoff ($\pi_i$) for subject $i$ is given by

$$\pi_i = w_i + 0.5(40 - \sum_{j=1}^{4} w_j).$$

(3)

The incentives are exactly the same across GIVE and TAKE since equations (2) and (3) describe the same underlying payoff function and only differ in how it is framed.
In addition to testing for framing effects, we investigate the effect of introducing a minimum level in each frame. In the give frame, subjects must give at least the announced minimum level of 2 Ethiopian birr, which corresponds to 20% of the endowment. We follow Andreoni (1993) and present the minimum level as a restriction on individuals’ choice set. For instance, conditional giving is elicited by subjects making eleven giving decisions (one for each possible integer average amount given by the others in the group); when the minimum level of 2 Ethiopian birr has been implemented, subjects make nine giving decisions instead of eleven and they know that they are not allowed to give less than 2 Ethiopian birr. In the take frame, where the procedures are exactly the same with the exception that the game is presented as take-from rather than give-to the public good, subjects must not take more than an announced amount of 8 Ethiopian birr, and hence leave at least 2 Ethiopian birr in the public good.

In the experiment, subjects participate in sessions with public goods experiments framed as TAKE or GIVE and within each session they complete two stages. Subjects knew from the beginning that there would be two stages of the experiment and that the second stage would be explained once the first stage had been completed. The first stage (Baseline) is a standard public goods experiment. It is followed by a second stage (MCL) which is a public goods experiment with an imposed minimum contribution level. We use stranger matching, i.e., they are re-matched with three new group members in the second stage, and as described above a subject makes two types of decisions (unconditional and conditional) in each stage. They are paid for their decisions in both stages but learn nothing about the decisions of others in the group until they are paid
some days after the experiment. In each frame, we test for the effect of the minimum level on public good contributions by comparing average contributions across the two stages.

B. Procedural Details

The experiment was conducted in 2013 in rural Ethiopia. It was a separate module of a household survey on community forestry that covered 15 villages scattered across the four major regions of the country. We ran experiments in eight of these villages. In each region we first randomly selected two villages from each region. Then one of the two villages was randomized into the give treatment and the other into the take treatment. With randomization of treatments at the regional level, we obtain a balanced sample where the regional mix of subjects is similar across the treatments. This is to ensure that our results are not driven by regional differences, which could be quite large given the wide (and diverse) geographical area covered.

In each village, households were randomly selected for participation in the survey. The household heads were interviewed in their respective houses in private by a trained enumerator. At the end of the household survey, they were asked if they would like to participate in an economic experiment. All household heads covered in the survey agreed to participate in the experiment. The experiment was conducted face-to-face similar to in for example Henrich et al. (2001). The above described public goods experiment was clearly described to the subjects, who after a

14 We do not test for order effects and the reason is that the order we impose is natural in most cases, in the sense that we are interested in the effect of moving from a setting without a restriction (no minimum level) to a setting with a restriction. This is what typically happens in reality: a public goods problem is identified and a remedy is sought and implemented. Moreover, since subjects receive no feedback about others’ decisions during the experiment, we do not expect repetition per se to affect subjects’ contribution decisions between the two stages. See for example Neugebauer et al. (2009) for an experimental test of repetition without feedback using a standard linear public goods game.

15 The 15 villages in the household survey were selected on the basis of certain criteria, including the extent of forest cover, product diversity, and year and purpose of establishment of the community forestry program.

16 Randomization of treatments within a village was not feasible since the experiments had to be rolled out over the course of several days and thus mixing treatments within a village would risk that subjects learn about this variation.
number of comprehension questions completed both stages of the experiment. Subjects were informed that similar experiments had or would take place in other households in their village and that they would be randomly and anonymously matched against other household heads in their village. They were also informed that payments would be distributed on a specific date and that this procedure was the same for everybody else participating in the experiment.\textsuperscript{17} The enumerators were trained to carefully explain and demonstrate the structure of the experiment according to a script, and they knew the importance of doing so in a neutral manner.\textsuperscript{18} A total of 360 subjects participated in the experiment, 180 in each treatment.

IV. RESULTS

Table 1 presents descriptive statistics of the sample. As can be seen, about 90\% of the household heads are males and over 50\% are literate. Farming is the predominant activity for the households and the total size of parcels for own cultivation is slightly over 4 acres. When comparing the socio-economic characteristics between the treatments, there is no statistical difference based on non-parametric tests, except that subjects in the TAKE treatment are statistically significantly younger at the 5\% level (49.0 years vs. 46.0 years; Mann-Whitney U-test; $p = 0.03$). However, we do not consider this average difference of 3 years to be of any economic significance. Overall, the randomization of subjects into treatments seems to have worked well.

\textit{Insert Table 1 about here}

\textsuperscript{17} We established a credible procedure through the involvement of the Kebele leader in the organization of the experiments, and also by running the experiments, which were approved by the national government, through the Ethiopian Development Research Institute.

\textsuperscript{18} See the Supplementary material for a complete transcript of the instructions.
Next, we turn to the impact of framing on unconditional contributions. For ease of comparison, we will mostly refer to “contributions” also in the take frame, and by this we mean the effective contribution, i.e., \(10 - w\), where \(w\) is the amount withdrawn from the public account. The results are presented in Table 2. Subjects in the GIVE treatment contribute on average 5.02 birr out of the endowment of 10 birr, i.e., 50.2%, whereas the average contribution in the TAKE treatment is 40.0%. In standard one-shot linear public goods games, average voluntary contributions (and normally a give frame is used) usually range from 40% to 60% of endowments (see, e.g., Chaudhuri, 2011). The difference between the two treatments is significant at the 1% level (Mann-Whitney U-test; \(p < 0.01\)). We thus replicate the pattern of higher contributions in the GIVE frame using a non-standard subject pool, namely farmers in Ethiopia. Furthermore, we find a substantial difference across treatments in the share of subjects opting for free riding, by contributing nothing, and full contribution, respectively. In the GIVE treatment, 2.2% of the subjects contribute nothing and 7.8% contribute their full endowment. In the TAKE treatment, 19.4% opt to free ride and only 1.1%, i.e., two subjects, contribute the whole endowment. At both ends of the spectrum – zero and full contribution – there is a highly significant difference in proportions between the treatments (Chi-square tests; \(p < 0.01\) in both cases). The result that there are more free riders in the TAKE frame is also in line with previous studies in the framing literature (e.g., Andreoni, 1995; Park, 2000; Cox, 2015; Khadjavi and Lange, 2015).

RESULT 1. The average contributions are significantly higher and the proportion of free riders is significantly lower in the GIVE frame.
We implement a minimum level in both frames and the results are presented in Table 3. In the GIVE treatment, the minimum level has a negative effect on contributions: the average contribution decreases from 5.02 birr to 4.46 birr, i.e., by 0.56 birr, which corresponds to 5.6 percentage points in terms of the initial endowment, and this difference is significant at the 1% level (Wilcoxon signed-rank test; \( p < 0.01 \)). This is partially explained by an increased proportion of free-riders. Conversely, in the TAKE treatment the average contribution increases from 4.03 birr in the baseline to 4.74 birr after the introduction of the minimum level, which corresponds to a 7.1 percentage point increase (Wilcoxon signed-rank test; \( p < 0.01 \)). The contributions are significantly different between the two treatments at the 10% level (Mann-Whitney U-test; \( p = 0.08 \)).

\textit{Insert Table 3 about here}

RESULT 2. \textit{When a minimum level is introduced in the GIVE frame, contributions to the public good decrease significantly; in contrast, when a minimum level is introduced in the TAKE frame, contributions increase significantly. Thus, the framing has a substantial effect on the efficiency of minimum levels.}

We provide more detailed information regarding the effect of the minimum level in Table 4, which is a disaggregation of the results in Table 3. For the baseline contributions, subjects are split into three categories: below, at, and above the minimum level of 2 birr. For contributions in the second stage, i.e., when the minimum level is implemented, subjects are separated into those who precisely match the minimum level of 2 birr, and those who contribute above it. This results in six possible contribution profiles, and thus we can obtain richer information on how different groups of subjects react to the minimum level and how these reactions differ between the two
treatments. The top two rows of Table 4 make it clear that the effect along the extensive margin is much stronger in the TAKE treatment. Here, the minimum level has a direct effect on 22% of the subjects who contributed less than 2 birr in the baseline, compared with only 4% of the subjects in GIVE. Interestingly, however, in the TAKE treatment about half of the subjects who contributed less than 2 birr in the baseline, i.e., 10% of the total number of subjects in this treatment, substantially increase their contribution in the second stage, on average from 0.6% of the endowment in the baseline to 57.1% when the minimum level has been implemented. Hence, they are strongly crowded in. Looking at the bottom two rows of the table, we can see that the majority of subjects contribute more than 2 birr in the baseline in (89% in GIVE and 74% in TAKE). When the minimum level is introduced, some of these subjects reduce their contribution all the way down to the postulated minimum and this effect is similar across treatments. Still, the majority of subjects in both treatments voluntarily contribute above the imposed minimum level and herein lays the main source of difference between the treatments, since subjects in the GIVE treatment on average decrease their contributions whereas those in the TAKE treatment instead increase their contributions.

Insert Table 4 about here

Using the full sample, we summarize subjects’ reactions along the intensive margin by looking at the extent to which the average subject is crowded in, by voluntarily increasing their contribution, or crowded out, by voluntarily decreasing their contribution, when the minimum level is imposed. We calculate the average difference between subjects’ baseline contribution and their contribution when the minimum level has been imposed, counting only the contributions that are above 2 birr, which is the minimum level in both cases, but averaging over all subjects in each
treatment. Subjects in the GIVE treatment are crowded out by an average of 0.63 birr (Wilcoxon signed-rank test; \( p < 0.01 \)) while subjects in the TAKE treatment are crowded in by an average of 0.31 birr, yet this effect is only significant at the 10% level (Wilcoxon signed-rank tests; \( p = 0.08 \)). These two effects are statistically different from each other at the 1% level (Mann-Whitney U test; \( p < 0.01 \)), which means that subjects act differently along the intensive margin in GIVE and TAKE. Among the subjects who already contributed above 2 birr in the baseline, 56% are crowded out and 17% are crowded in in the GIVE treatment, whereas 38% are crowded out and 35% are crowded in in the TAKE treatment. The average crowding-out effect in GIVE within this subsample is 0.85 birr, which is significant at the 1% level (Wilcoxon signed-rank test; \( p < 0.01 \)). In the TAKE treatment, the crowding-in effect we found when looking at the full sample does not exist within this subsample and instead there is a weak but insignificant crowding-out effect of 0.19 birr (Wilcoxon signed-rank test; \( p = 0.49 \)).

RESULT 3. The minimum level significantly crowds out voluntary contributions to the public good in the GIVE frame but weakly crowds in contributions in the TAKE frame.

The other part of the public goods experiment elicited conditional contributions following Fischbacher et al. (2001). Subjects stated their contribution for each possible average contribution of the other group members and we can thus investigate the impact of framing and minimum levels on subjects’ contribution strategies. Figure 1 displays average conditional contributions in the baseline for both treatments. The positive slope suggests that subjects are on average conditional cooperators, i.e., they contribute more when the other group members contribute

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19 Mechanically, we follow Falk and Kosfeld (2006) and proceed as follows. First, baseline contributions below the minimum level are manually adjusted up to this level. Then we test whether the average difference between MCL and baseline contributions is different from zero using all subjects (the average difference is zero for contribution profiles in rows 1 and 3 of Table 4). A positive difference implies crowding in and a negative crowding out.
more, and we can see that the contribution schedule in the GIVE frame consistently lies above the schedule in the TAKE frame.

Insert Figure 1 about here

Figures 2 and 3 illustrate the main effect of introducing the minimum level. Interestingly, the minimum level seems to have little overall effect on subjects’ contribution strategies; only in TAKE and at low levels of others’ public good contributions is there a marked difference, but the schedules gradually converge.

Insert Figures 2 and 3 about here

Table 5 provides further information. Individual contributions are regressed on others’ average contribution, separately for each frame in the baseline and after the minimum level has been implemented. In column 1 we can see the result for the GIVE treatment in the baseline, where the significant slope estimate indicates that subjects on average increase their contribution with 0.52 birr for every birr that the others’ average contribution increases. Subjects are on average conditional cooperators and this effect is similar across all four columns, i.e. in each frame in the baseline and after the minimum level has been implemented. Comparing across columns 1 and 2, we can see that the main difference between the GIVE and TAKE treatments in the baseline is that the intercept is larger in the GIVE treatment, meaning that subjects contribute more in the GIVE treatment than in the TAKE treatment for a given level of others’ average contribution.

20 We report from OLS regressions in Table 5 but a Tobit model gives similar results.
21 Another way to investigate conditional cooperation is to look at the correlation between subjects’ unconditional contributions and their beliefs about others’ unconditional contributions, which is similar to the information we get from the contribution table except for the additional uncertainty that subjects face concerning the accuracy of their beliefs. Regressing unconditional contributions on beliefs yields a positive effect that is significant at the 1% level in three of the four treatment combinations (it is insignificant in the TAKE treatment with a minimum level).
The effect is most pronounced when no one else contributes anything to the public good (2.68 birr vs. 1.67 birr, i.e. a 10.1 percentage point difference in terms of initial endowments), and then gradually declines as the others contribute more and more. The strong framing effect regarding baseline contributions to the public good thus prevails when we assess subjects’ contribution strategies by allowing them to condition their contribution on the other group members’ contributions. When the minimum level has been implemented, we can see in columns 3 and 4 that the difference between frames have become smaller, amounting to a difference of only 0.3 birr between the estimated intercepts.

*Insert Table 5 about here*

RESULT 4. *The framing has a substantial impact on subjects’ contribution strategies. When subjects can condition their decisions on the other group members’ contributions, they contribute more in the baseline GIVE frame than in the baseline TAKE frame. The difference across frames is smaller when the minimum level has been introduced.*

Using the Fischbacher et al. design further enables us to classify subjects into contribution types following the convention introduced by these authors. We thus consider subjects as either conditional cooperators, free riders, hump-shaped contributors, or others. We define types as follows: conditional cooperators either have a weakly increasing conditional contribution schedule, or their Spearman’s rho (correlation with the others’ average contribution) is positive and significant at the 1% level; free riders always contribute the lowest amount allowed; hump-shaped contributors display a positive Spearman correlation up to their highest contribution, whereafter the correlation is negative (both correlations should be significant at the 1% level); others do not fit into any of these categories. The distribution of contribution types is displayed in
Tables 6 and 7. We can see that the distribution is stable: the baseline type distribution is not significantly different between the GIVE and the TAKE treatment (Chi-square test; $p = 0.12$), and, furthermore, 76% of subjects in the GIVE treatment and 74% in the TAKE treatment are classified as the same type in the baseline as in MCL (observations on the diagonal in either table).²²,²³

\textit{Insert Tables 6 and 7 about here}

RESULT 5. The distribution of contributor types is stable. Contributor type distributions do not differ significantly across frames in the baseline or within each frame with respect to the implementation of a minimum contribution level.

V. CONCLUSION

Contribution to public goods is an important issue for policy makers around the globe. In their role as policy makers, however, they have the possibility to act as choice architects. Two institutional factors that are feasible and easy to implement are whether or not to impose a low compulsory minimum level of contributions and also whether to frame public goods in terms of giving or taking, especially in rural parts of developing countries. These factors are more cost efficient to implement than other institutional features such as different forms of monitoring followed by punishment. Our focus is on the relevance for policy design and we conduct our

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²² Thus, in neither treatment is the distribution significantly altered following the introduction of a minimum contribution level (Chi-square tests; $p = 0.56$ in GIVE and $p = 0.17$ in TAKE).Nor do the MCL type distributions differ significantly between frames (Chi-square test; $p = 0.17$).

²³ We find similar effects as in Fosgaard et al (2014), namely that the proportion of conditional cooperators is lower in the take frame while the proportion of free-riders is higher.
public goods experiments as a lab-in-the-field experiment in rural Ethiopia. The objective of our paper is to investigate the interaction effects between minimum levels and framing.

We find a strong frame dependency in the efficiency of minimum levels. In the standard public goods experiment, the give frame results in significantly higher contributions than the take frame. When the minimum level is introduced, the contribution levels between the frames are reversed and the levels are significantly higher in the take frame. Cooperation is crowded out in the give frame but crowded in in the take frame. It is difficult to draw any conclusions regarding absolute contribution levels from a public goods experiment, as well as feasible minimum levels to be used outside a laboratory setting. The first consideration when imposing a minimum level is to identify a feasible level, which in most cases would be low to make sure that everyone can contribute at least the level imposed. It would for example be difficult to make it mandatory for people to work say 150 days on a road project or something similar. Our experimental design builds on this reasoning and hence we set a relatively low minimum level, which more precisely corresponded to 20% of the endowment. If a policy maker is concerned about the potential negative welfare effects of a minimum level, caused by strong crowding-out, she can set the minimum level at the average contribution level before the level was imposed. By construction, the policy-maker will then safeguard herself against negative welfare effects from the imposed minimum level. At the end of the day, the optimal minimum level for a specific situation has to be decided from case to case, where feasibility and crowding-out will be main concerns for the policy-maker when determining the level.

It is important that policy makers are aware of the possible interaction effects between minimum levels and framing when implementing programs for public goods. Some real-life cooperation problems exhibit aspects of the give frame whereas other problems instead resemble the take
frame. For example, the problem of labor contribution to a local public good can be considered a give frame, while the problem of over-harvesting from a local public good can be considered a take frame. Our results indicate that introducing minimum levels in order to curb underinvestment in local public goods is a more efficient policy in the take frame, despite the fact that individuals face the same underlying economic problem in both frames. Furthermore, this finding highlights the potential importance of framing lab experiments in accordance with the structural aspects of the real-life cooperation problem that the researcher is trying to address. This is a question of external validity and is highly relevant to the literature that examines institution formation, policy interventions, and the general impact of incentives on cooperation in public goods experiments, since these results almost exclusively rely on experiments using the give frame (rather than the take frame). In addition, changing the framing can sometimes be a policy tool in itself. Our results indicate that the success of a policy intervention, such as the introduction of minimum levels in public goods provision, can depend on the manner in which the situation is framed, e.g., whether cooperative behavior is encouraged by focusing on aspects of doing good or avoiding harm. To the extent it is possible, policy makers in the role as choice architect should thus use the best frame in a given context and for a given policy intervention.

Framing and minimum levels are cheap and easy-to-implement local-level policy options, and they could be especially important in situations with comparatively weak centralized formal institutions or when funds for monitoring and enforcement are limited, e.g., local environmental problems in developing countries. However, a potential drawback with a minimum level is the substantial heterogeneity in subjects’ reactions to it. It is important to acknowledge the fact that the high proportion of free riders found in experiments using students as subjects has not been replicated to the same extent using non-student samples, making the case for pure efficiency gain
of a minimum level weaker but a negative effect of crowding out more likely. We find a high share of conditional cooperators, which policy makers need to account for in their choice of policy instruments. For example, Rustagi et al. (2010) and Kosfeld and Rustagi (2015) implement novel experiments in rural Ethiopia and document the importance of conditional cooperation for successful management of forest commons. By using the design in Fischbacher et al. (2001), our study together with those two papers and the study by Fosgaard et al. (2014) also contribute to improve our knowledge about people’s cooperative preferences in non-student subject pools. To sum up, by carefully choosing a feasible minimum level combined with framing, policy makers can in their role as choice architects implement policies resulting in significantly higher provision of public goods, which is potentially most prominent in a developing country context.
REFERENCES


### TABLE 1

Descriptive statistics of subjects (household heads) separated by treatment

<table>
<thead>
<tr>
<th></th>
<th>GIVE</th>
<th>TAKE</th>
<th>( H_0: ) No difference between GIVE and TAKE (( p )-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>49.0</td>
<td>46.0</td>
<td>0.03(^a)</td>
</tr>
<tr>
<td>Male</td>
<td>87.2%</td>
<td>90%</td>
<td>0.40(^b)</td>
</tr>
<tr>
<td>Can read and write</td>
<td>51.1%</td>
<td>50.6%</td>
<td>0.92(^b)</td>
</tr>
<tr>
<td>Farming is main activity</td>
<td>91%</td>
<td>91%</td>
<td>0.86(^b)</td>
</tr>
<tr>
<td>Trust Kebele</td>
<td>2.51</td>
<td>2.46</td>
<td>0.56(^a)</td>
</tr>
<tr>
<td>Off-farm labor</td>
<td>23%</td>
<td>28.3%</td>
<td>0.23(^b)</td>
</tr>
<tr>
<td>Household size</td>
<td>7.0</td>
<td>6.8</td>
<td>0.40(^a)</td>
</tr>
<tr>
<td>Parcel size (acres)</td>
<td>4.56</td>
<td>4.17</td>
<td>0.38(^b)</td>
</tr>
<tr>
<td>Has savings</td>
<td>19.4%</td>
<td>23.3%</td>
<td>0.37(^b)</td>
</tr>
<tr>
<td>Remittances</td>
<td>7.8%</td>
<td>10.6%</td>
<td>0.36(^b)</td>
</tr>
<tr>
<td>Observations</td>
<td>180</td>
<td>180</td>
<td></td>
</tr>
</tbody>
</table>

*Note: *\(^a\) Mann-Whitney U test. \(^b\) Chi-square test. **Trust Kebele:** Kebele is the smallest administrative unit in Ethiopia and the question is phrased, “Most people who live in your Kebele can be trusted” (1 = agree fully, 5 = disagree fully); **Off-farm labor:** at least one household member worked off the farm at least once during last year; **Parcel size:** the size of the household’s land used for own cultivation; **Remittances:** the household received a remittance during last year.
<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Contributes nothing</th>
<th>Contributes everything</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIVE (n = 180)</td>
<td>5.02 (2.15)</td>
<td>2.2%</td>
<td>7.8%</td>
</tr>
<tr>
<td>TAKE (n = 180)</td>
<td>4.00 (2.44)</td>
<td>19.4%</td>
<td>1.1%</td>
</tr>
<tr>
<td>p-value</td>
<td>&lt; 0.01&lt;sup&gt;a&lt;/sup&gt;</td>
<td>&lt; 0.01&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt; 0.01&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*Note:* Standard deviations in parentheses. *n* = number of subjects. <sup>a</sup> Mann-Whitney U test. <sup>b</sup> Chi-square test.
<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>MCL</th>
<th>Difference</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GIVE (n = 180)</strong></td>
<td>5.02 (2.15)</td>
<td>4.46 (1.98)</td>
<td>-0.56</td>
<td>$&lt; 0.01^b$</td>
</tr>
<tr>
<td><strong>TAKE (n = 177)</strong></td>
<td>4.03 (2.44)</td>
<td>4.74 (2.06)</td>
<td>+0.71</td>
<td>$&lt; 0.01^b$</td>
</tr>
</tbody>
</table>

**Note:** Standard deviations in parentheses. $n =$ number of subjects. $^a$ Mann-Whitney U test. $^b$ Wilcoxon signed-rank test (H$_0$: Difference $=$ 0). Three subjects in the TAKE treatment report unfeasible contributions in MCL and we thus exclude them from the analysis.
<table>
<thead>
<tr>
<th>Contribution profile (Baseline, MCL)</th>
<th>GIVE</th>
<th></th>
<th></th>
<th>TAKE</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;2, =2)</td>
<td>(2%)</td>
<td>0.33</td>
<td>2.00</td>
<td>(12%)</td>
<td>0.14</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>(&lt;2, &gt;2)</td>
<td>(2%)</td>
<td>0.50</td>
<td>3.75</td>
<td>(10%)</td>
<td>0.06</td>
<td>5.71</td>
<td></td>
</tr>
<tr>
<td>(=2, =2)</td>
<td>(4%)</td>
<td>2.00</td>
<td>2.00</td>
<td>(2%)</td>
<td>2.00</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>(=2, &gt;2)</td>
<td>(3%)</td>
<td>2.00</td>
<td>4.50</td>
<td>(2%)</td>
<td>2.00</td>
<td>6.00</td>
<td></td>
</tr>
<tr>
<td>(&gt;2, =2)</td>
<td>(8%)</td>
<td>4.90</td>
<td>2.00</td>
<td>(10%)</td>
<td>5.82</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>(&gt;2, &gt;2)</td>
<td>(81%)</td>
<td>5.60</td>
<td>4.90</td>
<td>(64%)</td>
<td>5.21</td>
<td>5.56</td>
<td></td>
</tr>
</tbody>
</table>

Note: The share-of-subjects columns show the frequency of subjects who contributed according to the profile described in column one. The cells show the average contribution to the public good in the baseline and in MCL among subjects who behave according to this pattern, for GIVE and TAKE, respectively.
TABLE 5
Effect of framing and minimum level on cooperative preferences (OLS regression)

<table>
<thead>
<tr>
<th>Dependent variable: cond. contribution</th>
<th>Baseline</th>
<th>MCL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Give (1)</td>
<td>Take (2)</td>
</tr>
<tr>
<td>Constant</td>
<td>2.68 (0.16)***</td>
<td>1.67 (0.19)***</td>
</tr>
<tr>
<td>Others</td>
<td>0.52 (0.03)***</td>
<td>0.58 (0.03)***</td>
</tr>
<tr>
<td>Observations</td>
<td>1947</td>
<td>1969</td>
</tr>
<tr>
<td>- Clusters</td>
<td>177</td>
<td>179</td>
</tr>
<tr>
<td>Chow test (p-value) ^a</td>
<td>&lt; 0.01</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

Note: Robust standard errors clustered on individuals (in brackets). Others is the average contribution of the others in the group. The dependent variable is individual i’s conditional contribution. *** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. We exclude four subjects in the Baseline and sixteen in MCL since they either did not fill out the contribution table or reported unfeasible contributions. ^a The test statistics for the Chow test are F(2,355) = 9.94 and F(2,343) = 5.02 for Baseline and MCL, respectively.
TABLE 6
Distribution of contribution types in GIVE (n = 168)

<table>
<thead>
<tr>
<th>Baseline</th>
<th>MCL</th>
<th>Min-level (“free riders”) (=2)</th>
<th>Hump-shaped</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditional cooperators</td>
<td>56.55%</td>
<td>1.19%</td>
<td>0.00%</td>
<td>9.52%</td>
<td>67.26%</td>
</tr>
<tr>
<td>Free riders (=0)</td>
<td>0.00%</td>
<td>0.60%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.60%</td>
</tr>
<tr>
<td>Hump-shaped</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.19%</td>
<td>1.19%</td>
</tr>
<tr>
<td>Others</td>
<td>0.60%</td>
<td>0.60%</td>
<td>1.79%</td>
<td>19.05%</td>
<td>30.95%</td>
</tr>
<tr>
<td>Total</td>
<td>66.07%</td>
<td>2.38%</td>
<td>1.79%</td>
<td>29.76%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: Type definition follows Fischbacher et al. (2001). Conditional cooperators: increasing schedule or positive Spearman’s rho (correlation with others’ average contribution) at 1%; Free riders: contribute the lowest amount allowed; Hump-shaped: positive (negative) Spearman correlation at 1% up to (beyond) their highest contribution. Twelve subjects in this treatment report unfeasible conditional contributions after the introduction of the minimum level and are therefore excluded from the analysis.
### Table 7

Distribution of contribution types in TAKE ($n = 172$)

<table>
<thead>
<tr>
<th>MCL</th>
<th>Baseline</th>
<th>Conditional cooperators</th>
<th>Min-level (&quot;free riders&quot;) (=2)</th>
<th>Hump-shaped</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conditional cooperators</td>
<td>47.09%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>13.37%</td>
<td>60.47%</td>
</tr>
<tr>
<td></td>
<td>Free riders (=0)</td>
<td>1.16%</td>
<td>1.74%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>2.91%</td>
</tr>
<tr>
<td></td>
<td>Hump-shaped</td>
<td>1.74%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>2.33%</td>
<td>4.07%</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>5.23%</td>
<td>0.58%</td>
<td>1.16%</td>
<td>25.58%</td>
<td>32.56%</td>
</tr>
</tbody>
</table>

**Note:** Type definition follows Fischbacher et al. (2001). Conditional cooperators: increasing schedule or positive Spearman’s rho (correlation with others’ average contribution) at 1%; Free riders: contribute the lowest amount allowed; Hump-shaped: positive (negative) Spearman correlation at 1% up to (beyond) their highest contribution. Eight subjects in this treatment report unfeasible conditional contributions after the introduction of the minimum level and are therefore excluded from the analysis.
FIGURE 1
Average conditional contributions in the baseline (separated by treatment)

Note: One subject in the GIVE treatment and three subjects in the TAKE treatment either did not complete the contribution table or reported unfeasible numbers. These four subjects are excluded from the analysis.
FIGURE 2

Average conditional contributions in GIVE (n = 168)

Note: Twelve subjects in this treatment reported unfeasible conditional contributions after the introduction of the minimum level and are therefore excluded from the analysis.
FIGURE 3
Average conditional contributions in TAKE ($n = 172$)

Note: Eight subjects in this treatment reported unfeasible conditional contributions after the introduction of the minimum level and are therefore excluded from the analysis.