Impacts of Community-Level Conservation Incentives Across Diverse Institutional Landscapes*

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Abstract

Conservation incentives often target communities with diverse institutions and capacities for cooperation. We implement an online experiment (N = 1,010) using a modified public-goods game to examine how pre-existing institutions influence the impact of incentives. To reflect resource monitoring costs, we limit individuals' information about peer contributions and thus their ability to raise cooperation through peer punishment. Our 2×2 design staggers two treatments. First, a forum in which costly voluntary participation reveals participants' information about contributions. Second, temporary community payments that reward "additional" contributions above the group's pre-payment baseline. Our findings show that average contributions rise by 18% with a forum and 11% with payments. Access to the forum does not significantly raise the effectiveness of payments. Crucially, when the temporary payments end, contributions do not fall below the pre-intervention baseline. For groups with high initial cooperation, contributions remain significantly above their original baseline even after incentives are removed — a form of "crowding in".

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1 Introduction

External incentives for forest or biodiversity conservation, such as Payments for Ecosystem Services (PES), increasingly target communities rather than individuals. Collective payments may be driven by high transaction costs or communal resource ownership (Rights and Resources Initiative 2022). However, they pose a significant challenge: communities differ widely in their pre-existing institutions and capacity to provide public goods. While most existing research and policy designs treat groups as homogeneous, we investigate whether the effectiveness of external group-level incentives depends on a group's pre-existing institutional landscape and, by extension, whether group-based incentives should be targeted according to pre-existing institutions or paired with institution-building.

Thus, we examine how the effectiveness of group-level incentives for public-goods provision depends on pre-existing institutions, using a staggered 2×2 public-goods design. All groups start with limited information on peers' contributions and thus limited ability to punish free-riding. We then assign half of the groups to a Forum (like a community council), a costly voluntary institution in which attendees share all their information on contributions to facilitate targeted punishment of free-riders. Finally, we cross-randomize temporary external payments for "additionality", which reward groups for contributions above their pre-payment baselines. We find that the Forum and group payments each increase public-goods provision (by 18% and 11% respectively). Furthermore, the temporary incentives do not lead to "crowding out"; post-payment contributions never fall below those of the comparison group. Instead, a heterogeneity analysis shows evidence of "crowding in" among groups with high baseline cooperation levels, where contributions remain significantly above pre-intervention levels even after the group incentives are withdrawn.

Our pre-registered experiment[1] is a linear public goods game with punishment, modified to reflect the high monitoring costs typical of environmental resource management. To replicate these constraints, we limit group members' ability to observe each other: each participant automatically and costlessly observes the contribution of only one other group member, as well as the group's total contribution. This partial information design mirrors the informational constraints found in diverse resource management contexts. For example, on forest frontiers, monitoring tree-cutting or charcoal production is hindered by sparse social and geographic networks. Similarly, individual emissions in inland waterways and extraction levels from global fisheries are often hidden from public view.

The kind of information constraint we consider should reduce groups' ability to enforce cooperation using punishment. While a group member may choose to punish another — paying a cost to reduce the peer's payoff — the limited information on contributions makes it difficult to target free-riders effectively. Partial information with some capacity to punish

[1] The pre-analysis plan is available at https://osf.io/k5z8c.

offers one realistic middle way between two established extremes in the public-goods literature. On the one hand, complete information about each member's contribution, plus the ability to punish, typically yields close-to-full cooperation (Fehr and Gächter, 2000).[2] On the other hand, the absence of information or the inability to punish generally leads to a steady decline in public-goods contributions (Balliet et al., 2011).

Our experiment contains four parts. In Part 1, all randomly formed groups of five participants play our baseline public goods game with punishment but limited information in a fixed-matching protocol. The groups develop stable group contributions over 8 rounds of play in Part 1. Parts 2-4 introduce or remove specific institutional and monetary treatments to randomly selected groups in a staggered 2×2 design.

In Part 2, half of the groups are randomly selected to receive access to a forum, an information-sharing institution that mimics the function of village councils. Entry to the forum is voluntary but carries a cost, reflecting the real-world investments of time and transport required to participate in local governance. At the forum, each attendee truthfully reveals their own contribution and the contribution of the member they observed to all other attendees. This information sharing is designed to facilitate the targeted punishment of free-riders, thereby strengthening cooperation (Balliet et al., 2011). Our forum is distinct from standard experimental communication because it is designed to isolate the role of information from other social functions, such as persuasion, promise-making, or identity-building. By requiring participants to incur a cost to reveal only verifiable information, we avoid the confounding effects of "cheap talk" and ensure that any observed changes in behavior can be attributed specifically to the provision of information rather than mutual reassurance or social pressure. We also impose a minimal cost to understand whether costly information revelation could function as a signal of cooperative intent, something hitherto unexplored in this literature.

In Part 3, we cross-randomize monetary incentives for public goods provision in the form of group-level payments. To mirror the policy goal of "additionality," these incentives reward only those contributions that exceed a group's pre-payment baseline. Specifically, the payments equate to a doubling of the Marginal Per Capita Return (MPCR) for all contributions above that threshold. By rewarding only performance above the status quo, we simulate the logic of performance-based conservation contracts. These group-level payments are provided by the experimenter to internalize the positive externalities—such as biodiversity or carbon sequestration—that additional conservation efforts provide to global society. By increasing the return on contributions above the status quo, the incentives represent the value an external beneficiary places on "additional" conservation. We do not explicitly model the interaction between our experimental groups and the external beneficiaries. Instead, we take the external payments as given and analyse how they affect group dynamics and behaviour.

[2] Fehr and Gächter (2000) report that 82.5% of participants contribute their whole endowment in the final experimental round under punishment, while 53% of the same participants free-ride fully under no punishment.

Our experimental payments are temporary, reflecting the reality that many Payment for Ecosystem Services programs end by design or due to (funding) shocks. Therefore, in Part 4, we remove all incentives for "additional" contributions to examine whether prior experience with payments has lasting impacts on behavior. This allows us to test if external monetary incentives strengthen ("crowd in") or erode ("crowd out") non-monetary motivations for cooperation once the incentive is withdrawn. The literature remains unresolved on this point. Depending on the context and underlying behavioral mechanisms, conservation cooperation may be bolstered or displaced by the introduction (and subsequent removal) of monetary incentives (Gneezy et al., 2011; Moros et al., 2022).

We conducted the experiment online with 1,010 participants recruited from Prolific and the University of Exeter. We randomly assigned each participant to a group of five, then randomly assigned each group to one of our experimental design's four sequences that results from our staggered 2×2 design: *Baseline Only* – never adding the forum or payments to the baseline public-goods game with partial information and punishment; *Forum Only* – information-sharing forum available in Parts 2-4; *Payments Only* – group-level incentives for additional contributions are introduced in Part 3, then removed in Part 4; and, finally, *Forum Plus Payments* – combining the Forum Only and Payments Only institutions. This structure allows us to identify the interaction between pre-existing local governance in the form of the forum and temporary external incentives, mirroring the real-world scenario where global environmental funding is introduced to communities with varying institutions.

In Part 1 (the baseline game), participants contributed an average of 55% of their endowment (11 of 20 tokens), suggesting that partial information and peer punishment are sufficient to sustain moderate cooperation. Crucially, groups that played the baseline game throughout the experiment exhibited stable contribution levels after Round 8. This indicates that enduring cooperation was established by the end of Part 1, providing a robust counterfactual for evaluating subsequent interventions.

The voluntary and costly forum resulted in substantial information sharing. Sixty percent of participants utilized the forum in its initial round, increasing the average number of group members whose contributions are observed from 1.0 to 2.4 per person. This improved monitoring capacity significantly increased targeted punishment of free-riders. Consequently, the forum facilitated a stable increase in contributions of 18% (over 2 tokens) and a reduction in within-group variance of both contributions and beliefs. These results suggest that the forum enabled groups to converge toward more ambitious cooperation norms. Once these higher norms were established, costly information sharing and punishment became largely redundant, as evidenced by a significant decline in forum attendance over time, but persistently elevated contributions.

Exogenous group-level payments raised average contributions by 11%. This effect is driven by a shift in beliefs: the announcement of payments immediately raised expected peer con-

tributions by 13–19%, a shift that was subsequently realized in actual behavior. In terms of mechanisms, it is noteworthy that punishment did not rise with payments, even though (i) payments imply more money is available for punishing; (ii) stakes for cooperation are higher when payments reward additional contributions; and (iii) inequality consequences of free-riding are greater. Our findings do not suggest that collective payments are significantly more effective for groups with access to the forum.

After payments ended, contributions returned to no-payment levels in the aggregate. An explanation for no durable impact is that a key mechanism is beliefs and, on average, beliefs about others' contributions after payments ended matched no-payments levels. The effect of payment removal is not moderated by access to the forum.

We conduct a heterogeneity analysis exploring how the impact of our interventions depends on a group's baseline cooperation. In Part 1 (Rounds 1–8), groups developed stable but varied contribution patterns. While these contributions remained remarkably consistent within each group over time, they differed significantly between the randomly formed groups. This experimental baseline thus effectively replicates the real-world heterogeneity in community capacities to manage common-pool resources described by Ostrom (1990).

We use the distribution of group contributions in Round 8 — prior to any intervention— to categorize our groups in terms of their baseline contribution levels[3]: 'Low' for the groups with the lowest third of contributions (averaging 5 ECU); 'Medium' for those in the middle tercile (averaging 10 ECU); and 'High' for the groups with the highest third of contributions (16 ECU). Because the subsequent Forum and Payment treatments were randomly assigned, we can identify how baseline cooperation moderates the causal effect of those interventions.

We find that both the forum and the payments successfully increased contributions across all baseline cooperation terciles, with no statistically significant differences in treatment effects between them. However, baseline cooperation becomes critical once payments are withdrawn. While contributions in the Low and Medium cooperation groups returned to no-payment levels, the High cooperation groups sustained contributions above baseline. Consequently, we find no evidence of "crowding out" resulting from monetary incentives; rather, we observe evidence of "crowding in" —or persistent cooperation— within groups that possessed strong pre-existing cooperation.

The paper is structured as follows. Section 2 highlights how our study adds to the literature. Section 3 describes our experimental design and hypotheses. Pre-specified empirical strategies and outcomes of interest are explained in Section 4. Section 5 discusses the effects of the forum, group payments and their interaction. Section 6 shows that groups develop stable contributions in the first part of the experiment and shows how the effects of the forum and payments depend on baseline contributions. Section 7 concludes.

[3]We expected that after eight rounds, many groups would settle into a steady level of cooperation.

2 Contributions to the literature

We study how varying the information about others' contributions affects the effectiveness of punishment to sustain cooperation in groups. We deviate from work where participants have complete information (Fehr and Gächter, 2000) or only noisy signals about others' contributions (Grechenig et al., 2010; Ambrus and Greiner, 2012) before they decide whether to punish. Group members initially learn about the contributions by only one other member.

Consistent with this focus on limited information, we then introduce a voluntary (but costly) forum for information-sharing within a group. The forum serves three purposes. First, it facilitates cooperation by revealing individual contributions. This builds on work showing that transparency of contributions is associated with higher cooperation in social dilemmas (Fiala and Suetens, 2014). Second, since participation is costly, only cooperative types should enter the forum, thereby making it an effective signal of cooperative intent. To our knowledge, our study is the first to examine this signalling mechanism; prior research has primarily studied cooperative intentions via "cheap talk" (e.g., Fonseca and Normann, 2012; Feltovich and Grossman, 2014). Furthermore, our forum rules out many functions that have been identified with verbal communication, such as reassurance and rapport-building (Crawford, 1998). Finally, by allowing cooperators to signal their type, the forum also identifies free-riders. In doing so, it facilitates the endogenous coordination of altruistic punishment, which, to the best of our knowledge, is also an innovation in the literature.

Our Forum advances the literature on costly monitoring of peer contributions by shifting the institutional logic from deterrence to a coordination-and-signaling device. Our design departs from Nicklisch et al. (2021), in which participants receive noisy signals for all contributions and choose whether to monitor *prior* to the contribution stage. In their setting, monitoring serves as a threat of punishment. In contrast, our monitoring takes place *after* the contribution stage. Since only those who pay to attend the Forum learn the identities and actions of other attendees, participation itself becomes a credible signal of cooperative intent. Our Forum also differs from the endogenous monitoring frameworks in DeAngelo and Gee (2020). Their mechanism relies on probabilistic detection of contributions (66.6%) and limits punishment to individuals with the lowest contribution. In contrast, our Forum offers informational certainty, and our participants could punish all others, including group members whose contributions are unknown.

There is a related literature on public goods in which players can only observe the contributions of those with whom they share a link in a network (Boosey and Isaac, 2016, Carpenter, 2007, Carpenter et al., 2012, Leibbrandt et al., 2015). Importantly, in these designs, the information network is fixed, and players can only punish (a subset of) the participants they can observe. With the exception of Carpenter (2007), the four-player nature of the public good game studied by these papers means that players could recover information about the

unobserved player in the network, since they knew their own contribution, that of two others and the total. Our design has a more severe informational constraint than the aforementioned studies: a player can only recover information about an unobserved player if two other players whose contributions are unobserved join the forum, while at the same time allowing for punishment of any unobserved player. Furthermore, our environment is one in which the initial information network is sparse (a directed circle), with endogenous and costly link formation.[4]

This literature finds that the difference in cooperation between the full information benchmark with unrestricted punishment and more limited information setups, like the circle network, is not large and is not statistically significant. We complement this literature by finding that costly, endogenous monitoring networks (while keeping punishment unrestricted), are able to boost cooperation levels significantly. Furthermore, we find that players do not need to rely on information gathering to achieve higher cooperation. Our data suggest that participants signal cooperative intent by entering the forum, and are able to coordinate on a higher cooperation level after a short number of rounds in which they employ the forum, and sustain cooperation without using it thereafter.

The forum serves as a stylized laboratory analog for the community resource monitoring interventions evaluated in recent randomized controlled trials (Slough et al., 2021; Eisenbarth et al., 2021). We find that forum access significantly increases contributions to the public good, mirroring the positive conservation outcomes observed in the field. By studying how this costly information-sharing interacts with external financial incentives, we provide a more rigorous test of institutional complementarity than is possible in the field.

The literature on PES has identified the importance of pre-existing norms and (governance) institutions in supporting voluntary adoption and program success in group-level PES schemes (Kotchen and Segerson, 2020; Segerson, 2022). However, systematic field evidence on the role and importance of institutions is scarce.[5] Our paper therefore fills an important knowledge gap. Our focus on heterogeneity in pre-intervention contributions builds on research that studies how social capital impacts the ability of communities to coordinate contributions to collective goods (Narloch, Pascual, and Drucker, 2012; Pfaff and Velez 2011; Pfaff, et al., 2018). Pfaff et al. (2019) find that past histories of cooperation between upstream and downstream users of Mexican watersheds predict cooperation levels in lab-in-the-field PES experiments. Our work is related to Kaczan et al. (2017) who study collective incentives to provide a public good subject to an additionality constraint. They focus on an exogenous target which may be above or below a group's historical mean, and penalize contributions below target. We explicitly condition on past contributions and reward contributions above that

[4] In McMahan (2021), players can form bilateral punishment links in a complete information linear public good game. However, link formation in his design is either free or subsidized, while it is costly in ours.

[5] For PES, see surveys by Samii et al. 2014, Kerr, Vardhan, and Jindal 2014, Hayes et al. 2019, Wunder et al. 2020, Engel 2016. Pfaff and Robalino 2017, Pirard et al. 2019, and Borner et al. 2020 examine conservation programs.

(endogenous) level. Like us, Kaczan et al. (2017) find that conditional incentives are effective in increasing cooperation. Our innovation is the introduction of institutions for information sharing, while Kaczan et al. (2017) study the effect of veto rights over the conditionality condition itself.[6]

Finally, we contribute to the literature on payments removal — an important practical consideration, as in reality, most payments for ecosystem services programs eventually end. Post-payments effects are one consideration of "dynamic effects" or temporal spillovers, as in Pfaff and Robalino (2017). Hypotheses about motivational crowding posit that external financial incentives can fundamentally reshape intrinsic motivations, leading to lasting shifts in cooperative behavior that persist even after the incentives are withdrawn (see Muradian, 2013; as well as surveys by Ezzine-de-Blas, Corbera, and Lapeyre, 2019; Rode, Gómez-Baggethun, and Krause, 2015; and Grillos et al., 2019; Handberg and Angelsen, 2019; Kaczan et al., 2017; Kolinjivadi et al., 2019; Moros, Vélez, and Corbera, 2019; Moros et al., 2022 for lab-in-field experiments with relevant populations). We see no 'crowding out' of public-good contributions. We do find novel evidence of 'crowding in' in groups with high initial contributions.

3 Design and Hypotheses

3.1 Experimental Design

3.1.1 Baseline

We employed a modified version of the linear public-goods game with costly peer punishment (Fehr and Gächter, 2000). We randomly assigned each participant to a group of five, which was fixed thereafter. Each participant started each round with 20 Experimental Currency Units (ECUs) to keep or contribute to a public good that equally benefits all group members.

One modification to the standard setup for such public-goods games is our belief elicitation. Prior to contributing, each group member was asked to report their expectations about the total contributions made by the other four members of the group. We incentivized beliefs by paying 1 ECU at the end of the round if this belief was correct (0 otherwise). These beliefs allow us to compute a measure of contribution norms combining belief and contribution data.

Our significant modification to the standard public goods game was the limited observability of individual members' contributions in any group. Specifically, after contributions are made, each group member learns the group's total contributions, individual payoffs from the public good (40% of the total), and the contribution by one other group member. Participants knew they would observe the contribution by the same group member throughout

[6]Related lab-in-field studies for collective incentives include Pfaff, Rodriguez and Shapiro-Garza (2019), while the conceptual distinctions around different policy instruments used in group incentive schemes are noted in Kotchen and Segerson (2018), Kotchen and Segerson (2020), and Segerson (2022).

the game. They also knew that one group member – always the same – would observe their contributions. This setup contrasts with previous designs with complete or no information.

Our model of limited observability represents the spatially and socially sparse networks typical of frontier resource management, where monitoring costs are high, and peer oversight is incomplete. Limiting each member to observing only one other group member also generates significant strategic value from information sharing. If individuals each observed two other group members, for instance, then two members sharing information would know at least four contributions, making the information-sharing forum (explained below) too effective.

Participants could spend any amount, from their remaining endowments plus their payoffs from the public good, to reduce the payoff of any other member, whether or not they know that member's contribution. Every ECU spent on punishment reduced that other's payoff by 3 ECU. Thus, player i's payoff in our Baseline game, given their contribution c_i, is given by:

$$\pi_i = \max\left\{0, E - c_i + b\sum_j c_j - r\sum_{j\neq i} p_{ji}\right\} - \sum_{i\neq j} p_{ij} \tag{1}$$

where $E = 20$ is the endowment, $b = 0.4$ is the marginal per capita return (MPCR) to the public good, c_i is the PG contribution by player i, p_{ij} is punishment units sent to i by j, and $r = 3:1$ is the ratio of the costs of punishment points to those receiving points.

Without information-sharing, limited observability may limit the impact of punishment. Subjects could infer the average contribution of those they cannot observe, and if that average is below the group average, it could be grounds for punishing all other group members. However, given variance in contributions, that might well include punishment of a contributor. This, too, is a realistic feature of commons dilemmas: even though agents have the means to punish, when they cannot observe all behavior, they are unsure if punishments are warranted.

Our design consists of four sequences of experimental manipulations (see Table 1). Each experimental sequence consisted of four parts, each of which involved multiple rounds. Subjects read instructions before starting each part. Part 1 had 8 rounds and all groups played the Baseline game in Part 1. Parts 2-4 had six rounds and introduced or removed institutions, as described below. Groups were randomly allocated to one of those experimental sequences.

3.1.2 Forum

In some of our experimental sequences, we provided groups a costly option for group members to share information about other group members' contributions, prior to punishment decisions. Each could access a forum at a fixed cost. All who did so truthfully revealed to all those in the forum their own contribution as well as the contribution of the member they observed. So, those who chose to attend the forum could identify those who attended and how much

Table 1: Experimental Design

	Part 1	**Part 2**	**Part 3**	**Part 4**	
Rounds	1-8	9-14	15-20	21-26	N
Baseline Only	Baseline	Baseline	Baseline	Baseline	(52, 260, 6515)
Forum Only	Baseline	Forum	Forum	Forum	(50, 250, 6330)
Payments Only	Baseline	Baseline	Payments	Baseline	(51, 255, 6515)
Forum Payment	Baseline	Forum	Forum & Payments	Forum	(51, 255, 6495)

Notes: We lost some decision rounds due to a few of the participants experiencing internet connection issues. The numbers in the last column indicate the numbers of groups, of subjects, and of individual decisions.

they contributed. Those who did not attend could not find out who attended.

Our forum is a pared-down version of real institutions where information sharing occurs —in informal community forums or formal assemblies— before community decisions. We opted for a design in which deception was not possible in order to ascertain the effect of information sharing on cooperation, similar to the literature on social networks (although using a centralized institution, as opposed to bilateral links). We also decided to impose a minimal cost to understand whether costly information revelation could function as a signal of cooperative intent, something hitherto unexplored in this literature.

With the forum, the payoff function changes to equation 2 below, where $F_i = 1$ if a group member i attended the forum ($F_i = 0$ otherwise, $f = 1$ is the cost of forum attendance):

$$\pi_i = \max\left\{0, E - c_i + b\sum_j c_j - f \cdot F - r\sum_{j\neq i} p_{ji}\right\} - \sum_{i\neq j} p_{ij} \tag{2}$$

3.1.3 Payments

In some sequences, groups could earn collective payments for "additional" contributions exceeding their pre-payment baseline, H_g. This baseline, defined as $H_g = \sum_{j\in g} c_j$, equals the group's contribution in Round 14, the final round before payments are introduced. For contributions above H_g, external payments increased the marginal per capita return (MPCR) from 0.4 to 0.8. This design mirrors many real-world conservation contracts, which reward improvements relative to a verified status quo.

Using a group-specific threshold rather than a uniform one, we ensure that the marginal incentive for additional (beyond-H_g) contributions is identical for all groups, regardless of their initial performance. A uniform threshold (H) would have introduced significant asymmetries: groups starting below H would face an MPCR of 0.4 on their initial improvements, whereas groups already above H would receive higher payments for "business-as-usual" contributions

that were not truly additional. Our group-specific threshold H_g avoids such asymmetries in the incentives for contributions.

Crucially, these payments represent the internalization of positive externalities—such as carbon sequestration or biodiversity preservation—that local conservation efforts provide to the wider global society. While our design does not include passive "bystanders", the experimenter acts as a proxy for these external beneficiaries. By doubling the MPCR for additional contributions, we simulate a Payment for Ecosystem Services mechanism that funnels global spillovers from additional conservation back to the local group. The external payments make the marginal social value of conservation tangible within the payoff structure.

Our primary analytical focus is not the strategic bargaining between local communities and external beneficiaries, but rather how the local institutional landscape — specifically baseline cooperation and the option to share information — moderates the effectiveness of payments. This focus on internal group dynamics is a prerequisite for effective policy targeting.

The payoff functions with payment, without and with a forum, are in Equations 3 and 4:

$$\pi_i = \max\left\{0, E - c_i + b\sum_j c_j - r\sum_{j\neq i} p_{ji}\right\} - \sum_{i\neq j} p_{ij} + h \cdot t \cdot \left(\sum_j c_j - H_g\right) \tag{3}$$

$$\pi_i = \max\left\{0, E - c_i + b\sum_j c_j - f \cdot F - r\sum_{j\neq i} p_{ji}\right\} - \sum_{i\neq j} p_{ij} + h \cdot t \cdot \left(\sum_j c_j - H_g\right) \tag{4}$$

where, adding to expressions above, h is an indicator that a group additionality payment was triggered ($h = 1$ if $C = \sum_j c_j \geq H_g$, else $h = 0$) and $t = 0.4$ is MPCR's rise for the additional contributions beyond a group's own baseline H_g. Thus, the last part of the payoff function, $h \cdot t \cdot \left(\sum_j c_j - H_g\right)$, reflects any additional transfers made under these collective payments. As is the case for the public good itself, all group members benefit equally from the payments.

3.1.4 Payments Removal

Reflecting limited budgets and shifting criteria for many actual PES programs, which end due to various types of shocks or as an intentional element of their designs, our payments for additional contributions were temporary. They lasted for only the 6 rounds within Part 3. When the payments for additional contributions are removed, the payoff function for groups with a forum is in Equation 2, while payoffs for groups without a forum are in Equation 1.

3.1.5 Sequences

As per Table 1, our design consists of four sequences of experimental manipulations. Each one consisted of four parts: Part 1, i.e., our Baseline, was 8 periods long; while Parts 2 to 4 were each 6 periods long. Each group was randomly assigned to one experimental sequence.

Part 1 establishes a baseline, characterized by punishment and limited observability. Within this setting, distinct contribution norms emerge organically, allowing the experiment to capture the 'commons-use' heterogeneities observed in real-world communities (Ostrom, 1990) and maintaining 'parallelism' with field dynamics (Plott, 1987). To allow contribution levels to stabilize—particularly given the informational constraints—Part 1 is longer than subsequent Parts (8 vs. 6 rounds). This ensures that participants gain sufficient experience and that group-specific cooperation dynamics are firmly established prior to any interventions.

The "Baseline Only" sequence is our control, with the baseline game in all four parts. It is a benchmark for estimating the effects on contributions and beliefs of our voluntary "Forum Only" and "Payments Only" interventions. It also lets us see whether the contributions at the end of our Baseline were maintained for the duration of the experiment – offering internal validity to heterogeneity analyses using baseline cooperation levels.

The "Forum Only" sequence exogenously adds a voluntary information-sharing forum in Part 2, and then retains this costly but voluntary option in Part 3 and Part 4. Maintaining the option is intended to reflect the fact that local institutions, such as community councils that are relevant for commons, can be quite durable once put into place (Ostrom, 1990).

The "Payments Only" sequence adds our 'additional contributions' payments in Part 3. These payments are 'external', in that funds come from outside the endowments available to spend on punishment or on attending the forum. Payments are always removed in Part 4. Their temporary nature reflects reality (see above and various cases in Moros et al., 2022).

For those groups randomly assigned to our two-institutions sequence, "Forum Payments", we introduced a forum in Part 2, then retained it and introduced Payments in Part 3, which we removed in Part 4 – for three reasons. First, in reality, many forums are not interventions but prior features of communities. Thus, to study interactions of payments with pre-existing formal institutions, we add the payments to groups without or with our forum. Second, we introduced changes to the design sequentially as each change is reasonably complex.

3.1.6 Procedures

We recruited 1,010 participants between July 7, 2021 and September 15, 2021 from the Prolific platform ($n = 940$) and the participant pool at the FEELE lab ($n = 70$), using hroot (Bock et al., 2014). We pre-registered both participant pools; our intention was to focus solely on Prolific participants, but initial recruitment issues led us to conduct online sessions with participants registered with the FEELE lab. Our findings remain qualitatively and quanti-

tatively consistent when the sample is restricted solely to Prolific participants (see Appendix Tables B10, B11, and B12). The experiment was advertised as an online decision-making task carried out in a group context. Its average duration was 1 hour.[7]

Upon reaching the experimental web page, participants saw a standard consent form followed by Part 1 instructions. Participants were told that the experiment would have four separate parts, but that they would read the instructions for each part only when they reached it. Participants had to solve a comprehension questionnaire to verify understanding of the public good game, the observability of actions, and the punishment technology. Participants who could not answer all comprehension questions correctly after three attempts were excluded and paid £1. Participants who correctly answered the comprehension questions entered a waiting room and were randomly placed in groups of five to start the experiment. If a participant could not be matched within 5 minutes of entering the waiting room, they were dropped out and paid £5. Every group in a session was allocated to one of four experimental sequences (seen in Table 1), and sessions were randomly allocated to sequences.

When making decisions, participants did not have access to information from past rounds, only from the current round. New instructions appeared at the start of each part of the experiment, for all participants, even if there was no change in the game across those parts (as in, e.g., the "Baseline Only" sequence). Payoffs were denoted in Experimental Currency Units (ECU), and 170 ECU = £1. The instructions informed participants that their payment would be the sum of their earnings from Parts 1, 2, 3 and 4. Participants earned £11.76, on average, which included £6.00 for completing the experiment. We paid the participants electronically, through the Prolific platform or using a bank transfer.[8]

Running real-time experiments online carries the risk of participants dropping out due to connection issues, or by participants' own choice. In the overwhelming majority of cases, dropouts occurred before treatment assignment, so we do not have sample selection bias to contend with. The breakdown of dropouts was: 71 did not proceed beyond the consent form; 222 did not finish reading the instructions; 146 did not complete the comprehension questions; 238 failed the comprehension questions; 181 correctly answered the comprehension questions but could not be matched to a group within 5 minutes; 39 participants dropped out mid-session, and caused 151 other participants to also drop out. The dropouts that occurred at the consent form and instructions were probably due to the fact that Prolific participants realised that the experiment would last around 1 hour — the overwhelming majority of Prolific studies are individual-decision or survey studies that are not time-sensitive and do not take longer than 10-15 minutes. Our study was an extreme outlier in that sense and was perhaps

[7]We obtained ethics approval for this study from the University of Exeter Ethics board, application eUEBS004078.

[8]The experimental software was designed in such a way that identifying information was not included in the data; it was stored in a separate system such that we could not match experimental data to identification information in the FEELE participant pool, or to a Prolific ID.

more quantitative than the norm for studies in Prolific. Of the 39 participants who dropped out, 15 had been assigned to Baseline Only, 7 to Payments Only, 9 to Forum Only and 8 to Forum Payments. While the dropout rate is nominally higher in Baseline Only, the total number of cases is too small for us to be confident of any statistical pattern. Those groups were excluded from the analysis as pre-registered.

3.2 Behavioral Hypotheses

3.2.1 Forum

As our forum transfers information between participants, we note the huge literature showing that communication among group members matters. Crawford (1998) surveys prior literature on pre-play communication, highlighting a role in mutual reassurance as one of the key drivers of improved coordination and cooperation. We focus on one feature of pre-play communication forums that may well facilitate cooperation: the sharing of information about contributions.

We study voluntary, costly forum attendance whose value depends on others' attendance. If attendance depends on others' expected attendance, with other-regarding preferences, cooperation games with dominant-strategy Nash equilibria can become coordination games with Pareto-ranked equilibria (Fehr and Schmidt, 1999). It can be worth paying to share information if that facilitates coordination upon a Pareto-superior equilibrium. Costly revelation of information concerning one's own and one's peers' contributions could facilitate cooperation by enabling cooperators to signal their willingness to join into a high-cooperation equilibrium.

We hypothesize that the exogenous availability of our voluntary and costly forum for sharing information about contributions will increase contributions to the public good and raise expectations about contributions by others. We further hypothesize that it should reduce the variance of beliefs about other group members' contributions to the public good. Finally, it will increase punishment at the individual-individual level because altruistic punishers can distinguish free-riders from cooperators. If contributions then rise, punishment will decline.

3.2.2 Payments

Our incentives raise the marginal return for each group member from a contribution to the public good above a group's baseline.[9] This makes equilibria with higher group contributions more financially attractive under inequality aversion or efficiency preferences (Charness and

[9]Linking our additionality payments to MPCR: take any vector of (positive) contributions and suppose one group member reduces their contribution by 1 unit; then the group member deviating will experience a payoff increase equal to 1-MPCR, while other members will experience a payoff decrease equal to the MPCR. We note that as the MPCR increases, the payoff difference between the deviator and any other group member is the same, but those deviated on bear a greater share, while the gain to a free-rider shrinks. The greater the negative share, the higher the disutility to those deviated on, so the higher the willingness to punish free-riders. There is ample evidence in the experimental economics literature for inequality aversion and efficiency preferences (Cooper and Kagel, 2016). These are preference channels for payments to affect behavior.

Rabin, 2000; Engelmann and Strobel, 2004). Higher marginal returns also raise disutility when one or more members deviate, perhaps raising participants' desire to punish free-riders (Fehr and Schmidt, 1999; Fehr and Gächter, 2000).

Beyond those points about preferences, payments can have a strategic effect, as other-regarding preferences could transform the payoffs in the linear public-goods game so that free-riding is no longer a dominant individual strategy. A linear public-good game can become a coordination game in which different cooperation levels are (Pareto-ranked) Nash equilibria. Then, if a member believes other members would raise contributions in response to payments, it is a best response to contribute more. This could lead to a Nash equilibrium with higher contributions, a 'strategic channel' through which external payments could affect behaviors.

We hypothesize that external payments for contributions beyond a group's baseline will raise contributions to the public good, plus expectations about contributions by others. Punishment for not contributing to the public good may be more severe since more is at stake, fairness concerns increase, and there is more money available to punish free-riders. However, in the absence of a forum, punishment may be limited by information – limiting that effect.

3.2.3 Forum-Payments Interaction

The interaction between the forum and additionality payments is theoretically ambiguous and we consider three options. First, the institutions may be substitutes. If both the forum (through monitoring) and payments (through financial returns) independently address the collective action problem, layering them may yield diminishing marginal returns.

Second, the institutions may be additive and address distinct and independent barriers to cooperation—such as information scarcity versus low private returns. In this case, their individual effects would simply sum, with the forum not altering the marginal impact of the monetary incentive.

Third, the institutions may be complementary, and the presence of one enhances the marginal effectiveness of the other. For example, the forum may provide the information necessary for peer punishment, allowing groups to achieve higher cooperation and reap the additional monetary reward, while payments may increase the stakes, making the forum more valuable to participants.

3.2.4 Payments Removal

We explore what happens if payments are removed. Most PES funders do not plan to pay forever – though a few programs have run for decades.[10] Removing payments in Part 4 implies the same payoffs and choices as in Parts 1 and 2 for "Payment Only". Thus, any behavioral

[10] While market prices may differ in impact from policy shifts, for natural resources we note that MPCR shifts with returns from external uses (e.g., 'provisioning ecoservices' demand for urban heating using charcoal).

shifts due to payments might vanish. Yet having simply faced payments can, in principle, have temporal spillovers, implying that post-payment choices differ from un-/pre-paid ones.

'Crowding' hypotheses (Moros et al., 2022) are about exactly such temporal spillovers: having faced payments matters after payments removal. For instance, high cooperation norms may be established during payments, 'crowding in' positive expectations and behaviors in self-enforcing equilibria with high contributions. Alternatively, payments might focus participants on money, shifting from pro-social to instrumental motives. If prior intrinsic pro-social motivations were 'crowded out', contributions may be lower post- than pre-payment.

4 Estimation

4.1 Average Treatment Effects

We use this pre-registered estimating equation to test hypotheses about the impact of our exogenous institutions on contributions, beliefs, norm strength, attendance at the forum, information, and peer punishment. Each of those outcomes can be the Y_{igt} for participant i in group g in round t:

$$\begin{aligned} Y_{igt} = \beta_1 \; & + \beta_F \text{Forum}_{gt} + \beta_{3F} \text{Forum}_{gt} \times \text{Part } 3_t + \beta_{4F} \text{Forum}_{gt} \times \text{Part } 4_t \\ & + \beta_P \text{Payment}_{gt} + \beta_{PF} \text{Payment}_{gt} \times \text{Forum}_{gt} + \beta_R \text{Rem}_{gt} + \beta_{RF} \text{Rem}_{gt} \times \text{Forum}_{gt} \\ & + \beta_2 \text{Part } 2_t + \beta_3 \text{Part } 3_t + \beta_4 \text{Part } 4_t + \delta X_{igt} + v_i + \alpha_g + \varepsilon_{igt} \end{aligned} \tag{5}$$

where the dummy variable Forum_{gt} equals 1 if group g has access to the information-sharing forum in round t; dummy variable Payment_{gt} equals 1 if the group has access to payments in round t; dummy variable Rem_{gt} for payment removal equals 1 in Part 4 for groups with access to payments in Part 3; the dummy variables $\text{Part } 2/3/4_t$ equal 1 for Parts 2, 3, and 4, respectively; X_{igt} are static controls, including country, age, and gender; v_i is an individual random effect; α_g is a group random effect; and ε_{igt} is the error. Standard errors are clustered at the group level, allowing for arbitrary correlation of the error terms within groups across individuals and over time.

The coefficient β_F captures the effect of the forum. As that effect may change over time, the coefficient β_{3F} for the interaction term $\text{Forum}_{gt} \times \text{Part } 3_t$ measures the difference in the effect of the forum in Part 3 versus in Part 2. Thus, $\beta_F + \beta_{3F}$ is the effect of the forum in Part 3, in comparison to groups without access to the forum in Part 3. All results tables report *Forum + Forum × Part 3* as well as the p-value for the test of whether this linear combination is equal to zero. Along these same lines, all results tables report and show the equivalent test for *Forum + Forum × Part 4*.

The coefficient β_P measures the effect of access to payments for additional contributions. Payments may be more (or less) effective with the forum, and β_{PF} captures interactions between those institutions. If this coefficient is positive, then a group receives more than the sum of the forum's and the payments' effects when both institutions are available, so payments and the forum are complements. If β_{PF} is negative, however, the institutions are substitutes. The total effect of payments in the presence of a Forum (relative to the baseline) is captured by $\beta_P + \beta_{PF}$. The linear combination *Pay* + *Forum* × *Pay*, as well as the corresponding p-values, are reported at the bottom of the result tables.

The coefficient β_R shows the effect of removed payments and captures temporal spillovers from prior exposure to payments. It compares Part 4 (rounds 20-26) outcomes Y_{igt} between the participants previously exposed to payments and those who never received payments (and only played the baseline game). The interaction term coefficient β_{RF} shows how these temporal spillovers vary with Forum access. For groups with access to both institutions, the total effect of payment removal (relative to the baseline) is given by $\beta_R + \beta_{RF}$. The linear combination *Pay rem.* + *Forum* × *Pay rem.*, as well as the corresponding p-values, are reported at the bottom of the result tables.

Part 1 is our pure control and the coefficients β_2, β_3 and β_4 for the dummy variables Part $2/3/4_t$ capture changes in outcomes for the control group from the passage of 'time' (rounds) alone. If these coefficients are not significant, then Baseline Only outcomes are steady across Parts ('time').

We consider effects on multiple outcomes: participants' contributions; their beliefs about others' contributions; forum attendance; the number of other contributions known by each participant i; and peer punishment. All vary by participant i and round t and are defined as follows. Contributions$_{it}$ are participant i's contributions to the public good (0 to 20) in round t. Each participant reports beliefs about the total contributions by the other 4 members of the group, in every round. We divide this total by 4 to facilitate direct comparisons between beliefs and individual contributions, so Beliefs$_{it}$ about others' average contributions also ranges from 0 to 20. In our limited-information setup, the number of others' contributions known by participant i, Seen$_{it}$, is at least 1 and at most 4. The outcome Entered Forum$_{it}$ is a dummy equal to 1 if participant i attended the forum in round t. It is defined for participants with forum access.

We also study the strength of groups' contributions norms, defined as $(s_c^2 + s_b^2)^{1/2}$, where s_c^2 is within-group variance in contributions and s_b^2 is within-group variance in beliefs about others' contributions. Our measure is the distance to the origin in the variance space. Zero implies no variance in contributions or beliefs, i.e., all behave the same way and believe the same behavior is to be played (the strongest possible cooperation norm[11]). Thus, factors that

[11] A behavior is "socially normative" if individuals engage in it and believe others do as well (Bicchieri, 2005).

push toward convergence to a norm will have negative effects on this outcome. When this strength of group norm Norm_{gt} is the outcome, we only have one observation per group g and round t and we do not use individual-specific control variables (country of residence, age and gender).

We study punishment at the individual-individual level. The main dependent variable is No of points_{ijt}, i.e., the number of punishment points sent from i to j in round t. We distinguish the extensive and intensive margins of punishment. Thus, a Punishment_{ijt} dummy equals 1 if i punishes j in round t, the extensive margin of punishment. To measure the intensive margin of punishment, we use No. | Punished_{ijt}, i.e., the number of punishment points sent from i to j in round t, conditional on i punishing j in that round (recall that the cost to j is 3 times the cost to i).

4.2 Beliefs After Announcements

For groups with payments, beliefs data from rounds 14 (before the announcement of incentives) and round 15 (after the announcement, yet before any new contribution choices are observed) can be compared to analyze how the payment announcements themselves changed beliefs. Yet we need to control for any generic 'restart effects'. Participants read instructions at the start of each Part, even when there was no change in the game between any two Parts in the sequence. Pausing to read new instructions could itself generate restart effects, moving subjects to higher levels of cooperation, especially within fixed-matching designs (Andreoni, 1988; Chaudhuri, 2018). If restart effects exist, then groups would experience them after the reading of any instructions at all, regardless of whether there was a change in the game. For sequences without any change in the game between parts, any behavior change in the round following the reading of new instructions could only be a restart effect. Hence, those sequences are a suitable control group to isolate impacts of restart effects from effects of announcements.

For payments announcements without a forum, the groups in Payments Only sequences should experience both announcement and restart effects. To remove those restart effects, the Baseline Only sequence is used as a control group. We use data from rounds 14 and 15 for the Baseline Only sequence and Payments Only sequence and the following estimating equation:

$$B_{igt} = \beta_0 + \beta_1 \text{Round } 15_t + \beta_2 \text{Pay}_g + \beta_3 \text{Round } 15_t \times \text{Pay}_g + v_i + \alpha_g + \varepsilon_{igt} \tag{6}$$

where B_{igt} is a belief of player i in group g in round t about other members' contributions in round t. The variable Round 15 is a dummy for all the observations from round 15, then β_1 captures the restart effect. Pay_g is a dummy for the Payment Only sequence (effectively taking out a group or a sequence effect). If the payments announcement significantly affects the beliefs about cooperation among individuals without access to a forum, we expect $\beta_3 > 0$.

With a forum, we are interested in the change in beliefs in the Forum-Payment sequences

and we can use the Forum Only Sequence as the control group to net out any restart effects:

$$B_{igt} = \beta_0 + \beta_1 \text{Round } 15_t + \beta_2 \text{ForPay}_g + \beta_{3F} \text{Round } 15_t \times \text{ForPay}_g + v_i + \alpha_g + \varepsilon_{igt} \quad (7)$$

where B_{igt} is a belief of player i in group g in round t about other group members' contributions in round t. The variable Round 15 is a dummy for observations in Round 15 (both sequences), and β_1 captures the restart effect. ForPay_g is a dummy for the Forum-Payment sequence (again, this removes any sequence effect). If the payments announcement significantly affects beliefs about cooperation among individuals without access to a forum, we expect $\beta_{3F} > 0$.

5 Results

This section shows how the forum, payments, and their interaction affect contributions and other outcomes of interest. Unless specified, we report pre-registered[12] results of the mixed-effects models in Section 4, while test statistics are Wald tests. Any non-pre-registered analysis is indicated in the text or tables.[13] For the sake of brevity of exposition, we moved summary statistics to Appendix A and some tables with results to Appendix B.

5.1 Baseline

Figure 1 shows contributions by Part by sequence. The average contribution in Part 1, across all sequences, is 11 ECUs. In keeping with random allocations to institutional sequences, F-tests show that average contributions in Part 1 and the last round of Part 1 (Round 8) do not differ significantly across sequences (Table B1).[14] Furthermore, average contributions in the baseline condition remained steady throughout the experiment, as shown in Figure 1 and evidenced by the statistically insignificant coefficients for the Part 2, 3, and 4 dummies in Table 2 (Column 1).

5.2 Forum

The exogenous availability of the voluntary and costly forum option for sharing information:

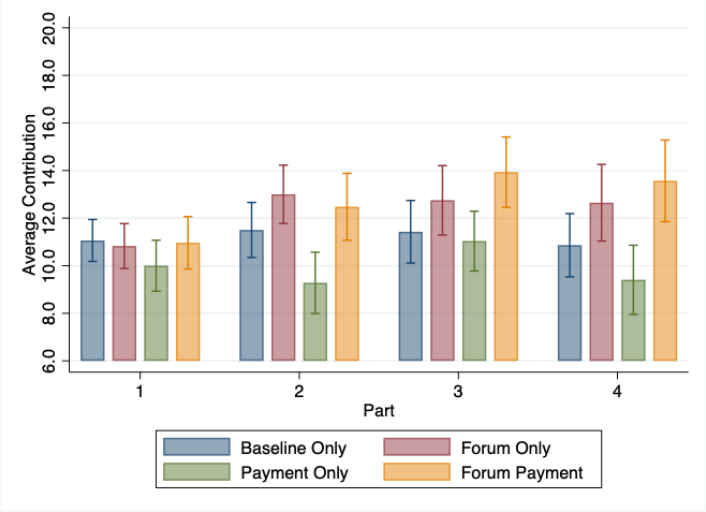
- increased contributions to the public good;
- increased expectations about the contributions by others within one's own group;

[12] The pre-analysis plan is available at https://osf.io/k5z8c.

[13] While our sample includes participants from both Prolific ($n = 940$) and the FEELE Lab ($n = 70$), all results are robust to the exclusion of the FEELE Lab subsample (see Appendix Tables B10, B11, and B12).

[14] Contribution levels in the "Payment Only" sequence were slightly lower than in the "Baseline" sequence in Parts 1 and 2. As these sequences were experientially identical at this stage, this difference is due to random variation. Consequently, our estimates of the payment effect are likely conservative.

Figure 1: Average individual contributions by part and treatment sequence



Notes: This figure shows average individual contributions to the public good by treatment sequence and part of the experiment. The information sharing forum is introduced in Part 2 in Forum Only and Forum Payment and remains in place thereafter. Payments are introduced in Part 3 in Payment Only and Forum Payment and removed in Part 4. The bars represent 95% confidence intervals based on robust standard errors clustered at the group level.

- reduced the variance of both beliefs about others' contributions and own contributions to the public good, indicating norm convergence;
- increased the use of punishment at the individual-individual level.

When interpreting the forum's effects, note that they may vary across different parts of the experiment. The *Forum* coefficient captures the forum's effect in Part 2. *The Forum* $\times$ *Part 3* interaction reflects the difference in the forum's effect between Part 2 and Part 3. The sum of these two coefficients (Forum + Forum $\times$ Part 3), reported at the bottom of the results tables, gives the total effect of the forum in Part 3 relative to the Baseline-only control group. The same logic applies to the forum's effects in Part 4.

Our forum option for sharing information generated a significant rise in contributions, of 2 ECUs, i.e., 18% more than Baseline in Part 2 (see coefficient estimate for *Forum* in Column 1 of Table 2, p-value<0.001). This increase is stable, as the effect of the Forum on contributions in Parts 3 and 4 does not differ significantly from the effect in Part 2 (see the coefficient estimates *Forum* $\times$ *Part 3* and *Forum* $\times$ *Part 4* in Column 1 of Table 2, p-values>0.37) – despite the falling use of the Forum (see Figure 2 as well as *Forum* $\times$ *Part 3* and *Forum* $\times$ *Part 4* in Column 5 of Table 2).

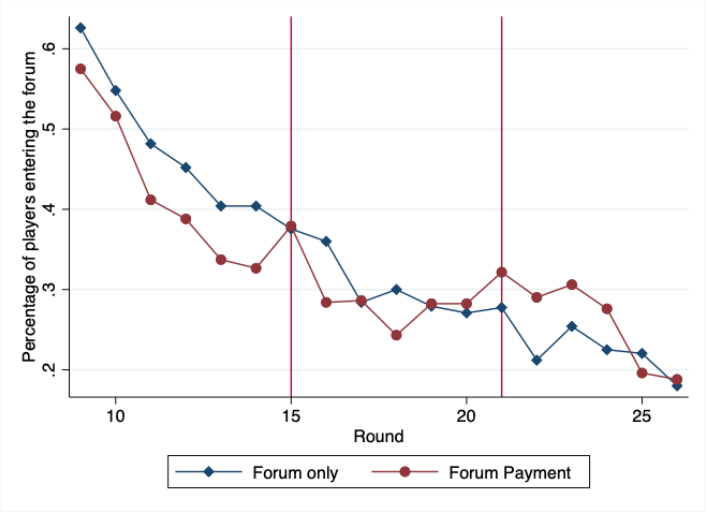
The forum raised contributions by enabling members to target punishments at free-riders or shoring up beliefs and improving coordination. Figure 2 shows that 60% of the potential attendants entered the forum in the first round it was available. Thus, on average, participants

Table 2: Effect on contributions, beliefs, norms, information, and forum entry

	(1) Contribution	(2) Belief	(3) Norm	(4) No. Seen	(5) Entered Forum
Forum	1.992***	1.403***	-0.731	1.046***	
	(0.370)	(0.336)	(0.647)	(0.073)	
Forum x Part 3	-0.324	0.056	-1.529**	-0.442***	-0.170***
	(0.531)	(0.473)	(0.780)	(0.086)	(0.024)
Forum x Part 4	0.135	0.580	-2.369**	-0.678***	-0.258***
	(0.678)	(0.590)	(1.114)	(0.086)	(0.029)
Payment	1.151**	0.840*	0.906	0.000	0.036
	(0.527)	(0.471)	(0.875)	(0.000)	(0.033)
Forum × Payment	0.179	0.170	0.230	0.048	
	(0.868)	(0.772)	(1.292)	(0.118)	
Payment removed	0.084	-0.246	0.105	0.000	0.095**
	(0.566)	(0.532)	(0.945)	(0.000)	(0.038)
Forum × Payment removed	0.982	0.695	1.544	0.262**	
	(1.010)	(0.920)	(1.558)	(0.119)	
Part=2	-0.146	0.464**	-1.927***	0.000	
	(0.240)	(0.211)	(0.366)	(0.000)	
Part=3	0.118	0.943**	-3.038***	-0.000	
	(0.457)	(0.414)	(0.571)	(0.000)	
Part=4	-0.445	0.555	-3.448***	0.000	
	(0.501)	(0.454)	(0.692)	(0.000)	
Constant	11.152***	10.945***	15.273***	0.976***	0.476***
	(0.976)	(0.487)	(0.356)	(0.075)	(0.103)
Forum + Forum x Part 3	1.668	1.458	-2.260	0.605	
Forum + Forum x Part 3 p-value	0.015	0.019	0.013	0.000	
Forum + Forum x Part 4	2.127	1.983	-3.100	0.368	
Forum + Forum x Part 4 p-value	0.008	0.006	0.006	0.000	
Pay + Forum x Pay	1.330	1.010	1.135	0.048	
Pay + Forum x Pay p-value	0.054	0.099	0.232	0.682	
Pay rem. + Forum x Pay rem.	1.066	0.448	1.649	0.262	
Pay rem. + Forum x Pay rem. p-value	0.202	0.550	0.183	0.028	
Controls	Yes	Yes	Yes	No	Yes
Group random effects	Yes	Yes	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes	No	Yes
Observations	25855	25855	5171	25855	8915

This table shows the estimated effect of the Forum, Payments, and their combination on the following outcomes: Individual contributions to the public good in Column 1, individual's belief's about other group members' contributions to the public good in the upcoming round in Column 2, Contribution Norms in Column 3, the number of other group members contributions the individual can observe (ranging from 1 to 4) in Column 4 and an indicator whether an individual with forum access entered the forum in Column 5. The analysis is at the individual-round level in Columns 1, 2, 3 and 5, and at the group-round level in Column 4. Estimation is based on Equation 5. Controls are country of residence, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01

Figure 2: Percentage of players entering the forum



Note: This Figure shows the percentage of experimental participants entering the Forum by round and experimental sequence. The option to attend the forum is only available from Round 9 onwards and only for participants in the "Forum Only" and in the "Forum - Payment" sequence.

in Forum Only and Forum Payment – including those who did not enter the forum – knew the contributions of 2.4 other group members (versus just 1 without the forum), while half saw at least 3. Those who saw 3 effectively had full information concerning individual contributions, since they knew their own contribution and could thus infer that of the remaining individual.

Participants used this information to punish more often. Punishments at the individual-individual level rose significantly in value, by 0.18 ECU (see *Forum* in Column 1 of Table 3, p-value=0.004). However, the rise in punishment within Forum Only did not last beyond Part 2. In Parts 3 and 4, there is no statistically significant difference in punishment between Forum and Baseline groups (see *Forum* + *Forum* × *Part 3* as well as *Forum* + *Forum* × *Part 4*, p-values>0.4, at the bottom of Table 3).

Thus, even groups with a forum option followed the downward trend in punishment in the Baseline (see coefficients for Parts 2/3/4 in Table 3 for Baseline punishment trends). A relatively small initial increase in punishment, combined with its subsequent decline, suggests that the forum was used predominantly to shore up beliefs about cooperation (i.e., to firm up cooperation norms), as a signaling mechanism, or as a facilitator of coordination. Despite falling forum use, forum groups settled on higher average contributions than in Baseline (see *Forum* + *Forum* × *Part 3* (1.668, p-value = 0.015) and *Forum* + *Forum* × *Part 4* (2.127, p-value = 0.008) at the bottom of Table 2's Column 1).

We also see significantly faster development of cooperation norms in the forum groups. Recall, *Norm* is based on variances of contributions and beliefs, so it takes smaller values when norms are stronger. Column 3 of Table 2 shows that the Forum raised norm strength (i.e.,

Table 3: Effect of forum and payments on punishment

	(1) No. of points	(2) Punishment dummy	(3) No. of points | Punished
Forum	0.180***	0.020	0.438**
	(0.062)	(0.015)	(0.175)
Forum x Part 3	-0.105	-0.033*	-0.031
	(0.080)	(0.017)	(0.227)
Forum x Part 4	-0.130	-0.033*	-0.038
	(0.086)	(0.020)	(0.279)
Payment	-0.000	-0.012	0.039
	(0.083)	(0.020)	(0.251)
Forum × Payment	-0.007	0.006	0.253
	(0.121)	(0.027)	(0.405)
Payment removed	0.044	-0.021	0.512*
	(0.084)	(0.019)	(0.270)
Forum × Payment removed	-0.064	0.002	-0.232
	(0.127)	(0.028)	(0.443)
Part=2	-0.240***	-0.049***	-0.404***
	(0.044)	(0.011)	(0.102)
Part=3	-0.333***	-0.073***	-0.398**
	(0.063)	(0.013)	(0.174)
Part=4	-0.401***	-0.086***	-0.608***
	(0.065)	(0.014)	(0.215)
Constant	0.964***	0.324***	2.575***
	(0.190)	(0.052)	(0.319)
Forum + Forum x Part 3	0.076	-0.013	0.408
Forum + Forum x Part 3 p-value	0.410	0.524	0.140
Forum + Forum x Part 4	0.050	-0.014	0.400
Forum + Forum x Part 4 p-value	0.606	0.525	0.227
Pay + Forum x Pay	-0.007	-0.006	0.291
Pay + Forum x Pay p-value	0.938	0.751	0.360
Pay rem. + Forum x Pay rem.	-0.020	-0.018	0.279
Pay rem. + Forum x Pay rem. p-value	0.831	0.387	0.425
Controls	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes
Group random effects	Yes	Yes	Yes
Observations	103420	103420	21239

This table shows results from the regressions with dyadic punishment data. In column 1, the dependent variable is the number of punishment points sent from i to j in round t. Column 2 looks at the extensive margin of punishment and the dependent variable is a dummy=1 if i punished j in round t. Column 3 looks at the intensive margin of punishment and the dependent variable is the number of punishment points sent from i to j conditional on i punishing j in round t. Estimation is based on Equation 5. We control for country, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Norm declines) by 2.3 points in Part 3 (*Forum* + *Forum* × *Part 3*, p-value=0.013) and 3.1 points in Part 4 (*Forum* + *Forum* × *Part 4*, p-value=0.006) when we compare Forum with Baseline. Thus, our forum accelerates the increase in the norm strength by 50 to 70 percent.

When a stable contribution norm has been established, costly information sharing should become superfluous. Figure 2 confirms a fall in Forum attendance as the Parts progress, while Table 2's Column 5 shows 17% and 25% lower attendance in Parts 3 and 4 (p-values<0.001).

5.2.1 Payments (Including Interaction with Forum)

The exogenous availability of external payments for contributions beyond a group's baseline:

- increased contributions to the public good;
- increased expectations about the contributions by others within one's own group;
- did not significantly shift our measure of norm strength, i.e., the variance of both beliefs about the others' contributions and own contributions;
- did not increase the use of punishment at the individual-individual level.

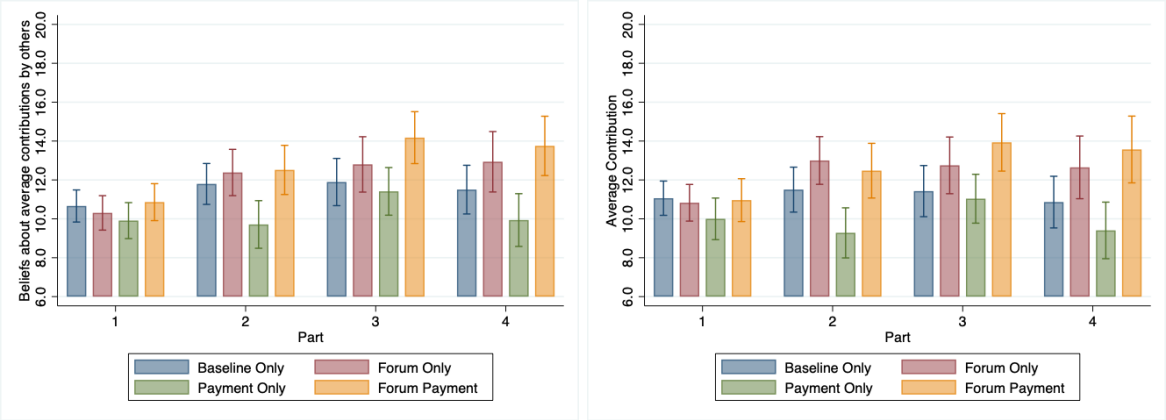
The availability of payments to reward additional contributions (above groups' Round 14 contributions) generated a significant increase in contributions of 1.15 ECUs, or 11% more than Baseline (Figure 1 and coefficient for *Payment* in Column 1 of Table 2, p-value = 0.003). Further, on average, the effect of payments did not depend significantly on access to a Forum: *Forum* × *Payment* in Table 2 Column 1 is not significantly different from zero (p-value=0.837).

Payments raise cooperation through a strategic channel. Payments' announcement, at the start of Part 3, significantly raised beliefs about others' contributions (Table B2). For the Payments Only sequence, beliefs about others' contributions increased by 2.5 ECUs (*Payment* × *Round 15* in Column 1 of Table B2, p-value<0.001), while for Forum Payment they increased by 1.7 ECUs (*Payment* × *Round 15* in Column 2 of Table B2, p-value<0.001). These increases are above the 'restart effect' we estimate using the Round 15 dummy (Table B2).

Figure 3 shows that contributions track beliefs closely, suggesting that our subjects shifted their contributions strategically. As noted earlier, if subjects exhibit other-regarding preferences, a linear public-good game can become a coordination game. If one believes that other members will increase contributions, it could be the best response to increase one's own contributions. Thus, payment announcements are productive if they raise beliefs about others' contributions.

We find no clear evidence that payments raised contributions via a preferences channel. We expect punishment for free-riding to rise with payments, as free-riding has a higher impact on total payoffs, or efficiency, when a group is over its baseline (Charness and Rabin, 2002). Moreover, a higher MPCR raises disutility from income inequalities (Fehr and Schmidt, 1999;

Figure 3: Beliefs (left panel) and Contributions (right panel)



Note: The left panel shows participants' average beliefs about others' contributions by Part and sequence. Each participant reports beliefs about the other 4 group members' contributions in every round. We divide by 4 to facilitate comparison of beliefs with individual contributions (so $Beliefs_{it}$ on others' average contributions also ranges from 0-20). The right panel shows average individual contributions by Part and sequence. The information-sharing forum is introduced in Part 2 in Forum Only and Forum Payment and remains in place, while payments are introduced in Part 3 in Payment Only and Forum Payment and removed in Part 4. The bars represent 95% confidence intervals based on robust standard errors clustered at the group level.

Charness and Rabin, 2002). Yet we do not see more punishment within groups with payments. The effect of Payment on punishment in Column 1 of Table 3 is 0.000 (p-value=0.998). The availability of the forum does not influence this null effect, as demonstrated by the small and statistically insignificant coefficient estimate for the interaction term *Forum* × *Payment*.

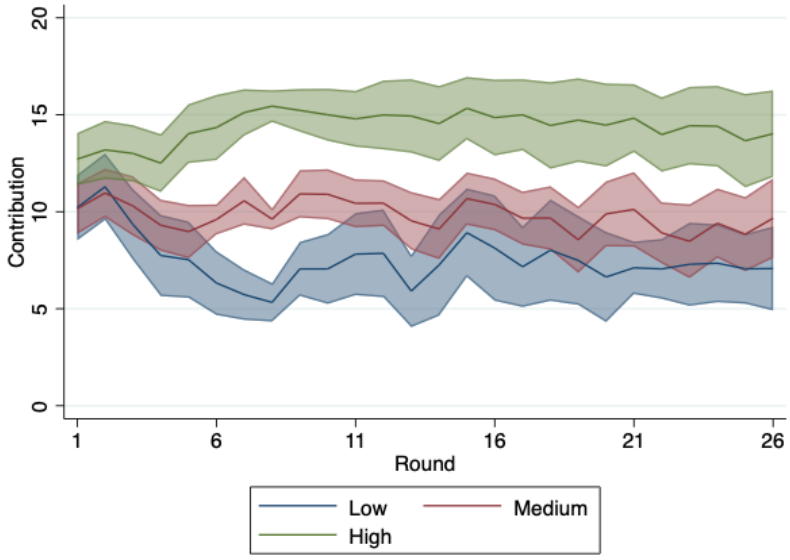
Payments also did not raise forum attendance, or the number of participants observed (see *Payment* coefficient estimate in Column 5 of Table 2, p-value=0.267). The estimates for *Payment* and for *Forum* × *Payment* in Column 4 of Table 2 show that, in all cases, having payments did not significantly raise the number of other participants who could be seen within forum groups.

5.3 Exogenous Payments Removal

There is no evidence that prior exposure to additionality payments crowded out contributions. Part 4 contributions do not differ between those groups who previously received payments and those who had never received payments (see coefficient estimate of 0.084 (p-value= 0.882) for *Payment Removed* in Column 1 of Table 2). With sequences differing insignificantly in Part 1, and Part coefficients being insignificant, post-payment also does not differ from pre-payment.

If anything, there is tentative (if not significant) evidence of 'crowding in' with access to the Forum. Contributions are 1 ECU (p-value = 0.20) higher in Forum groups after payment removal, compared to Forum groups which did not previously receive payments.

Figure 4: Average Contributions, over time, for the three contribution terciles in Baseline



Notes: Average individual contributions by round and baseline cooperation tercile. Groups are categorized (Low, Medium, High) based on their contribution terciles in round 8, i.e., the final round in Part 1. The shaded areas represent 95% confidence intervals (based on robust standard errors clustered at the group level).

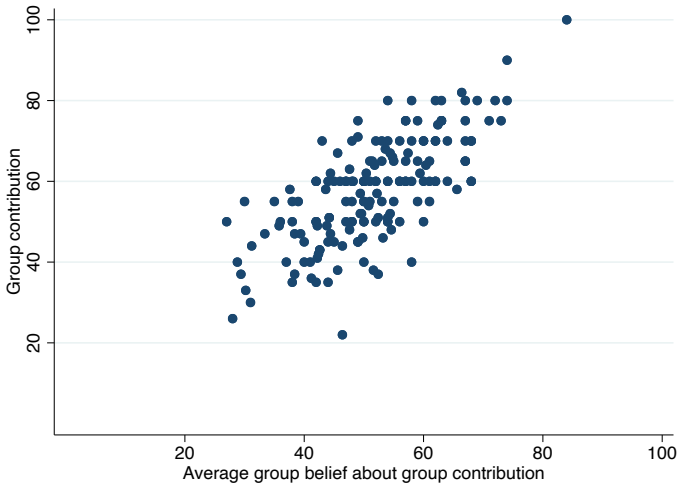
6 Heterogeneity analysis: Baseline cooperation and Impacts of Forum and/or Payments

Our analyses above ignored substantial between-group heterogeneity in Part 1 behavior. In the Baseline, groups have converged towards what one could describe as different contribution norms (Figure 4), because of differences in preferences (e.g., conditional cooperators, defectors) and interactions. Just below, we explore the bases for highly varied informal group contribution norms, which emerge prior to the introduction of the Forum and Payments. Next, we explore whether those norms influenced the effect of each formal institution, as well as any interactions between them.

6.1 What explains differences in baseline cooperation?

Group contributions norms vary with preferences for cooperation, as well as beliefs about others' cooperation (Fischbacher and Gächter, 2010; Rustagi et al., 2010). We did not measure preferences independent of our experiment but can analyze Round 1 contributions and beliefs. Figure B1 in Appendix B shows the heterogeneity in contributions to the public good: at the extremes 25% of group members contributed all their endowment (20 tokens) but only 4% contributed zero. The majority of contributions were clustered at focal points: 44% of

Figure 5: Projected and actual contributions in round 1



Notes: This figure compares group beliefs with actual group contributions in Round 1. A member's belief about the group contribution consists of their own contribution plus their reported beliefs about others' contributions; the "group belief" is the average of these individual projections across all group members. These beliefs are strongly correlated with actual behavior (Pearson's $r = 0.717$), indicating that initial cooperation is driven by members' expectations of group behavior.

participants contributed half of their endowment (10 tokens), with additional clusters at the 5 token and 15 token marks.

Also, there is a strong correlation between individuals' perceptions of cooperation in Round 1 and actual cooperation (see Table B8 in Appendix B). This alignment is consistent with the "imperfect conditional cooperation" documented by Fischbacher and Gächter (2010).

Beliefs are reasonably accurate. Consider the projection by player i about Round 1 group contributions, i.e., that player's own contribution in Round 1 added to their beliefs about the contributions by their group's other four members.[15] Averaging projections across group members provides a 'group belief' about Round 1 group contributions. Groups' average projections or beliefs about their group's contributions are very strongly correlated with actual group contributions, as per Figure 5 (Pearson's r = 0.717; see also Table B8 in Appendix B).

Thus, there is strong evidence that: most of our sample were conditional cooperators; there is heterogeneity in the extent to which they preferred to cooperate and thought others would cooperate; and, as expected, these factors combined to generate significantly varied contribution patterns in Part 1. Further, there is a reasonable correlation (Pearson's r = 0.34) between the terciles for Round 1 group contributions and Round 8 group contributions. Thus, insofar as random assignment yields distinct groups of preferences, that appears to have played a significant role in our Round 8 contributions. Most importantly, our Baseline Only

[15] Effectively, player i's expectation about their group's contribution (knowing their own contribution).

groups show that these contribution levels in Round 8 stayed very steady for the remainder of the experiment. Thus, stable descriptive cooperation norms were formed by the end of Part 1. It is worth noting that, as Fischbacher and Gächter (2010) suggest, play dynamics were part of establishing stable norms: between Rounds 1 and 8, some groups "improve" or "worsen" (Table B9 in Appendix B).

Groups are categorized into terciles - Low, Medium and High - based on their contribution levels in Round 8 of Part 1.[16] These terciles represent distinct baseline cooperation levels, averaging 4.9, 10.1, and 16.3 ECU, respectively.

Crucially, the distribution of these baseline levels is statistically independent of the assigned treatment sequences (Pearson $\chi^2(6) = 8.45, p = 0.207$).[17] In the absence of interventions, cooperation remained stable. This is shown in Figure 4 and Table 4, where the dummies for Parts 3 and 4 are statistically insignificant. We therefore analyze the effectiveness of the forum and additionality payments by splitting the sample according to these three baseline cooperation levels.

6.2 Baseline cooperation and impacts of forum and payments

Forum. The forum significantly increased contributions across all baseline cooperation levels (Table 4), with no statistically significant differences in treatment effects between terciles (Table B3 in the Appendix). Specifically, the forum raised average contributions by 2.35 ECU for the "Low" tercile, 2.54 ECU for the "Medium" tercile, and 2.83 ECU for the "High" tercile. This increase in cooperation is stable and is underpinned by a significant upward shift in beliefs regarding peer contributions across all groups (Table B4).

Initial forum participation was high across baseline contribution terciles (Table B6), but was most pronounced among "Low" baseline cooperation groups, where 66% of participants attended in Part 2 (see constant in Table B6). In other words, the groups with the weakest cooperation at the end of Part 1 made most use of the opportunities to identify free-riders, despite the cost associated with their forum attendance. Consistent with the role of the forum as a coordination and information-sharing tool, attendance declined significantly in all terciles over time, suggesting the institution became less critical once new beliefs and behavioral patterns were established.

Payments. Payments' impact upon groups' contributions also does not vary significantly with the baseline contribution level. Table 4 shows that payments raise contributions for each

[16] We pre-specified heterogeneous effects in any Part using the terciles at the end of the previous Part. Here, we use terciles in Round 8, as they precede both randomized institutions. Our main tables split the sample into Low, Medium and High terciles, instead of using tercile-interaction terms, to ease interpretation. Table B3 shows results for contributions and beliefs with interaction terms as a robustness test.

[17] To test this, we created a 4 (sequence) $\times$ 3 (tercile) contingency table in which each cell records the number of groups within each tercile-sequence, then performed a Pearson chi-squared test of independence.

Table 4: Heterogeneous effects of interventions on contributions

	(1) Low	(2) Medium	(3) High
Contribution			
Forum	2.350***	2.540***	2.831***
	(0.732)	(0.722)	(0.673)
Forum x Part 3	-1.119	0.581	-0.458
	(0.813)	(0.700)	(0.895)
Forum x Part 4	-0.210	0.364	0.396
	(1.177)	(1.045)	(1.088)
Payment	1.512*	2.130***	1.418*
	(0.827)	(0.701)	(0.802)
Forum × Payment	1.161	-0.299	-0.632
	(1.299)	(1.199)	(1.237)
Payment removed	-0.058	0.547	1.592**
	(0.966)	(0.904)	(0.807)
Forum × Payment removed	1.634	1.122	-0.573
	(1.696)	(1.622)	(1.236)
Part=3	0.608	-0.408	-0.108
	(0.605)	(0.442)	(0.550)
Part=4	0.034	-0.971	-0.674
	(0.852)	(0.717)	(0.693)
Constant	6.595***	10.768***	14.625***
	(1.361)	(2.251)	(1.864)
Forum + Forum x Part 3	1.230	3.122	2.373
Forum + Forum x Part 3 p-value	0.290	0.002	0.039
Forum + Forum x Part 4	2.139	2.904	3.227
Forum + Forum x Part 4 p-value	0.110	0.029	0.009
Pay + Forum x Pay	2.673	1.831	0.786
Pay + Forum x Pay p-value	0.008	0.060	0.404
Pay rem. + Forum x Pay rem.	1.576	1.670	1.019
Pay rem. + Forum x Pay rem. p-value	0.258	0.215	0.276
Controls	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes
Group random effects	Yes	Yes	Yes
Observations	5930	5935	5770

Notes: This table shows the effect of our interventions on individual contributions to the public good for groups with Low (Column 1), Medium (Column 2) and High (Column 3) initial cooperation. The sample is split into Low, Medium and High based on group contribution terciles in round 8. The unit of analysis is the individual-round observation. Estimation follows Equation 5. We control for country, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

tercile: 1.5 ECU (p-value=0.068) in Low; 2.1 ECU (p-value=0.002) in Medium; and 1.4 ECU (p-value=0.077) in High. While the estimated effect is highest for Medium, the coefficients do not differ statistically (Table B3 in the Appendix). In the Medium tercile, the effect is an 18% increase over the 11.3 ECU average contribution in Part 3 for the comparison group without payment (much like the average impact of a Forum).

Table B4 mirrors Table 4 to further link beliefs and actions. Payments' impact on beliefs about others' contributions is highest for Medium, suggesting beliefs are a central channel for changing contributions. This pattern is consistent with groups re-coordinating on higher-contribution equilibria. In coordination games with ranked equilibria, when others increase contributions, it is optimal to do the same.

Having the potential to receive additionality Payments raises neither Forum entry (Table B6) nor punishment (Table B7), nor the strength of any informal norm (Table B5) for any tercile. If anything, the variances of contributions and of beliefs rise slightly (though not statistically significantly) for groups with Low baseline cooperation. Since payments do not provide additional information about one's group members (unlike Forum), this could reflect uncertainty about others' reactions to incentives.

Forum × Payment. We find little evidence that the forum significantly alters the efficacy of monetary payments. Across all baseline cooperation levels, the interaction terms between the forum and payments are not statistically different from zero. However, the results in Table 4 (Column 1) offer a tentative qualitative pattern: for groups with Low baseline cooperation, the interaction coefficient is positive (1.16, p-value=0.34). While not statistically significant, this suggests that groups with the lowest initial cooperation might potentially derive greater benefit from the forum as a foundational institution prior to the introduction of payments. In contrast, no such synergy is suggested for groups with higher baseline cooperation.

Payment Removal. Impacts of payment removal depend on the pre-existing cooperation level. Having faced payments crowds in contributions for groups with High baseline cooperation (Table 4). For the High contribution tercile, we see a large, statistically significant (p-value=0.049) contribution effect of 1.6 ECU even after payments end. This means contributions are 11% higher than a 14.7 ECU total contribution in High baseline cooperation groups without any prior payment (and without a forum). Thus, stronger cooperation is induced for the groups already cooperating well. In other words, High pre-existing contribution complement payments after they end. For the Medium and Low terciles, contributions are not statistically different from those of the no prior payment comparison group.

Table B4 shows that beliefs about others' contributions do not differ significantly from those of the no payment comparison groups once payments are withdrawn. Table B5 examines norm strength: unchanged for Low and Medium, slightly tighter for High, again with no effects

significantly different from zero. Finally, Table B6 and Table B7 show there is little impact of payments removal on Forum attendance, or punishment, although it is worth recalling that Payments are removed in Part 4 – often after a drop in Forum attendance.

Forum × Payment removal. We find no evidence that the forum significantly moderates the effect of removing payments across any of the baseline cooperation levels (Table 4). For groups with low and medium baseline cooperation, the coefficient estimates for the Forum and payment removal interaction are positive (but statistically insignificant). These positive point estimates tentatively suggest that the forum might help sustain higher contributions after payments are withdrawn compared to groups without forum access.

This pattern is reversed for groups with high initial cooperation, where the interaction term is negative. For groups already capable of high cooperation, the additional institutional support of a forum is redundant and might even be counterproductive. However, given the high p-values, these results are very tentative.

7 Conclusion

The ongoing degradation of global public goods, such as biodiversity and a stable climate, motivates the use of global financial incentives to shift local behaviors. These conditional payments are often directed at communities, for both strategic and practical reasons. However, the success of such incentive programs — both while they are in place and after they are withdrawn — varies widely in magnitude, significance, and direction (see e.g., surveys by Alix-Garcia and Wolff, 2014; Kerr et al., 2014). This suggests that the local context, specifically the institutional landscape, plays a decisive role in determining outcomes.

Our study explores how pre-existing local institutions shape the effectiveness of external incentives for contributions to a public good. Our baseline is a public goods game with limited observability, in which each group member can observe one other member's contribution. To introduce variation in groups' formal institutions, we randomize groups' access to a voluntary, costly forum—analogous to a village council. In this forum, attendees learn about the contributions of all other attendees, as well as those of any peers they had previously observed. The information-sharing forum itself raises contributions. Participants use the forum and gather information. Peer punishment rises immediately after the forum is introduced but then steadily declines over time, along with forum attendance. This pattern suggests that the forum served as a coordination device, establishing higher cooperation that eventually required little monitoring and punishment.

Having established heterogeneity in formal institutions, we then cross-randomize external payments in a staggered 2×2 design. Our analysis focuses on external payments for 'additional' contributions—those exceeding a group's pre-payment baseline—mirroring the

logic of many real-world conservation contracts. These payments raise average contributions primarily by shifting expectations: the announcement of incentives immediately heightened beliefs that others would contribute more. Actual behavior tracked these shifting beliefs quite closely. Notably, the effect of payments does not significantly depend on prior access to the information-sharing forum.

A potential concern about monetary incentives, which often end, is that they might 'crowd out' intrinsic motivations to contribute to public goods. We find no evidence that offering and then withdrawing payments for additionality reduces contributions. To the contrary, contributions are significantly higher after payments among groups with high initial cooperation.

To inform institutional targeting, we analyze how initial cooperation moderates the impact of our interventions. During Part 1 (Rounds 1–8), groups developed contribution patterns that were stable over time but varied significantly between groups. This baseline effectively replicates the real-world institutional heterogeneity described by Ostrom (1990). We use Round 8 contributions — prior to any intervention— to categorize groups into Low, Medium and High initial contribution terciles.

Our heterogeneity analysis reveals that both the forum and financial payments increased contributions across all initial cooperation terciles, with no statistically significant differences in their respective treatment effects. We find tentative evidence, however, that the two institutions interact differently depending on a group's starting point. For groups with low initial cooperation, the forum and payments appear to be complements, with the forum enhancing the effectiveness of payments. Conversely, in groups with high initial cooperation, the institutions act as substitutes; once a high level of cooperation is established, one institution may 'get the job done,' rendering the other largely redundant. While the interaction terms are not significant in our split samples, they point towards critical insights for the targeting and design of conservation incentives and represent a vital area for future research.

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A Summary statistics

Table B1: Summary statistics by treatment sequence

	(1)	(2)	(3)	(4)
	Baseline Only	Forum Only	Payment Only	Forum Payment
Contribution	11.292	12.198	9.957	12.616
	(6.831)	(6.840)	(7.078)	(7.144)
Belief: others' average contribution	11.492	11.980	10.240	12.691
	(5.265)	(5.814)	(5.556)	(5.921)
Contribution norm	13.144	12.788	12.988	12.250
	(7.099)	(7.875)	(7.053)	(8.434)
Player entered forum		0.341		0.326
		(0.474)		(0.469)
No. seen	1.000	1.500	1.000	1.507
	(0.000)	(1.022)	(0.000)	(1.053)
Punishment points sent	2.919	2.642	2.660	2.328
	(6.130)	(6.031)	(6.009)	(5.423)
Observations	6,760	6,500	6,630	6,630

This table shows means and standard deviations (in brackets) for all outcome variables by treatment sequence. The outcome variables are defined as individual contributions to the public good, individual's belief's about other group members' contributions to the public good in the upcoming round, contribution norms (where lower values imply tighter norms), an indicator whether an individual with forum access entered the forum, the number of other group members' contributions the individual can observe (ranging from 1 to 4) and the total number of punishments points sent by the individual to all other group member. "Punishment points sent" is measured at the individual level and not at the dyadic level.

Figure A1: Average contribution by treatment sequence

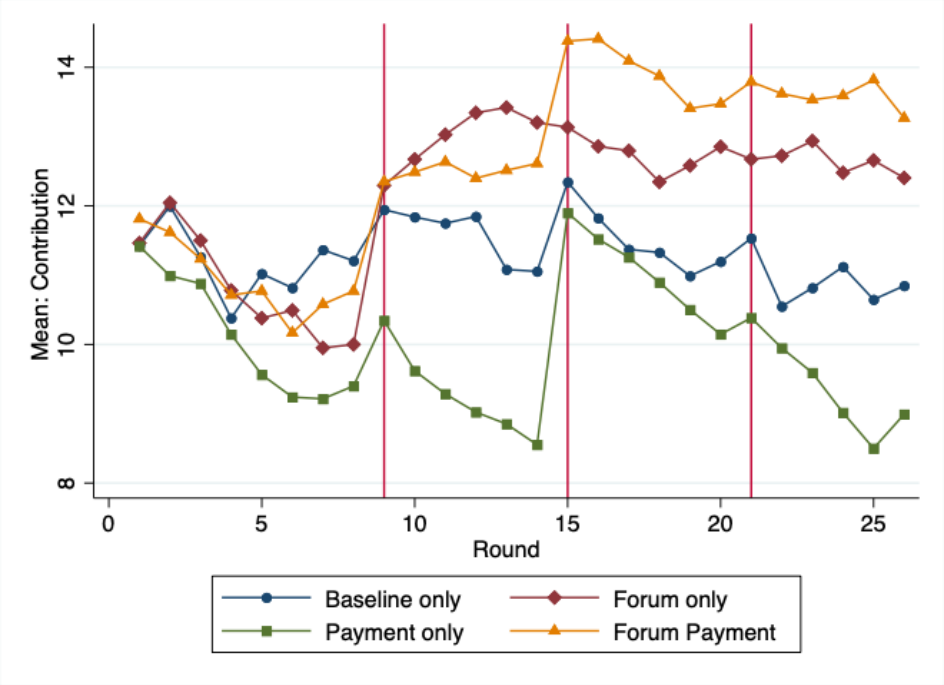
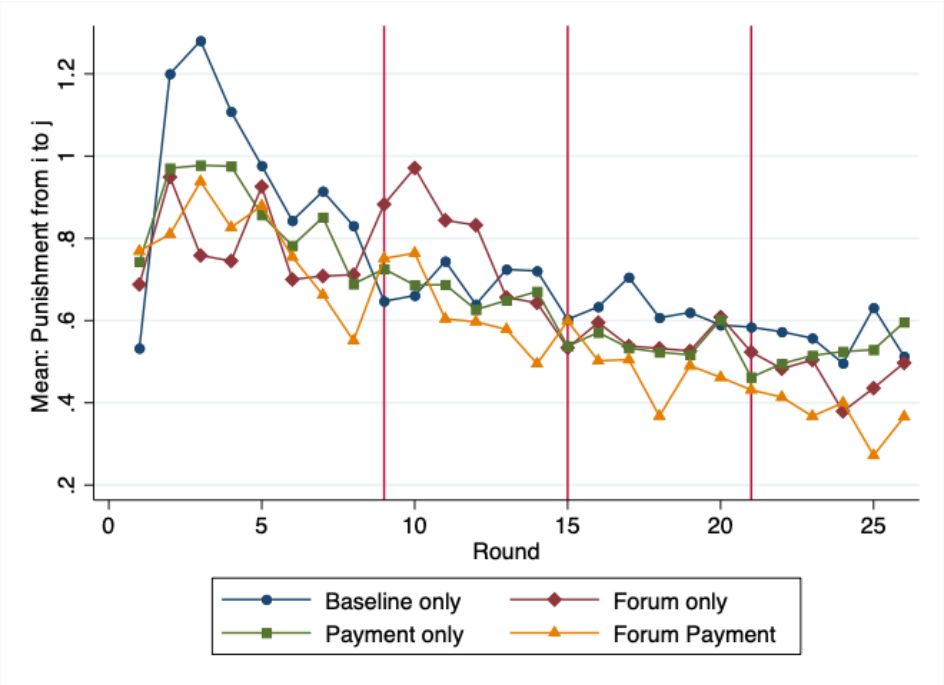


Figure A2: Average punishment points sent from i to j by treatment sequence



B Additional Analyses

Figure B1: Distribution of individual contributions in round 1

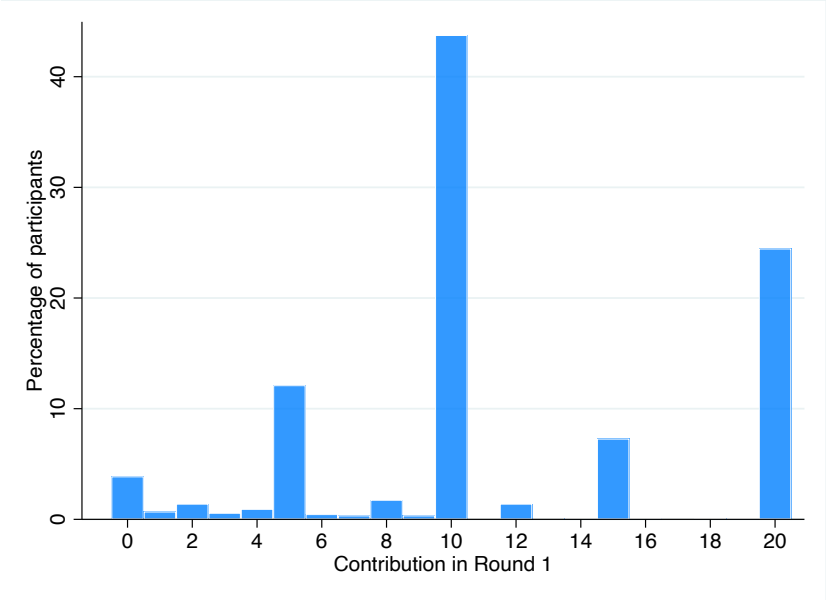


Table B1: Balance tests

	(1) Contributions Part 1	(2) Contributions Round 8
Forum Only	-0.371	-1.208
	(0.660)	(0.913)
Payment Only	-1.098	-1.808*
	(0.720)	(0.973)
Forum Payment	-0.233	-0.436
	(0.734)	(0.977)
Constant	11.183***	11.208***
	(0.458)	(0.609)
F-Statistic	0.810	1.359
p-value F-Stat	0.490	0.257
Controls	No	No
Random effects	No	No
Observations	7855	995

Notes: This table shows a test for differences in contributions across experimental sequences using individual-round level observations from Part 1 of the experiments (Column 1) and from the last round of Part 1 (Round 8). Baseline Only is the comparison group. Forum Only, Payment Only and Forum Payment are dummy variables, indicating that participants were part of the respective experimental sequences. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01

Table B2: Effect of announcement on beliefs

	(1) Payment only	(2) Payment with forum
Belief: others' average contribution		
Round 15	0.794***	-0.089
	(0.280)	(0.179)
Payment Only Sequence	-2.547***	
	(0.930)	
Forum Payment Sequence		-0.230
		(1.011)
Payment x Round 15	2.258***	1.762***
	(0.480)	(0.309)
Controls	No	No
Individual random effects	Yes	Yes
Group random effects	Yes	Yes
Observations	1005	980

Notes: This table shows how the announcement of payments affects participants' beliefs about their group members' average contribution to the public good. Estimation in columns 1 and 2 follows Equations 6 and 7, respectively. Dependent variable: Beliefs about others' average contributions to the public good at the individual-round level. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Table B3: Heterogeneous effects on contributions and beliefs

	(1)	(2)
	Contribution	Belief: others' average contribution
Medium	3.481***	3.856***
	(0.663)	(0.601)
High	8.470***	8.313***
	(0.762)	(0.706)
Forum	2.158***	1.880***
	(0.732)	(0.629)
Forum × Medium	0.466	-0.283
	(1.034)	(0.929)
Forum × High	0.648	0.296
	(1.017)	(0.928)
Forum × Part=3	-0.448	-0.359
	(0.626)	(0.493)
Forum × Part=4	0.453	0.487
	(0.918)	(0.823)
Forum x Part=3 x Medium	0.678	1.128*
	(0.764)	(0.613)
Forum x Part=3 x High	-0.060	0.723
	(0.887)	(0.566)
Forum x Part=4 x Medium	-0.439	0.351
	(1.107)	(0.967)
Forum x Part=4 x High	-0.109	0.577
	(1.162)	(0.886)
Payment	2.166***	1.658***
	(0.644)	(0.503)
Payment × Medium	-0.381	0.293
	(0.788)	(0.639)
Payment × High	-0.799	-0.404
	(0.813)	(0.687)
Forum × Payment	0.495	0.840
	(1.188)	(0.951)
Forum x Payment x Medium	-0.446	-1.724
	(1.598)	(1.354)
Forum x Payment x High	-1.075	-1.709
	(1.594)	(1.218)
Payment removed	0.589	0.483
	(0.633)	(0.511)
Payment removed × Medium	-0.384	-0.171
	(0.722)	(0.770)
Payment removed × High	0.952	0.354
	(0.623)	(0.605)
Forum × Payment removed	0.975	0.639
	(1.525)	(1.299)
Forum x Payment Removed x Medium	0.492	-0.065
	(2.059)	(1.808)
Forum x Payment Removed x High	-1.496	-1.189
	(1.784)	(1.505)
Part=3	-0.057	0.111
	(0.314)	(0.298)
Part=4	-0.623	-0.290
	(0.433)	(0.365)
Controls	Yes	Yes
Observations	17635	17635

This table shows how the effect of our interventions varies across baseline contribution terciles. Individual i contributions to the public good in round t are the outcome variable in Column 1, and individual i's beliefs about other group members' contributions to the public good in the upcoming round t in Column 2. Estimation follows the moderator analysis pre-specified in Section 5.2 of the pre-analysis plan. Interaction terms between payments / payments removal and medium / high were not pre-specified. Moreover, we deviated from the PAP in defining Low, Medium and High based on group contribution in Round 8, rather than based on contributions at the end of the previous part. Controls are country of residence, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Table B4: Moderator analysis - beliefs about contributions

	(1) Low	(2) Medium	(3) High
Belief: others' average contribution			
Forum	2.163***	1.505**	2.113***
	(0.627)	(0.651)	(0.624)
Forum x Part 3	-1.149*	1.115*	0.480
	(0.616)	(0.648)	(0.667)
Forum x Part 4	-0.362	1.220	1.182
	(0.968)	(0.846)	(0.797)
Payment	0.873	2.296***	1.370*
	(0.625)	(0.663)	(0.766)
Forum × Payment	1.625	-1.230	-0.984
	(1.024)	(1.104)	(0.975)
Payment removed	-0.362	0.693	0.956
	(0.718)	(0.888)	(0.795)
Forum × Payment removed	1.483	0.193	-0.667
	(1.399)	(1.431)	(1.053)
Part=3	0.901*	-0.235	-0.005
	(0.473)	(0.443)	(0.527)
Part=4	0.560	-0.672	-0.409
	(0.622)	(0.566)	(0.625)
Forum + Forum x Part 3	1.014	2.620	2.593
Forum + Forum x Part 3 p-value	0.284	0.009	0.007
Forum + Forum x Part 4	1.801	2.725	3.295
Forum + Forum x Part 4 p-value	0.125	0.020	0.002
Pay + Forum x Pay	2.497	1.066	0.386
Pay + Forum x Pay p-value	0.002	0.228	0.522
Pay rem. + Forum x Pay rem.	1.121	0.886	0.289
Pay rem. + Forum x Pay rem. p-value	0.350	0.430	0.675
Controls	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes
Group random effects	Yes	Yes	Yes
Observations	5930	5935	5770

Note: This table shows the effect of our interventions on individual beliefs about other group members' contributions for groups with Low (Column 1), Medium (Column 2) and High (Column 3) initial cooperation. The analysis is at the individual-round level. The sample is split into low, medium and high based on group contribution terciles in round 8. Estimation follows Equation 5. Controls are country of residence, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Table B5: Moderator analysis - norm strength

	(1) Low	(2) Medium	(3) High
Contribution norm			
Forum	0.075	1.199	-2.047
	(1.261)	(1.275)	(2.061)
Forum x Part 3	-1.124	-2.739***	0.801
	(1.106)	(1.005)	(1.638)
Forum x Part 4	-0.486	-3.613**	-0.867
	(1.735)	(1.518)	(2.330)
Payment	1.734	-0.030	-0.730
	(1.209)	(1.202)	(1.529)
Forum × Payment	-1.570	0.705	-0.088
	(2.061)	(2.094)	(2.366)
Payment removed	0.172	0.096	-1.457
	(1.682)	(1.304)	(1.789)
Forum × Payment removed	-0.536	0.777	1.907
	(2.368)	(2.182)	(3.609)
Part=3	-0.370	-0.356	-1.906**
	(0.855)	(0.603)	(0.811)
Part=4	-0.857	-0.882	-2.272*
	(1.427)	(0.862)	(1.207)
Forum + Forum x Part 3	-1.048	-1.540	-1.246
Forum + Forum x Part 3 p-value	0.502	0.279	0.591
Forum + Forum x Part 4	-0.410	-2.414	-2.915
Forum + Forum x Part 4 p-value	0.844	0.137	0.226
Pay + Forum x Pay	0.164	0.675	-0.818
Pay + Forum x Pay p-value	0.922	0.694	0.650
Pay rem. + Forum x Pay rem.	-0.363	0.872	0.450
Pay rem. + Forum x Pay rem. p-value	0.828	0.618	0.886
Controls	No	No	No
Group random effects	Yes	Yes	Yes
Observations	1186	1187	1154

Notes: This table shows the effect of our interventions on contributions norms for groups with Low (Column 1), Medium (Column 2) and High (Column 3) initial cooperation. The dependent variable Contribution norm is defined at the group-round level and measured via the variance of beliefs and contributions. A lower value implies a tighter contribution norm. The sample is split into Low, Medium and High based on group contribution terciles in round 8. Estimation follows Equation 5. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Table B6: Moderator analysis - forum entry

	(1) Low	(2) Medium	(3) High
Player entered forum			
Forum x Part 3	-0.149***	-0.195***	-0.132**
	(0.035)	(0.040)	(0.055)
Forum x Part 4	-0.235***	-0.302***	-0.188***
	(0.035)	(0.053)	(0.057)
Payment	0.050	0.015	0.006
	(0.053)	(0.055)	(0.066)
Payment removed	0.096	0.131*	0.010
	(0.060)	(0.067)	(0.071)
Constant	0.660***	0.505***	0.424*
	(0.078)	(0.143)	(0.242)
Controls	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes
Group random effects	Yes	Yes	Yes
Observations	2995	3085	2570

Notes: This table shows the effect of our interventions on a participant's decision to attend the forum for groups with Low (Column 1), Medium (Column 2) and High (Column 3) initial cooperation. The Forum Entry variable is only defined if individuals had the option to attend the forum, i.e. for Parts 2-4 in the Forum and Forum-Payment Sequences. The sample is split into Low, Medium and High based on group contribution terciles in round 8. Estimation follows Equation 5. Controls are country of residence, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Table B7: Moderator analysis - punishment

	(1) Low	(2) Medium	(3) High
Punishment from i to j			
Forum	0.179	-0.073	-0.005
	(0.131)	(0.163)	(0.153)
Forum x Part 3	-0.098	-0.282**	-0.048
	(0.121)	(0.124)	(0.131)
Forum x Part 4	-0.112	-0.189	-0.191
	(0.128)	(0.145)	(0.147)
Payment	-0.008	-0.156	-0.078
	(0.116)	(0.101)	(0.134)
Forum × Payment	-0.027	0.308*	0.084
	(0.179)	(0.175)	(0.185)
Payment removed	-0.078	0.112	-0.044
	(0.123)	(0.119)	(0.108)
Forum × Payment removed	0.004	-0.011	0.112
	(0.192)	(0.186)	(0.198)
Part=3	-0.045	-0.049	-0.085
	(0.083)	(0.077)	(0.080)
Part=4	-0.125	-0.219**	-0.068
	(0.099)	(0.094)	(0.068)
Constant	1.137***	0.959***	0.550**
	(0.393)	(0.299)	(0.253)
Forum + Forum x Part 3	0.081	-0.355	-0.052
Forum + Forum x Part 3 p-value	0.624	0.025	0.764
Forum + Forum x Part 4	0.068	-0.263	-0.195
Forum + Forum x Part 4 p-value	0.656	0.095	0.203
Pay + Forum x Pay	-0.034	0.152	0.006
Pay + Forum x Pay p-value	0.800	0.289	0.962
Pay rem. + Forum x Pay rem.	-0.074	0.101	0.068
Pay rem. + Forum x Pay rem. p-value	0.613	0.482	0.683
Controls	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes
Group random effects	Yes	Yes	Yes
Observations	23720	23740	23080

Notes: This table shows the effect of our interventions on the number of punishment points sent from i to j in round t for groups with Low (Column 1), Medium (Column 2) and High (Column 3) initial cooperation. The sample is split into Low, Medium and High based on group contribution terciles in round 8. Estimation follows Equation 5. We control for country, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Table B8: Contributions and beliefs in Round 1

	(1) Individual contributions	(2) Group contributions
Belief: others' average contribution	0.586***	
	(0.039)	
Average projected group contribution		0.896***
		(0.067)
Constant	5.684***	11.561**
	(0.429)	(3.527)
Observations	850	170
R^2	0.209	0.514

Notes: This table shows non-preregistered, exploratory analysis of round 1 data. Column 1 (Individual Level): The dependent variable is individual contributions; the regressor is the belief regarding other members' average contributions. Column 2 (Group Level): The dependent variable is the total group contribution. The regressor is the "Average Projected Group Contribution", defined as the group-wide average of individual beliefs about the group's total contributions (a participant's own contribution plus their belief about others' contributions). Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table B9: Joint distribution of round 1 and round 8 contributions

		Round 8 tercile		
		Low	Medium	High
Round 1 tercile	Low	26	20	14
	Medium	20	20	13
	High	7	13	33

Notes: This table tabulates group contribution terciles in Round 1 and Round 8. The Low tercile includes groups in the bottom 33% of contributions, while the High tercile includes those in the top 33%.

Table B10: Effect on contributions, beliefs, norms, information, and forum entry - Prolific participants only

	(1) Contribution	(2) Belief	(3) Norm	(4) No. Seen	(5) Entered Forum
Forum	1.805***	1.225***	-0.847	1.032***	
	(0.390)	(0.356)	(0.709)	(0.078)	
Forum x Part 3	-0.299	0.047	-1.571*	-0.412***	-0.163***
	(0.552)	(0.499)	(0.822)	(0.091)	(0.026)
Forum x Part 4	0.075	0.536	-2.531**	-0.643***	-0.247***
	(0.705)	(0.616)	(1.182)	(0.088)	(0.029)
Payment	1.256**	0.881*	1.067	-0.000	0.009
	(0.555)	(0.503)	(0.905)	(0.000)	(0.037)
Forum × Payment	0.083	0.027	-0.592	-0.042	
	(0.970)	(0.866)	(1.437)	(0.128)	
Payment removed	0.135	-0.160	0.146	-0.000	0.064
	(0.595)	(0.563)	(1.003)	(0.000)	(0.041)
Forum × Payment removed	0.949	0.499	1.285	0.163	
	(1.124)	(1.037)	(1.668)	(0.126)	
Part=2	-0.175	0.429*	-1.967***	-0.000	
	(0.253)	(0.223)	(0.381)	(0.000)	
Part=3	-0.078	0.836*	-3.015***	-0.000	
	(0.488)	(0.449)	(0.607)	(0.000)	
Part=4	-0.556	0.457	-3.502***	0.000	
	(0.528)	(0.484)	(0.746)	(0.000)	
Constant	11.252***	10.851***	15.775***	1.033***	0.573***
	(0.929)	(0.520)	(0.374)	(0.052)	(0.101)
Forum + Forum x Part 3	1.506	1.272	-2.418	0.620	
Forum + Forum x Part 3 p-value	0.036	0.053	0.014	0.000	
Forum + Forum x Part 4	1.880	1.762	-3.378	0.389	
Forum + Forum x Part 4 p-value	0.024	0.020	0.005	0.000	
Pay + Forum x Pay	1.339	0.908	0.475	-0.042	
Pay + Forum x Pay p-value	0.092	0.198	0.670	0.745	
Pay rem. + Forum x Pay rem.	1.083	0.339	1.431	0.163	
Pay rem. + Forum x Pay rem. p-v.	0.256	0.697	0.283	0.194	
Controls	Yes	Yes	Yes	No	Yes
Group random effects	Yes	Yes	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes	No	Yes
Observations	22405	22405	4481	22405	7150

This table reproduces Table 2, but the sample comprises only observations from online experiments conducted on Prolific. This table shows the estimated effect of the Forum, Payments, and their combination on the following outcomes: Individual contributions to the public good in Column 1, individual's belief's about other group members' contributions to the public good in the upcoming round in Column 2, Contribution Norms in Column 3, the number of other group members contributions the individual can observe (ranging from 1 to 4) in Column 4 and an indicator whether an individual with forum access entered the forum in Column 5. The analysis is at the individual-round level in Columns 1, 2, 3 and 5, and at the group-round level in Column 4. Estimation is based on Equation 5. Controls are country of residence, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01

Table B11: Effect of forum and payments on punishment - Prolific participants only

	(1) No. of points	(2) Punishment dummy	(3) No. of points | Punished
Forum	0.221***	0.030*	0.493**
	(0.070)	(0.016)	(0.197)
Forum x Part 3	-0.112	-0.037**	0.018
	(0.086)	(0.018)	(0.241)
Forum x Part 4	-0.150	-0.037*	-0.041
	(0.092)	(0.021)	(0.300)
Payment	0.037	-0.006	0.143
	(0.087)	(0.020)	(0.262)
Forum × Payment	-0.069	0.000	-0.030
	(0.139)	(0.031)	(0.424)
Payment removed	0.055	-0.020	0.548*
	(0.088)	(0.019)	(0.291)
Forum × Payment removed	-0.100	-0.004	-0.281
	(0.142)	(0.032)	(0.491)
Part=2	-0.269***	-0.056***	-0.429***
	(0.045)	(0.011)	(0.108)
Part=3	-0.375***	-0.080***	-0.478**
	(0.067)	(0.014)	(0.189)
Part=4	-0.441***	-0.094***	-0.678***
	(0.070)	(0.014)	(0.238)
Constant	1.039***	0.331***	2.795***
	(0.206)	(0.056)	(0.336)
Forum + Forum x Part 3	0.109	-0.007	0.512
Forum + Forum x Part 3 p-value	0.270	0.742	0.084
Forum + Forum x Part 4	0.071	-0.007	0.453
Forum + Forum x Part 4 p-value	0.500	0.763	0.207
Pay + Forum x Pay	-0.033	-0.006	0.113
Pay + Forum x Pay p-value	0.763	0.807	0.736
Pay rem. + Forum x Pay rem.	-0.045	-0.024	0.267
Pay rem. + Forum x Pay rem. p-value	0.687	0.344	0.499
Controls	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes
Group random effects	Yes	Yes	Yes
Observations	89620	89620	18922

This table reproduces Table 3, but the sample comprises only observations from online experiments conducted on Prolific. Data collected in the FEELE lab at the University of Exeter are excluded. This table presents the results of regressions using dyadic punishment data. In column 1, the dependent variable is the number of punishment points sent from i to j in round t. Column 2 looks at the extensive margin of punishment and the dependent variable is a dummy=1 if i punished j in round t. Column 3 looks at the intensive margin of punishment and the dependent variable is the number of punishment points sent from i to j conditional on i punishing j in round t. Estimation is based on Equation 5. We control for country, age, and gender. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

Table B12: Heterogeneous effects on contributions - Prolific participants only

	(1) Low	(2) Medium	(3) High
Contribution			
Forum	2.529***	2.131***	2.835***
	(0.751)	(0.765)	(0.743)
Forum x Part 3	-1.091	0.531	-0.227
	(0.837)	(0.754)	(0.949)
Forum x Part 4	-0.094	-0.127	0.767
	(1.209)	(1.147)	(1.162)
Payment	1.505*	2.306***	1.367
	(0.828)	(0.746)	(0.835)
Forum × Payment	0.552	0.137	-1.067
	(1.407)	(1.318)	(1.447)
Payment removed	-0.065	0.396	1.907**
	(0.965)	(1.014)	(0.858)
Forum × Payment removed	1.053	2.074	-1.426
	(1.858)	(1.834)	(1.319)
Part=3	0.612	-0.587	-0.427
	(0.606)	(0.512)	(0.558)
Part=4	0.039	-0.823	-1.046
	(0.852)	(0.852)	(0.712)
Constant	6.667***	11.977***	14.052***
	(1.389)	(1.848)	(2.105)
Forum + Forum x Part 3	1.437	2.661	2.608
Forum + Forum x Part 3 p-value	0.238	0.015	0.034
Forum + Forum x Part 4	2.435	2.004	3.602
Forum + Forum x Part 4 p-value	0.082	0.160	0.006
Pay + Forum x Pay	2.057	2.442	0.300
Pay + Forum x Pay p-value	0.071	0.025	0.800
Pay rem. + Forum x Pay rem.	0.989	2.470	0.481
Pay rem. + Forum x Pay rem. p-value	0.533	0.106	0.631
Controls	Yes	Yes	Yes
Individual random effects	Yes	Yes	Yes
Group random effects	Yes	Yes	Yes
Observations	5320	5230	4695

This table reproduces Table 4, but the sample comprises only observations from online experiments conducted on Prolific. Data collected in the FEELE lab at the University of Exeter are excluded. This table shows the effect of our interventions on individual contributions to the public good for groups with Low (Column 1), Medium (Column 2) and High (Column 3) initial cooperation. The sample is split into Low, Medium and High based on group contribution terciles in round 8. Estimation follows Equation 5. Standard errors in parentheses are clustered at the group level. * p<0.1, ** p<0.05, *** p<0.01.

C Experimental Materials and Methods

C.1 Instructions

We reproduce the instructions for the Forum Payment sequence, which includes all the different parts. The instructions for each part were displayed before that part started. In other sequences where a part was repeated (e.g., Baseline Only), the instructions from the previous part were displayed, preceded by the statement "Your task will be **the same** as that in **Part 1/2/3**. We reproduce the instructions below to refresh your memory."

Introduction

Welcome to our experiment!

Please read these instructions carefully. Your compensation for today will depend on your decisions, as well as the decisions of other participants. These instructions will help you to understand how the experiment will take place. After reading the instructions, you will have to answer a few questions that ensure you understand the way the experiment will work. You will continue to the experiment when you have answered the questions correctly.

There are 4 parts to this experiment. Each part has a separate set of instructions.

Once you complete all the parts in the experiment, **we will add up your earnings from Parts 1, 2, 3 and 4** and **that total will be your final payment for the whole experiment**. The currency in the experiment is the Experimental Currency Unit (ECU). 170 ECU ECU = £1.

In the experiment, all participants are randomly assigned to groups of 5. This means that you are in a group with four other participants. You will be part of the same group throughout the entire experiment.

Each group member will receive an identification letter: A, B, C, D, or E. Each member of your group will retain their identification letter throughout the session.

Next

Part 1 Instructions

There will be many rounds in this Part 1 of the experiment.

Each round in Part 1 has **two** stages. We will now explain how each stage works.

Stage 1 (of each round)

You, as well as each of the other four members of your group, will start each round with an endowment of 20 ECU.

Your task in this stage is to decide how much of your endowment to contribute to a group account, and how much to keep for yourself. Each group member will independently make the same decision with their own endowments.

Given all those decisions, your Stage 1 payoff will have three parts that will be added:

1. Amount of your endowment that you kept for yourself.
2. Payoff you get from the group account, equalling 40% (2/5) of the total contributions made by the 5 group members. This part will be the same for each group member.
3. Payoff from guessing the decisions of other group members (explained below).

To be sure that you understand how your payoff will be calculated, let's go through an example. Suppose that the total contribution to the group account by all five group members is 60 ECU. Each group member will then get 40% × 60 = 24 ECU, from the group account, as the second part of their payoff (an easy way to determine 40% is to divide by 5, here yielding 12, then multiply that value by 2, here yielding 24). Your Stage 1 payoff would be equal to those 24 ECU plus whatever part of your endowment you kept for yourself (plus any bonus for correctly guessing the four others' total contributions to the group account).

Each ECU that you contribute to the group account raises the total contribution to the group account by 1 ECU. The part of the endowment you keep for yourself **goes down by 1 ECU** for each ECU that you contribute to the group account, but on the other hand your payoff from the group account **goes up by 40% × 1 = 0.4 ECU** for each ECU that you contribute.

The payoff of the other members of your group will also **rise by 0.4 ECU** for each ECU you contribute to the group account, as everybody has the same group account payoff. Thus, **your contributions to the group account will raise the payoffs of the other participants**.

In turn, **all of the contributions to the group account by other participants will also raise your group account payoff**. For each ECU contributed to the group account by another participant, the second part of your payoff **rises by 40% × 1 = 0.4 ECU.**

Before you decide how much to contribute to the group account, we will ask you to guess the **TOTAL contribution to the group account by the other four** members of your group. If you guess that total correctly, you will receive an extra 1 ECU at the end of the round (which will add to your earnings for the round). If you guess incorrectly, you will receive 0 ECU.

To summarize, we will ask you as well as the four other group members to each take two actions in Stage 1 of each round:

1. Guess the total contribution by the other four group members to the group account.
2. Decide how many ECUs to contribute from your endowment to the group account.

Once you and all other group members have simultaneously made your respective guesses and decided upon your respective contributions to the group account, Stage 1 ends.

Stage 2 (of each round)

Once all the group members have taken their actions, you (and all of the group members) will receive the following information concerning the decisions that were made in Stage 1:

- The ECU amount that ONE other group member contributed to the group account.
  - You will see the contribution of the same group member in every round.
  - Likewise, ONE group member will see your contribution in every round (note: you will not know which group member sees your contributions).
- The total amount that was contributed by the other four group members.
- A reminder of how much you contributed to the group account.
- Your Stage 1 payoff.

You then decide whether or not you wish to reduce the payoff of any of the other members in your group – at a cost to you. You can do so for one, two, three, or all four of the group's members, if you wish (or none of them). At this time, each of the other group members will be making the same decision and each could reduce your payoff, should they wish to do so. Indeed, any group member can reduce any other member's payoff, again at a cost to them.

You can spend any part of your Stage 1 payoff in order to reduce the payoff of a given group member. Each 1 ECU that you spend on this will reduce that group member's payoff by 3 ECU. However, you cannot reduce a group member's payoff below zero in a given round.

If you do not wish to reduce any given group member's payoff, then in the relevant decision box you should indicate that you choose to spend 0 ECU on reducing that member's payoff.

In sum, your payoff at the end of Stage 2 will be calculated in three steps:

Step 1: : we take your Stage 1 payoff and subtract 3 times the total number ECU the other participants spent on reducing your payoff. If the resulting value is negative, your payoff will be 0 ECU instead, i.e., your total ECU will **not go below zero here**.

Step 2: we take the amount of ECU in Step 1 and subtract any ECU that you assigned to reducing other group members' payoffs. This final amount **could be negative**, depending on your Step 1 total and the ECU you spent on the other participants.

Step 3: we take the amount of ECU from Step 2 and add any amount that you may have earned by correctly guessing the four others' total contributions in Stage 1.

After Stage 2 is over, the round is over as well.

It is important to note that ECUs you earn in one round do not carry over to the next round. You will start each round with 20 ECU.

Your total earnings for this Part of the experiment are the sum of the earnings across all of the rounds in the Part.

Comprehension Check Questions

NOTE: You have 4 attempts to answer the questions correctly

Question 1

Suppose that in Stage 1, the total contribution to the group account by all five group members is 50 ECU. What is each group member's payoff from the group account?

- ○ 20 ECU
- ○ 12 ECU
- ○ 30 ECU
- ○ 40 ECU

Question 2

How much would your Stage 1 payoff be if the total contribution to the group account was 50 ECU and your contribution to the group account was 10 ECU?

- ○ 20 ECU
- ○ 12 ECU
- ○ 30 ECU
- ○ 40 ECU

Question 3

How much would your Stage 1 payoff be if the total contribution to the group account was 50 ECU and your contribution to the group account was 0 ECU?

- ○ 20 ECU
- ○ 12 ECU
- ○ 30 ECU
- ○ 40 ECU

Question 4

How many other group members' contributions will you observe at the end of Stage 1?

- ○ One other group member
- ○ Two other group members
- ○ All four group members

Question 5

And how many other group members will observe your contribution?

- ○ One other group member
- ○ Two other group members
- ○ All four group members

Question 6

Whose payoff can you reduce?

- ○ Nobody

- ○ Just the person whose contribution I see
- ○ Whoever I want, including the people whose contributions I do not see

Question 7

If you spend 1 ECU to reduce another group member's payoff, by how much would their payoff go down?

- ○ 1 ECU
- ○ 3 ECU
- ○ 4 ECU

Next

Part 2 Instructions

Time left to complete this page: **4:59**

Your task will be similar to that in Part 1, but there are important differences. Please read these instructions carefully in order to understand the changes.

There are many rounds in Part 2. Each round in Part 2 has **three** stages (adding one more stage to Part 1). We will explain how each stage works.

Stage 1 (of each round) {SAME AS PART 1}

You, as well as each of the other four members of your group, will start each round with an endowment of 20 ECU.

Your task in this stage is to decide how much of your endowment to contribute to a group account, and how much to keep for yourself. Each group member will independently make the same decision with their own endowments.

Given all those decisions, your Stage 1 payoff will have three parts that will be added:

1. Amount of your endowment that you kept for yourself.
2. Payoff you get from the group account, equalling 40% (2/5) of the total contributions made by the 5 group members. This part will be the same for each group member.
3. Payoff from guessing the decisions of other group members (explained below).

To be sure that you understand how your payoff will be calculated, let's go through an example. Suppose that the total contribution to the group account by all five group members is 60 ECU. Each group member will then get 40% × 60 = 24 ECU, from the group account, as the second part of their payoff (an easy way to determine 40% is to divide by 5, here yielding 12, then multiply that value by 2, here yielding 24). Your Stage 1 payoff would be equal to those 24 ECU plus whatever part of your endowment you kept for yourself (plus any bonus for correctly guessing the four others' total contributions to the group account).

Each ECU that you contribute to the group account raises the total contribution to the group account by 1 ECU. The part of the endowment you keep for yourself **goes down by 1 ECU** for each ECU that you contribute to the group account, but on the other hand your payoff from the group account **goes up by 40% × 1 = 0.4 ECU** for each ECU that you contribute.

The payoff of the other members of your group will also **rise by 0.4 ECU** for each ECU you contribute to the group account, as everybody has the same group account payoff. Thus, **your contributions to the group account will raise the payoffs of the other participants**.

In turn, **all of the contributions to the group account by other participants will also raise your group account payoff**. For each ECU contributed to the group account by another participant, the second part of your payoff **rises by 40% × 1 = 0.4 ECU.**

Before you decide how much to contribute to the group account, we will ask you to guess the **TOTAL contribution to the group account by the other four** members of your group. If you guess that total correctly, you will receive an extra 1 ECU at the end of the round (which will add to your earnings for the round). If you guess incorrectly, you will receive 0 ECU.

To summarize, we will ask you as well as the four other group members to each take two actions in Stage 1 of each round:

1. Guess the total contribution by the other four group members to the group account.
2. Decide how many ECUs to contribute from your endowment to the group account.

Once you and all other group members have simultaneously made your respective guesses and decided upon your respective contributions to the group account, Stage 1 ends.

Stage 2 (of each round) {NEW!}

Once all of the group members have taken their actions, you (and all of the group members) will receive the following information concerning the decisions that were made in Stage 1:

- The amount that one other group member contributed to the group account.
- The total amount that was contributed by the other four group members.
- A reminder of how much you contributed to the group account.
- Your Stage 1 payoff.

After you receive this information, you will have the option of entering into a group Forum at a cost of 1 ECU. The forum allows group members to share information with other members of the same group about the contribution levels of which they are aware.

That is, if you enter the forum **the following information will automatically be revealed to the other group members who also pay to enter the forum**:

- Your contribution to the group account
- The contribution to the group account by the other group member you observed at the start of Stage 2

If you enter the forum, you will in turn **automatically receive the following information**:

- Individual contributions to the group account by the group members who enter the forum
- Individual contribution to the group account by the group members observed by those who enter the forum.
- You will also know which group members entered the forum (by their letters).

Entering the forum costs 1 ECU. Should you choose to enter the forum, that cost will be deducted from your final payoff **at the end of the round**.

If you choose not to enter the forum, you will be informed of how many people entered the forum in this round, but not whom.

Before you decide on entering the forum, we will ask you to guess how many of the other members in your group will enter the forum (from zero to all four). If you guess correctly how many other group members enter the forum, then you will receive an additional 1 ECU at the end of the round. If you guess incorrectly, you will receive 0 ECU.

You will have to take two actions in this stage:

1. Guess how many of the other four group members will enter the forum.
2. Decide whether or not to enter the forum.

All other group members will also take those actions. Once you and all of the other group member have made your guesses, and decided whether to enter the forum, Stage 2 ends.

Stage 3 (each round) {SAME AS STAGE 2 IN PART 1}

Once all the group members have taken their actions, you (and all of the group members) will receive the following information concerning the decisions that were made in Stage 1:

- The ECU amount that ONE other group member contributed to the group account.
  - You will see the contribution of the same group member in every round.
  - Likewise, ONE group member will see your contribution in every round (note: you will not know which group member sees your contributions).
- The total amount that was contributed by the other four group members.
- A reminder of how much you contributed to the group account.
- Your Stage 1 payoff.

You then decide whether or not you wish to reduce the payoff of any of the other members in your group – at a cost to you. You can do so for one, two, three, or all four of the group's members, if you wish (or none of them). At this time, each of the other group members will be making the same decision and each could reduce your payoff, should they wish to do so. Indeed, any group member can reduce any other member's payoff, again at a cost to them.

You can spend any part of your Stage 1 payoff in order to reduce the payoff of a given group member. Each 1 ECU that you spend on this will reduce that group member's payoff by 3 ECU. However, you cannot reduce a group member's payoff below zero in a given round.

If you do not wish to reduce any given group member's payoff, then in the relevant decision box you should indicate that you choose to spend 0 ECU on reducing that member's payoff.

In sum, your payoff at the end of Stage 2 will be calculated in three steps:

Step 1: : we take your Stage 1 payoff and subtract 3 times the total number ECU the other participants spent on reducing your payoff. If the resulting value is negative, your payoff will be 0 ECU instead, i.e., your total ECU will **not go below zero here**.

Step 2: we take the amount of ECU in Step 1 and subtract any ECU that you assigned to reducing other group members' payoffs. This final amount **could be negative**, depending on your Step 1 total and the ECU you spent on the other participants.

Step 3: we take the amount of ECU from Step 2 and add any amount that you may have earned by correctly guessing the four others' total contributions in Stage 1.

After Stage 3 is over, the round is over as well.

It is important to note that ECUs you earn in one round do not carry over to the next round. You will start each round with 20 ECU.

Your total earnings for this Part of the experiment are the sum of the earnings across all of the rounds in the Part.

Next

Part 3 Instructions

Time left to complete this page: **4:59**

Your task will be similar to that in Part 2, but there are important differences. Please read these instructions carefully in order to understand the changes.

There are many rounds in Part 3. Each round in Part 3 has **three** stages . We will explain how each stage works.

Stage 1 (of each round) {NEW!}

You and the other four members of your group will start each round with an endowment of 20 ECU.

Your task in this stage is to decide how much of your endowment to contribute to a group account, and how much to keep for yourself. Each group member will independently make the same decision.

Your Stage 1 payoff will now consist of 4 parts, which will be added together:

1. The amount of your endowment that you kept for yourself
2. Payoff you get from the group account, equalling 40% (2/5) of the total contributions made by the 5 group members. This part will be the same for all group members.
3. A bonus payoff from the group account, above what was received in Parts 1 and 2. We will explain how this bonus payoff works next.
4. Payoff from guessing the decisions of other group members.

The new part of your Stage 1 payoffs for Part 3 is that you will receive a **bonus payoff** from the group account that is proportional to the amount by which total group contributions are greater than the total contribution by your group in the final round of Part 2, **0 ECU**.

This bonus is computed using only the contributions made to the group account **above 0 ECU. Specifically, for all of Part 3 rounds there is a bonus of 40% (2/5) of the amount by which total group contributions in that round are above 0 ECU (from Part 2's final round)**. For any round in which total contributions are above 0 ECU, you and your group members will receive the bonus payoff at the **end of the round**. It will be the same for every group member.

To make sure that you understand how your bonus payoff will be calculated, if a bonus is in fact earned by the group, let's go through an example. Suppose that the total contribution to the group account by all five group members is 5 ECU. According to the way payoffs have been and still are calculated, as per the second part of payoffs each group member gets 40% × 5 ECU = 2 ECU from the group account. Now, in addition, as the third part of individual payoffs each group member also receives an additional bonus payoff of 40% × 5 = 2 ECU because in this example the total group contributions went above 0 ECU by 5.

Before you decide how much to contribute to the group account, we will ask you to guess the **TOTAL contribution to the group account by the other four** group members. If you guess correctly, you will receive an extra 1 ECU at the end of the round. If you guess incorrectly, you will receive 0 ECU.

To summarize, we will ask you and each of the other four group members to simultaneously make two decisions in Stage 1 of each round:

1. Guess the total contribution by the other four group members to the group account

2. Decide how many ECUs to contribute yourself

Once you and all other group members have simultaneously made your respective guesses and decided on your respective contributions to the group account, Stage 1 ends.

Stage 2 (of each round) {SAME AS PART 2}

Once all of the group members have taken their actions, you (and all of the group members) will receive the following information concerning the decisions that were made in Stage 1:

- The amount that one other group member contributed to the group account.
- The total amount that was contributed by the other four group members.
- A reminder of how much you contributed to the group account.
- Your Stage 1 payoff.

After you receive this information, you will have the option of entering into a group Forum at a cost of 1 ECU. The forum allows group members to share information with other members of the same group about the contribution levels of which they are aware.

That is, if you enter the forum **the following information will automatically be revealed to the other group members who also pay to enter the forum**:

- Your contribution to the group account
- The contribution to the group account by the other group member you observed at the start of Stage 2

If you enter the forum, you will in turn **automatically receive the following information**:

- Individual contributions to the group account by the group members who enter the forum
- Individual contribution to the group account by the group members observed by those who enter the forum.
- You will also know which group members entered the forum (by their letters).

Entering the forum costs 1 ECU. Should you choose to enter the forum, that cost will be deducted from your final payoff **at the end of the round**.

If you choose not to enter the forum, you will be informed of how many people entered the forum in this round, but not whom.

Before you decide on entering the forum, we will ask you to guess how many of the other members in your group will enter the forum (from zero to all four). If you guess correctly how many other group members enter the forum, then you will receive an additional 1 ECU at the end of the round. If you guess incorrectly, you will receive 0 ECU.

You will have to take two actions in this stage:

1. Guess how many of the other four group members will enter the forum.
2. Decide whether or not to enter the forum.

All other group members will also take those actions. Once you and all of the other group member have made your guesses, and decided whether to enter the forum, Stage 2 ends.

Stage 3 (of each round) {SAME AS IN PART 2}

Once all the group members have taken their actions, you (and all of the group members) will receive the following information concerning the decisions that were made in Stage 1:

- The ECU amount that ONE other group member contributed to the group account.
    - You will see the contribution of the same group member in every round.

    - Likewise, ONE group member will see your contribution in every round (note: you will not know which group member sees your contributions).
- The total amount that was contributed by the other four group members.
- A reminder of how much you contributed to the group account.
- Your Stage 1 payoff.

You then decide whether or not you wish to reduce the payoff of any of the other members in your group – at a cost to you. You can do so for one, two, three, or all four of the group's members, if you wish (or none of them). At this time, each of the other group members will be making the same decision and each could reduce your payoff, should they wish to do so. Indeed, any group member can reduce any other member's payoff, again at a cost to them.

You can spend any part of your Stage 1 payoff in order to reduce the payoff of a given group member. Each 1 ECU that you spend on this will reduce that group member's payoff by 3 ECU. However, you cannot reduce a group member's payoff below zero in a given round.

If you do not wish to reduce any given group member's payoff, then in the relevant decision box you should indicate that you choose to spend 0 ECU on reducing that member's payoff.

In sum, your payoff at the end of Stage 2 will be calculated in three steps:

Step 1: : we take your Stage 1 payoff and subtract 3 times the total number ECU the other participants spent on reducing your payoff. If the resulting value is negative, your payoff will be 0 ECU instead, i.e., your total ECU will **not go below zero here**.

Step 2: we take the amount of ECU in Step 1 and subtract any ECU that you assigned to reducing other group members' payoffs. This final amount **could be negative**, depending on your Step 1 total and the ECU you spent on the other participants.

Step 3: we take the amount of ECU from Step 2 and add any amount that you may have earned by correctly guessing the four others' total contributions in Stage 1.

After Stage 3 is over, the round is over as well.

It is important to note that ECUs you earn in one round do not carry over to the next round. You will start each round with 20 ECU.

Your total earnings for this Part of the experiment are the sum of the earnings across all of the rounds in the Part.

Next

Part 4 Instructions

Time left to complete this page: **4:59**

Your task will be **the same as** that in **Part 2**. We reproduce the instructions below to refresh your memory.

There are many rounds in Part 4. Each round in Part 4 has **three** stages. We will explain how each stage works.

Stage 1 (of each round)

You, as well as each of the other four members of your group, will start each round with an endowment of 20 ECU.

Your task in this stage is to decide how much of your endowment to contribute to a group account, and how much to keep for yourself. Each group member will independently make the same decision with their own endowments.

Given all those decisions, your Stage 1 payoff will have three parts that will be added:

1. Amount of your endowment that you kept for yourself.
2. Payoff you get from the group account, equalling 40% (2/5) of the total contributions made by the 5 group members. This part will be the same for each group member.
3. Payoff from guessing the decisions of other group members (explained below).

To be sure that you understand how your payoff will be calculated, let's go through an example. Suppose that the total contribution to the group account by all five group members is 60 ECU. Each group member will then get 40% × 60 = 24 ECU, from the group account, as the second part of their payoff (an easy way to determine 40% is to divide by 5, here yielding 12, then multiply that value by 2, here yielding 24). Your Stage 1 payoff would be equal to those 24 ECU plus whatever part of your endowment you kept for yourself (plus any bonus for correctly guessing the four others' total contributions to the group account).

Each ECU that you contribute to the group account raises the total contribution to the group account by 1 ECU. The part of the endowment you keep for yourself **goes down by 1 ECU** for each ECU that you contribute to the group account, but on the other hand your payoff from the group account **goes up by 40% × 1 = 0.4 ECU** for each ECU that you contribute.

The payoff of the other members of your group will also **rise by 0.4 ECU** for each ECU you contribute to the group account, as everybody has the same group account payoff. Thus, **your contributions to the group account will raise the payoffs of the other participants**.

In turn, **all of the contributions to the group account by other participants will also raise your group account payoff**. For each ECU contributed to the group account by another participant, the second part of your payoff **rises by 40% × 1 = 0.4 ECU.**

Before you decide how much to contribute to the group account, we will ask you to guess the **TOTAL contribution to the group account by the other four** members of your group. If you guess that total correctly, you will receive an extra 1 ECU at the end of the round (which will add to your earnings for the round). If you guess incorrectly, you will receive 0 ECU.

To summarize, we will ask you as well as the four other group members to each take two actions in Stage 1 of each round:

1. Guess the total contribution by the other four group members to the group account.
2. Decide how many ECUs to contribute from your endowment to the group account.

Once you and all other group members have simultaneously made your respective guesses and decided upon your respective contributions to the group account, Stage 1 ends.

Stage 2 (of each round)

Once all of the group members have taken their actions, you (and all of the group members) will receive the following information concerning the decisions that were made in Stage 1:

- The amount that one other group member contributed to the group account.
- The total amount that was contributed by the other four group members.
- A reminder of how much you contributed to the group account.
- Your Stage 1 payoff.

After you receive this information, you will have the option of entering into a group Forum at a cost of 1 ECU. The forum allows group members to share information with other members of the same group about the contribution levels of which they are aware.

That is, if you enter the forum **the following information will automatically be revealed to the other group members who also pay to enter the forum**:

- Your contribution to the group account
- The contribution to the group account by the other group member you observed at the start of Stage 2

If you enter the forum, you will in turn **automatically receive the following information**:

- Individual contributions to the group account by the group members who enter the forum
- Individual contribution to the group account by the group members observed by those who enter the forum.
- You will also know which group members entered the forum (by their letters).

Entering the forum costs 1 ECU. Should you choose to enter the forum, that cost will be deducted from your final payoff **at the end of the round**.

If you choose not to enter the forum, you will be informed of how many people entered the forum in this round, but not whom.

Before you decide on entering the forum, we will ask you to guess how many of the other members in your group will enter the forum (from zero to all four). If you guess correctly how many other group members enter the forum, then you will receive an additional 1 ECU at the end of the round. If you guess incorrectly, you will receive 0 ECU.

You will have to take two actions in this stage:

1. Guess how many of the other four group members will enter the forum.
2. Decide whether or not to enter the forum.

All other group members will also take those actions. Once you and all of the other group member have made your guesses, and decided whether to enter the forum, Stage 2 ends.

Stage 3 (each round)

Once all the group members have taken their actions, you (and all of the group members) will receive the following information concerning the decisions that were made in Stage 1:

- The ECU amount that ONE other group member contributed to the group account.
  - You will see the contribution of the same group member in every round.
  - Likewise, ONE group member will see your contribution in every round (note: you will not know which group member sees your contributions).
- The total amount that was contributed by the other four group members.
- A reminder of how much you contributed to the group account.
- Your Stage 1 payoff.

You then decide whether or not you wish to reduce the payoff of any of the other members in your group – at a cost to you. You can do so for one, two, three, or all four of the group's members, if you wish (or none of them). At this time, each of the other group members will be making the same decision and each could reduce your payoff, should they wish to do so. Indeed, any group member can reduce any other member's payoff, again at a cost to them.

You can spend any part of your Stage 1 payoff in order to reduce the payoff of a given group member. Each 1 ECU that you spend on this will reduce that group member's payoff by 3 ECU. However, you cannot reduce a group member's payoff below zero in a given round.

If you do not wish to reduce any given group member's payoff, then in the relevant decision box you should indicate that you choose to spend 0 ECU on reducing that member's payoff.

In sum, your payoff at the end of Stage 2 will be calculated in three steps:

Step 1: : we take your Stage 1 payoff and subtract 3 times the total number ECU the other participants spent on reducing your payoff. If the resulting value is negative, your payoff will be 0 ECU instead, i.e., your total ECU will **not go below zero here**.

Step 2: we take the amount of ECU in Step 1 and subtract any ECU that you assigned to reducing other group members' payoffs. This final amount **could be negative**, depending on your Step 1 total and the ECU you spent on the other participants.

Step 3: we take the amount of ECU from Step 2 and add any amount that you may have earned by correctly guessing the four others' total contributions in Stage 1.

After Stage 3 is over, the round is over as well.

It is important to note that ECUs you earn in one round do not carry over to the next round. You will start each round with 20 ECU.

Your total earnings for this Part of the experiment are the sum of the earnings across all of the rounds in the Part.

Next

C.2 Decision and Feedback Screens

In this section, we reproduce the decision screens. We present them thematically and not necessarily in the order in which they appeared in a round.

C.2.1 Contribution decision, punishment and feedback

The first screenshot is the contribution screen. The second is the punishment decision screen, and the third is the contribution feedback screen.

Contribute: Part 1, Round 2

Time left to complete this page: **1:22**

You are player B.

First, please estimate how many ECU the other four group members will contribute to the group account (between 0 and 80):

ECU

Please decide how many ECU to contribute to the group account.

Remember: **Stage 1 Payoff = 20 – Contribution + 0.4 Total Contribution**.

ECU

Next

Punishment: Part 1, Round 2

Time left to complete this page: **1:29**

Please decide how much you would like to spend to reduce the payoff of the other group members. Enter 0 in a box if you do not wish to reduce the payoff of that group member. Each ECU spent reduces the payoff of the other participant by 3 ECU.

You have **20 ECU** remaining to spend.

Your contribution was 0 ECU

The total group contribution by the other four group members was **0 ECU**.

Player A	? ECU	ECU
Player B	? ECU	ECU
Player D	0 ECU	ECU
Player E	? ECU	ECU

Next

Contributions Status: Part 1, Round 2

Time left to complete this page: **1:28**

Contributions to the group account from other group members:

Player A	? ECU
Player B	? ECU
Player D	0 ECU
Player E	? ECU
Total contribution to the group account by the other four group members	**0 ECU**
Your contribution to the group account	0 ECU
Total group contribution	**0 ECU**
Group account payoff	0 ECU
Remaining endowment	20 ECU
Your Stage 1 Payoff	**20 ECU**

Next

C.2.2 Forum

In this section, we display the screenshots for the forum entry decision, as well as the feedback screens for those who entered the forum and those who did not. in which participants made their forum entry decision,

Contributions Status: Part 2, Round 1

Time left to complete this page: **1:26**

Contributions to the group account from other group members:

Player A	? ECU
Player C	0 ECU
Player D	? ECU
Player E	? ECU
Total contribution to the group account by the other four group members	**0 ECU**
Your contribution to the group account	0 ECU
Total group contribution	**0 ECU**
Group account payoff	0 ECU
Remaining endowment	20 ECU
Your Stage 1 Payoff	**20 ECU**

The forum allows group members to share information about contributions. That is, if you enter the forum the following information will automatically be revealed to the other group members who also pay to enter the forum:

- Your contribution to the group account.
- The contribution to the group account by the other group member you observed at the start of Stage 2.

You will also receive the same information from any group member who enters the forum. You will also know which group members entered the forum.

Entering the forum costs 1 ECU. Should you choose to enter the forum, that cost will be deducted from your final payoff at the end of the round.

If you choose not to enter the forum, you will be informed of how many people entered the forum in this round, but not whom.

Please estimate how many of the other four group members will enter the forum (0 to 4):

Please decide if you wish to enter the forum or not:

- ○ Enter forum
- ○ Do not enter forum

Next

Forum: Part 2, Round 1

Time left to complete this page: **1:13**

The following participants entered the forum: **A,B**. (As a reminder, you are player A).

Below you can see the contributions from the players that entered the forum, **plus** the contributions from the players they observed at the end of the last stage:

Player A:	0 ECU
Player B:	0 ECU
Player C:	0 ECU
Player D:	? ECU
Player E:	? ECU

Total contribution to the group account by the other four group members:	**0 ECU**

Next

Forum opt out: Part 2, Round 1

Time left to complete this page: **0:06**

You chose not to enter the forum in this round. 2 other members entered the forum.

Please wait until the experiment continues.

C.2.3 End-of-round feedback

We display the different end-of-round feedback screens (Baseline, Forum, and Forum + Payment).

Results: Part 1, Round 2

Time left to complete this page: **1:29**

Here is the summary of your earnings in this round:

Stage 1 payoff:	20 ECU
Your stage 1 payoff was reduced by:	0 ECU
Your balance:	20 ECU
ECU spent by you on others:	0 ECU
Remaining balance:	20 ECU
You estimated the total contribution by the other four group members correctly. Contributions estimate bonus:	1 ECU
Final Payment for Round:	**21 ECU**

Next

Results: Part 2, Round 1

Time left to complete this page: **0:51**

Here is the summary of your earnings in this round:

Stage 1 payoff:	20 ECU
Your stage 1 payoff was reduced by:	0 ECU
Your balance:	20 ECU
ECU spent by you on others:	0 ECU
Remaining balance:	20 ECU
You estimated the total contribution by the other four group members correctly. Contributions estimate bonus:	1 ECU
You estimated how many of the other four group members entered the forum incorrectly. Your forum entry estimate payoff:	0 ECU
Forum entry fee:	-1 ECU
Final Payment for Round:	**20 ECU**

Next

Results: Part 3, Round 1

Time left to complete this page: **1:19**

Here is the summary of your earnings in this round:

Stage 1 payoff:	20 ECU
Your stage 1 payoff was reduced by:	0 ECU
Your balance:	20 ECU
ECU spent by you on others:	0 ECU
Remaining balance:	20 ECU
You estimated the total contribution by the other four group members correctly. Contributions estimate bonus:	1 ECU
You estimated how many of the other four group members entered the forum incorrectly. Your forum entry estimate payoff:	0 ECU
Forum entry fee:	-1 ECU
Bonus payoff	0 ECU
Final Payment for Round:	**20 ECU**

Next

C.2.4 End-of-experiment and questionnaire

We display the end-of-experiment screen, where final payoff information was displayed, as well as the post-experimental questionnaire.

Results

You have now finished the study.

In this study, you were player **C**.

Your payoff has been generated from your earnings in all 4 Parts of this experiment:

Part 1	168 ECU
Part 2	123 ECU
Part 3	120 ECU
Part 4	120 ECU
Total	**531 ECU**

With a conversion rate of 170 ECU = £1, and your completion fee of £6.00, this gives you a payoff **£9.12**.

Before finishing, please click Next to do a quick exit questionnaire.

Next

Questionnaire

Please explain in a few sentences how you decided to contribute to the group account:

Please explain in a few sentences how you decided how to (not) use the forum:

Please explain in a few sentences how you decided to reduce the other group members' payoff:

Please explain in a few sentences how/if the bonus group payment in Part 3 changed the way you made the three decisions you wrote about earlier (contributions, forum use, reducing income):

Next

C.3 Participant Pool and Recruitment

Participants were recruited from Prolific.co and from the volunteer pool at the FEELE lab at the University of Exeter. Prolific.co is a bespoke platform for social science research. Its participants are individuals from around the world who have volunteered to be contacted to do online social-science research. We restricted the Prolific participants to those registered as residents in the USA, UK and Ireland, to minimize the risk of confusion due to language barriers.

Upon creating an experimental session in the Prolific platform, their booking system shows the ad for the session to a randomly chosen subset of registered participants who meet the demographic restrictions (in our case: USA, UK, and Ireland residency). Participants then sign up to the session.

We required participants to complete a comprehension check quiz after the first set of instructions in order to ascertain their understanding of the experimental environment. Participants had four attempts to complete the quiz; should a participant not get all the correct answers after the fourth attempt, they were allowed to proceed with the study.

C.4 Experimental Protocols

The experiment was programmed on oTree (Bock et al.,). Participants accessed the software through a url to an oTree virtual waiting room, which was provided at the time recruitment was conducted. For the Prolific sample, the url was provided in the ad itself. For the FEELE sample, the url was provided in the confirmation email sent after participants confirmed their attendance.

Upon arriving to the virtual waiting room, participants started the experiment by reading a consent form, and declaring their consent to take part. After that, they read the instructions to the experiment, and answered comprehension questions. Once completed, the software matched participants in groups of five at random. If a participant was not matched after 8 minutes, we paid them a participation fee.

Sessions took place between 07/07/2021 and 15/09/2021.

C.5 Missing Data

Missing outcome variables. Participants had a time limit to make a decision and click through feedback screens. If they were inactive for more than 2 minutes, the round would elapse. If a participant missed three consecutive rounds, that group's session would end, and the other participants would receive a participation fee proportional to the time spent in the session. These rules were explained as part of the instructions. We did not impute decision data.

Missingness of outcome variables is rare. Only 2.5 percent of the potential outcome variables are missing. Missingness is balanced across treatment sequences based on the test specified in Section 6.2 in the pre-analysis plan.

Missing control variables. Data on one or more of the pre-specified covariates are missing for 1.2 percent of the observations in the sample. Missingness is balanced across treatment conditions.

We follow the pre-analysis plan and impute missing control variables. For the categorical variables "Gender" and "Residence status", we add a category "Missing". For age, we impute the sample mean of age. Given that information on age is only missing for 7 individuals in the sample (one or two per treatment sequence), mean imputation is unlikely to deflate standard errors substantially.