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Changing Collective Action: Norm-Nudges and Team Decisions

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Changing Collective Action: Norm-Nudges and Team Decisions*

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Abstract

We test whether a descriptive norm-nudge is a suitable policy tool to increase cooperation in a social dilemma when decisions are taken by teams, not individuals. Each team in our experiment comes from a different fishing boat at Lake Victoria, Tanzania. The provision of a norm-nudge is randomized across two decision making mechanisms, enabling us to identify experience with egalitarian or hierarchical decision structures, both present at Lake Victoria. The descriptive norm-nudge increases cooperation by 14 and 16 percentage points for egalitarian and hierarchical team decisions, respectively. Captains from boats with hierarchical organization are particularly responsive.

JEL Classification: C72, C92, D7, D91, Q22

Keywords: collective action; team decisions; norm-nudges; common pool resources

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1 Introduction

Conventional policy tools are not always able to achieve socially desirable outcomes. When formal regulations are insufficient, unavailable, or cannot be enforced, policy makers need alternative approaches. One such alternative is a policy that uses normative information. By appealing to the wish to do good (an injunctive norm-nudge) or by providing information about the behavior of others (a descriptive norm-nudge), policy makers can try to change behavior (Nyborg et al., 2016). By now, there is ample evidence that these norm-nudges are successful. To name but a few, they encourage recycling behavior (Schultz, 1999), help to save electricity (Allcott, 2011; Costa and Kahn, 2013), and induce tax compliance (Hallsworth et al., 2017). For the most part, norm-nudges have been used to improve outcomes when individuals (i) decide by themselves and (ii) do not directly interact with each other, see Farrow et al. (2017) and Bergquist et al. (2019) for recent reviews. In addition, there is emerging experimental evidence that norm-nudges also work in social interactions. For example, norm-nudges induce a behavioral change in the trust game (Bicchieri et al., 2020) or in a social dilemma (Lopez et al., 2012; Fehr and Schurtenberger, 2018; Diekert et al., 2021).

However, it is yet unknown whether norm-nudges change behavior when individuals do not decide by themselves, but as part of a group or team. Because team decision making is pervasive in the economy, it is important to address this gap in the literature. For example, climate negotiations or the fight against global pandemics are coordinated by governments. Boards of directors sanction the compliance decisions of firms and decide whether to collude or compete with other firms. Also, natural resources are mostly managed by communities and harvest decisions such as catching fish are taken by crews. Can norm-nudges improve governance when formal regulations fail to address social dilemmas between teams?

Decision making for teams that interact with other teams differs from decision making for individuals that interact with other individuals. In a social dilemma between teams, there are two tasks. First, team members have to coordinate to reach a joint decision. Second, the team as a whole interacts with other teams on solving the dilemma. Individuals that interact with other individuals only face the second task. The behavioral implications of the differences between individual and team decision making are documented by a long-standing literature in economics (Kugler et al., 2012; Kocher et al., 2020) and social psychology (Schopler and Insko, 1992; Wildschut et al., 2007): Teams make more rational and selfish decisions. In other words, individual decisions are not necessarily a good predictor of team decisions (Charness and Sutter, 2012).

In this paper, we present an experiment where teams interact with other teams in a prisoner's dilemma. To test whether a descriptive norm-nudge can increase cooperation, we vary whether teams are informed about the cooperative behavior of other teams in a previous experimental session. The teams in our experiment are fishing crews from different boats at Lake Victoria, Tanzania. These crews naturally interact and face the social dilemma of common-pool resource use in their daily lives. Moreover, the fisheries at Lake Victoria are a relevant setting to study whether norm-nudges can change collective action: Overfishing threatens the income and food security of more than four million people while formal regulations remain ineffective (Mkumbo and Marshall, 2015).

Furthermore, we use a particular feature of our field setting to understand whether the effect of a norm-nudge depends on how teams reach a joint decision. Like most firms around the world, many fishing boats at Lake Victoria have a hierarchical decision structure: About half of the fishing boats in our sample have a captain/owner who decides where to fish. The other half, however, uses an egalitarian decision structure. Here, the crew or the crew together with the captain/owner chooses the location for fishing. We mimic these decision structures in our experiment: A team's action is either determined by the dictatorial decision of one team member (hierarchical decision structure), or through majority voting (egalitarian decision structure). Because the decision structure is randomly assigned, some participants have real life experience with their role in either a hierarchical or an egalitarian structure while others do not. This allows us to identify the effect of role experience (Gibbons and Waldman, 2004; Huckman et al., 2009) on the success of a norm-nudge.

We find that a descriptive norm-nudge increases cooperation of teams in a prisoner's dilemma. When the team's action is determined by majority voting, the provision of social information leads to an increase in average cooperation by 14 percentage points. When the team's action is determined by the dictatorial decision of one member, average cooperation increases by 16 percentage points. Yet, the behavioral change is accompanied by a change in empirical expectations (the belief about the behavior of other teams) only for team dictators. Interestingly, the treatment effect of social information in a hierarchical decision structure is driven by participants with role experience: fishermen with authority over other team members in real life. Our results demonstrate that descriptive norm-nudges could be a promising policy tool also when decisions are taken by teams, opening a number of important avenues for future research. In particular, our findings suggest that policy makers should account for the decision structure in teams and particularly target those individuals that have experience with authority in team decision making.

2 Related Literature

We study whether information about the behavior of other teams affects team decisions in a social dilemma. Our study thereby links three previously unconnected strands of literature: research on the effect of descriptive norm-nudges on behavior (section 2.1, research on teams as decision makers (section 2.2), and research on the structure that teams use to make joint decisions (section 2.3).

To guide the reader's thinking of how we relate to the literature, it may be helpful to make two comments on what we are *not* doing. First, we do not compare individual to team behavior. There is a large literature on this comparison, see *e.g.*, Gillet et al. (2009) for a seminal paper on cooperation behavior. Instead of comparing individual to team behavior, we tackle the relevant policy question whether social information can be used at all to induce a pro-social behavioral change when decisions are made by teams? Second, we do not measure social norms. While we consider beliefs about other teams' behavior as a driving mechanism of a nudge's effect on team decisions, our study is designed to test (i) the existence of an effect and (ii) whether it depends on the team decision structure. The identification of and discrimination between various possible pathways of a potential effect will be the task of future work. In a previous experiment at Lake Victoria, we analyzed how a norm-nudge affects the formation of social norms in a repeated prisoner's dilemma when decisions are taken by individuals (Diekert et al., 2021).

2.1 Behavioral Change through Social Information

The behavior and opinion of others are powerful drivers of individual decision making. A large number of successful social information interventions leverage this fact. For example, in two independent studies on home energy use Allcott (2011) and Ayres et al. (2013) both document a 2% decrease in energy consumption when households are informed about the energy use of their neighbors. In a similar intervention, Brent et al. (2015) find a reduction in water use of up to 5%.

The experiments by Croson et al. (2009) and Bicchieri and Xiao (2009) show how these norm-nudges work: After individuals receive credible information about what others do (descriptive norm-nudge) or about what others consider to be appropriate (injunc-

tive norm-nudge), they update their expectations about others' beliefs and behavior.[1] Thereby, social information activates and/or changes the perceived social norm. Both descriptive and normative information have been successfully used in norm activation and nudges appear to be particularly effective when the underlying norm is vague and therefore still malleable (Dimant and Gesche, 2021).

A number of theoretical models formalize the intuition that violating social norms introduces discomfort (Sugden, 2000; Velez et al., 2009; Kimbrough and Vostroknutov, 2016; Michaeli and Spiro, 2017). The discomfort increases in the mismatch between own actions and the (expected) actions of others and is often reinforced by the prospect of punishment (Balafoutas and Nikiforakis, 2012; Fehr and Schurtenberger, 2018). In other words, individuals prefer to conform, especially if non-conformity may be sanctioned. Providing social information activates preferences for conformity: It makes the desired behavior salient and – conditional on the individual's initial expectation – may change the perceived social norm. Depending on the behavior in question, social information is however not limited to activating preferences for conformity as such. For example, a message on others' behavior in a social dilemma conveys useful information on (i) which behavior is desirable, (ii) which behavior may lead to equitable outcomes, and (iii) whether one should fear the exploitation by others. Here, a norm-nudge can also work through norms of fairness and norms of trust.

The credibility of the social information message and the relevance of the reference group are important considerations for a successful design of interventions that target social norms (Miller and Prentice, 2016; Bicchieri and Dimant, 2019) and looks to leverage potential spillover effects at the aggregate level (Efferson et al., 2020). Agents may disregard a message about others' behavior or beliefs if it (i) does not come from a trusted source, or (ii) does not draw a comparison to a relevant social group. For example, Diekert et al. (2021) document that the effect of social information increases with social proximity between agents in a social dilemma game.

2.2 Team Decision Making

While the neo-classical theory of self-interested, rational agents has difficulties to predict individual behavior, it applies remarkably well to team decisions (Kugler et al., 2012; Charness and Sutter, 2012). Teams make patient, time-consistent choices (Shapiro,

[1] Belief formation is usually tracked through incentivized elicitation of empirical expectations and personal normative beliefs (Bicchieri, 2017). Yet, dependencies between stated beliefs and behavior complicate the identification of empirical expectations and personal beliefs as driving mechanisms of behavioral change. While some agents' behavior is driven by their beliefs, others may state a certain belief to justify their behavior (Andreoni and Sanchez, 2014).

2010; Denant-Boemont et al., 2017) and are good at earning high payoffs because they avoid miscoordination (Feri et al., 2010) and make less errors in reasoning (Charness and Sutter, 2012). Moreover, teams generally transfer little or nothing in non-strategic allocation tasks such as the dictator game (Luhan et al., 2009).

The regularity of self-interested and rational team behavior holds in strategic settings. Experiments in economics (Kagel and McGee, 2016) and social psychology (Schopler and Insko, 1992) show that teams maximize own benefits over making socially optimal decisions in a social dilemma.[2] There are three main motivations why teams are non-cooperative when they interact with other teams: (i) social support for self-interest, (ii) the fear of exploitation by other teams, and (iii) the diffusion of responsibility.

First, teams defect in a social dilemma because team members' self-interest aligns with benefits to the in-group. While choosing a non-cooperative strategy hurts the out-group, it maximizes the in-group payoff. That is, defection can be rationalized as an act of shared self interest (Insko et al., 1990; Kugler et al., 2012) in which pro-social preferences towards other groups are crowded out by parochial altruism (Charness and Chen, 2020). Such altruism is consistent with a let-down aversion of one's own team (Charness and Holder, 2019) as cooperation is costly not only at the expense of own payoffs but also at the expense of the in-group.

Second, teams defect in a social dilemma because they fear the exploitation by other teams. Defection protects oneself and the in-group against a sucker payoff (Bornstein et al., 2004a). It can easily be rationalized as a defensive response when other teams are not trusted to cooperate (Kagel and McGee, 2016). Such a lack of trust in interactions between teams is documented in Kugler et al. (2007) and Song (2009), who find that teams expect other teams to act selfish.

Third, teams defect in a social dilemma because responsibility is diffused. The individual within a team is often not identifiable and thus cannot be solely held accountable for a selfish choice (Schopler et al., 1995; Kugler et al., 2012). The diffusion of responsibility facilitates selfish behavior (Charness, 2000). Moreover, the lack of distinct identification allows team members to hide behind a "shield of anonymity". This increases the social distance between teams and is detrimental for cooperation (Bohnet

[2]Teams show only limited pro-social behavior also in related strategic settings such as the ultimatum game (Bornstein and Yaniv, 1998), the trust game (Kugler et al., 2007), or in a gift-exchange game (Kocher and Sutter, 2007). This finding is called the "discontinuity effect" in the social psychology literature to describe that team decisions are less pro-social than suggested by the aggregate preferences of individual team members (Insko et al., 1988, 1990; Schopler and Insko, 1992; Schopler et al., 1995).

and Frey, 1999).[3]

2.3 Hierarchical and Egalitarian Decision Structures

The answer to our research question may depend on the teams' decision structure. We consider two ways how team decisions are being made. In a hierarchical structure, decisions are determined by the choice of a single agent, a team dictator. In contrast, in an egalitarian structure, every team member equally determines the team's decision.

Despite the fundamental nature of the question of how the organization of teams affects economic outcomes,[4] there are surprisingly few experimental papers that directly compare hierarchical and egalitarian decision structures. Bornstein et al. (2004b) and Heap et al. (2020) compare hierarchical and egalitarian teams in an inter-group chicken game and a price competition, respectively. Neither find significant differences in team behavior between the two structures. Frohlich et al. (1998) find that egalitarian teams (framed as employee-owned firms) perform better than hierarchical teams (framed as conventionally-owned firms) in a productivity task. Moreover, Ellman and Pezanis-Christou (2010) test whether differences in decision structures lead to differences in ethical decision making (behavior that harms third parties). Their results suggest that egalitarian teams make more ethical decisions.

In the previous section we gave three explanations for why teams are self-interested and rational decision makers. While the motivations of shared self-interest and the fear of exploitation apply to team decisions in either structure, the evasion of responsibility is not possible in hierarchical teams (Song, 2009). That is, the team's dictator is solely responsible for the team's decision. The inverse of the finding that the opportunity to evade responsibility leads to more selfish choices (Charness, 2000) is that sole responsibility increases cooperation. However, it is not clear whether this applies to teams because the existing evidence on the evasion of responsibility is based on comparisons between team and individual behavior (see Kugler et al., 2012). Atanasov and Kunreuther (2016), for example, show that team dictators are cautious decision makers that act tough as they worry about the impression they make with their team. Interestingly,

[3]Comparing the studies by (Cason and Mui, 1997) and Luhan et al. (2009), who study team decisions in a dictator game, highlights the implications of identifiability. While Luhan et al.'s (2009) finding of selfish allocations is in line with the large majority of the literature on team decisions, it contrasts with the results in Cason and Mui (1997), who observe more altruistic decisions. Among the differences between the two studies that may cause those higher transfers is the fact that Cason and Mui (1997) publicly identify single team members when teams are formed and thereby remove the shield of anonymity.

[4]See Garicano and Zandt (2012) for a review of the theoretical literature and Caliendo et al. (2020) for recent empirical evidence.

Iida and Schwieren (2016) find that dictators cooperate less when they cannot communicate with their team, but more when communication is possible and team members can exchange views on the social benefits of cooperation.

In summary, the evidence comparing hierarchical with egalitarian team structures is inconclusive. Yet, we note that the possibility to evade responsibility in egalitarian teams may interact with the effect of a descriptive norm-nudge that is designed to induce cooperation in a social dilemma. To inform policies, it is important to understand potential differences in the responsiveness of hierarchical and egalitarian teams to norm-nudge interventions.

3 Fishing at Lake Victoria

The Lake Victoria fisheries in East Africa are an important driver of local and regional economies in the three riparian countries Kenya, Tanzania, and Uganda (see Figure 1). The income and food security of more than four million people is supported by a common pool resource system that is under pressure from overfishing, pollution, climate change, and rapid population growth. As the demand for resources and food from the lake is steadily increasing and formal regulatory structures continue to be dysfunctional, there is an urgent need to find effective policies that balance the societal needs of both short-term resource exploitation and long-term conservation (Aura et al., 2019).

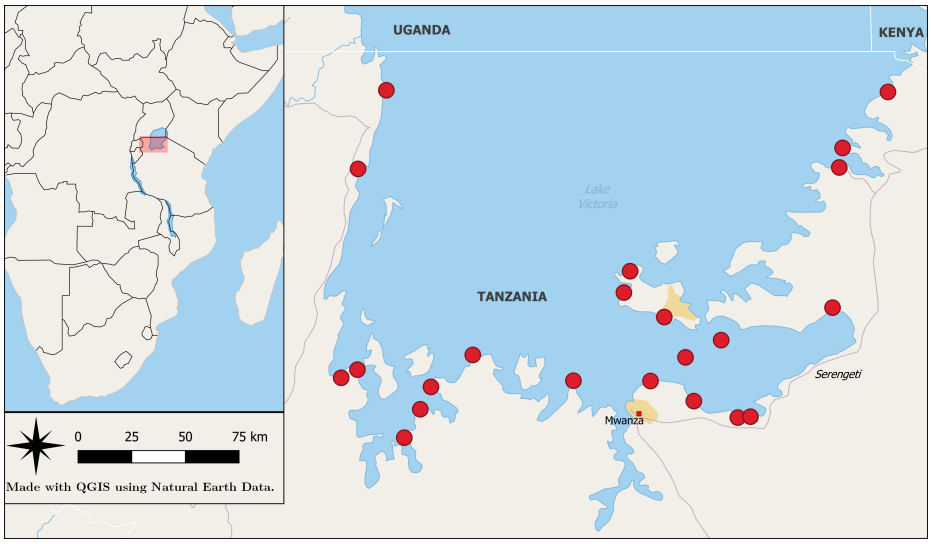

Figure 1: Map of Lake Victoria and visited landing sites

The Need for Informal Governance

Due to strategic incentives, limited state capacity, and dysfunctional formal institutions, the enforcement of fishing regulations at Lake Victoria is weak. All adjacent countries have passed fisheries regulations to govern issues such as licensing, gear use and the protection of breeding areas. Yet, violations are common and attempts to reduce illegal fishing practices are plagued by issues of corruption (Nunan et al., 2018). To help monitor and enforce regulations, landing site level co-management structures known as beach management units (BMU), *i.e.*, elected community representatives, were introduced to the lake in the late 1990s. However, strong norms of kinship compromise the utilization of these co-management structures as formal enforcement mechanism (Etiegni et al., 2017). Simply devolving law enforcement from the national government to elected community representatives has not worked. Especially in situations of economic distress, fishermen at Lake Victoria continue to break regulations (Cepić and Nunan, 2017).

The lake's resources are mostly contested on a local level since a large part of the fisheries rely on species that populate inshore areas (Taabu-Munyaho et al., 2013). When fishing crews choose to break regulations for their own economic benefits, they especially threaten the livelihoods of others in their own community or in neighboring communities. The social dilemma of common pool resource use can thus be broken down to the local level, generating important implications for policy makers that debate between bottom-up or top-down approaches to regulation. Through locally targeted interventions, social norms may be a promising tool to facilitate cooperation and self-management by resource users in local communities (Ostrom, 2008; Nyborg et al., 2016). Stakeholders that aim to ensure the sustainable use of Lake Victoria's resources in the long-term without jeopardizing the livelihoods of fishermen and their families in the short-term, may look to activate social norms of cooperation in the communities themselves.

Fishermen are Organized in Teams

Most fishermen at Lake Victoria work in teams. Figure 2 plots the distribution of crew size in our sample. Only about 3% of fishermen harvest on their own and 8% work in pairs. The fishery is dominated by small fishing crews of three (46%) and four (35%) members, indicating that the resource is contested on the boat level and not between individual fishermen.

Fishing crews at Lake Victoria can be distinguished by how they reach joint decisions. An important daily decision that determines production is the location of fishing. The fishing location is either decided by all crew members together or by the crew's captain

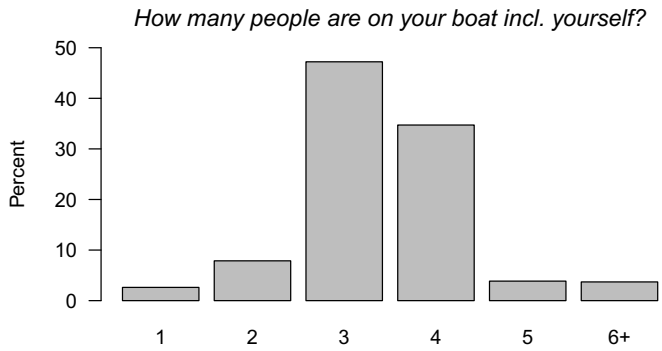

Figure 2: Distribution of fishing crew sizes at Lake Victoria, $N = 648$

or boat owner. Figure 3 shows the distribution of decision makers for the fishing location in our sample. The two darker colored bars indicate an egalitarian structure in which the decision is either made by all fishermen together (including the owner who often stays ashore) or the crew that goes out for fishing. In contrast, the two lighter colored bars indicate a hierarchical structure in which the decision is either made by the captain or the boat owner. We observe that the distribution between the two forms of decision structures is about equal (47% egalitarian to 53% hierarchical structure).

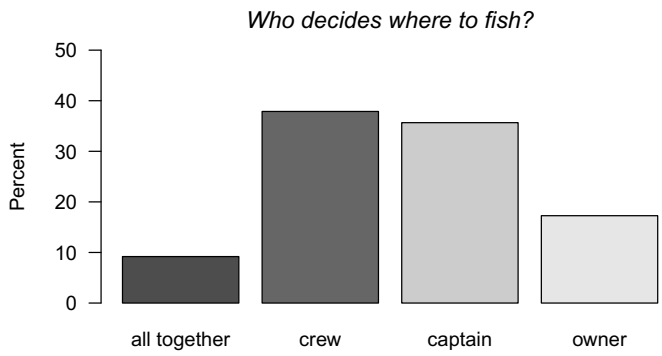

Figure 3: Distribution of decision makers for the location of fishing (top, $N = 631$)

Hence, the data not only suggests that the social dilemma of common pool resource use at Lake Victoria needs to be solved by teams but also that these teams use two different structures to reach a joint decision.

4 Experimental Design and Implementation

To model the social dilemma of common pool resource use between teams, we use a two-team prisoner's dilemma game with disapproval and incentivized belief elicitation. Three participants play together in a team. A team in the experiment comprises participants that work together on the same boat and hence form a real team in their daily lives. Each team is paired with another team to share an account with eight points. Both teams play with a binary choice set, framed as a decision to take four points from the shared account (hereafter: *defect*) or leave the points in the shared account (hereafter: *cooperate*). Moves are made simultaneously. The points remaining in the shared account are increased and then distributed equally. For four points left in the shared account, both teams receive three points, *i.e.*, a marginal per capita return of 0.75. The payoff matrix illustrates that defection is the payoff-dominant strategy while mutual cooperation is the social optimum, see Table 1.

Table 1: Payoff matrix

		Team B	
		leave points (*cooperate*)	take points (*defect*)
Team A	leave points (*cooperate*)	6,6	3,7
	take points (*defect*)	7,3	4,4

Decision Structure and Role Experience

Participants privately and simultaneously choose whether they want their team to take four points from the shared account or leave the points in the shared account. To reach a joint decision, teams use an imposed decision structure (randomized across sessions). Either an egalitarian or a hierarchical decision structure is used, the other structure is not mentioned. All team members earn the same amount of points. Direct communication or interaction within or across teams is not allowed.

The egalitarian decision structure is implemented by majority voting. The choice that is preferred by at least two out of the three team members will be the team's decision. Note that participants in the majority voting mechanism that come from boats with egalitarian structures in real life are familiar with the decision structure in the experiment. We therefore classify them to have role experience (Huckman et al., 2009).

The hierarchical structure is implemented by a dictatorial decision. That is, all team members indicate their choice, but only one is randomly selected to determine the team's action. Here, only those participants that come from boats with hierarchical structures *and* actually have decision making power in real life (i.e. the captain or boat owner) are classified as having role experience.

Social Information Treatment

To test the effect of a descriptive norm-nudge, we run a social information treatment, randomized across sessions. Teams in the social information treatment (SI) are given information about the behavior of other teams in a previous session of the experiment while teams in the no social information treatment (noSI) play the prisoner's dilemma without prior information on others' behavior. The following message is verbally provided to all participants during the instructions of the game:

You are not the first landing site where fishermen participated in this survey. In a previous session, many/most teams left the points in the shared account.[5]

Normative Beliefs

The social information message is designed to affect normative beliefs. If participants see informational value in the message provided, their beliefs should adjust. We elicit participants' expectations about others' behavior by asking what they "guess most teams in this session will actually do?". The elicitation of these *empirical expectations* (Bicchieri, 2017) uses the same binary choice set as the cooperation decision. It is incentivized with one extra point such that participants have no financial incentive to hide their true beliefs. Additionally, we ask participants what they think is the right thing to do in the given situation (their *personal normative belief*). Here, participants can additionally respond with a third option through which they can indicate a preference for conditional cooperation (*i.e.*, "one ought to do what other teams do"). The elicitation of participants' personal normative belief is not incentivized.

[5]In Swahili, the meaning of both "many" and "most" is expressed by the word "wengi". Hence, the original Swahili message does not imply a strict majority but conveys the general information that cooperation was a common choice by other groups. The message relies on data from one of the first sessions during the field trip (without social information) in which half the teams cooperated.

Disapproval

After indicating whether participants want their team to cooperate or defect, participants have the opportunity to express their disapproval of specific strategies. Each participant has to simultaneously choose one of the following options: (i) to disapprove defection, (ii) to disapprove cooperation, or (iii) to disapprove neither action. All participants are informed about the number of participants disapproving each option during feedback, see below. Disapproval votes are given without knowledge of the choices by other team members, the actions chosen by the other team that they are matched with, or the actions chosen by the other teams in the session.

Repetitions

The prisoner's dilemma is repeated for a total of five rounds of one-shot interactions. Teams are re-matched into new pairs based on a perfect stranger matching protocol, i.e., for each new round of the game, teams are randomly matched with another team that they have not played with before and will not play with afterwards. The composition of participants in a team, who work on the same boat in real life, is fixed over all five rounds.

We chose this design for a material and a technical reason. Materially, recurring interactions with other crews is a central feature of the social dilemma of common-pool resource use at Lake Victoria that is encountered by our participants on a daily basis.[6] Moreover, there is de facto open access to the lake, and each fishing boat has a very limited catch capacity. Therefore, the nature of cooperation at Lake Victoria is essentially binary: Fishermen either follow existing formal and informal rules and regulations (*e.g.*, not using illegal gear, not fishing in breeding grounds, not landing undersized fish) or violate them. Technically, a repeated prisoner's dilemma allows us to maintain a binary choice set in each round and construct a finer measure of cooperation (average cooperation over five rounds). Thereby, we attain statistical advantages and keep the game in a format that is both easy to explain and ensures a clear outcome of the majority voting procedure.

[6]The fact that the resource stock dynamics creates inter-temporal spillovers is of second order importance at Lake Victoria. Both Nile perch and Dagaa, the two main commercial species at the lake, have very fast growth dynamics and stochastic fluctuations in environmental conditions are more important in determining production possibilities (Yongo et al., 2018; Nyamweya et al., 2020).

Feedback

At the end of each round, participants are informed about the outcome of the prisoner's dilemma game in that round. First, everyone within a team is informed about the choices of their team members and the resulting team action. Second, all participants within a team are informed about the action of the other team in their pairing. They are however not informed about the individual choices that lead to the aggregate decision of the other team. Third, participants are informed about their own team's total payoff from the prisoner's dilemma. No information is given about the outcomes in other team-pairings. Finally, everyone is informed about the number of participants in the session that disapprove of either action and the number of participants that do not disapprove of any action.

Implementation

The experiment was implemented with fishermen from Lake Victoria, Tanzania in March 2020. The research trip comprised 36 sessions at 22 landing sites spanning the entire Tanzanian lakeshore (see Figure 1).[7] In a total of ten sessions (five in SI, five in noSI), we imposed the dictatorial decision structure while in 26 sessions (13 in SI, 13 in noSI), we imposed majority voting.

For each session, six boats were randomly selected from the list of registered fishing vessels at a given landing site. From each boat, we then randomly selected three fishers that were willing to participate in the experiment as a team. In each session, we therefore observe 18 participants in six teams that form three pairs in the prisoner dilemma in every round of the game. Participant characteristics are balanced across almost all relevant observables, see Appendix A-1. For teams that decide by dictatorial decision, the only difference between social information treatments is with respect to age. For teams that decide by majority voting, the sample is unbalanced with respect to crew size and their main target species.[8] We control for all unbalanced characteristics throughout our analysis, see Section 5.

A seating arrangement ensured that crew members would not sit next to each other. Informed consent was obtained and a detailed explanation of the game's rules was given.

[7]The present data collection effort is the third field trip of the research team to Lake Victoria. In contrast to the second field trip (see Diekert et al., 2021) that was conducted in 2018, re-sampling of participants was not an objective during the third trip. Out of 36 experimental sessions, 26 were hosted in re-visited communities and ten sessions were hosted in communities that we visited for the first time. Overall, 137 of the 648 participants participated in the first or second field trip.

[8]There are two main species for commercial use: (i) Dagaa which is fished at night with small seine nets, and (ii) Nile perch which is fished during the day with handlines or gillnets.

In particular, it was highlighted that all decisions have to be made anonymously, that communication is not allowed, and that the points earned during the game directly translate to real money at the end of the experiment. To ensure that rules were understood, we played out test scenarios and assessed comprehension of the scenarios' outcomes with test questions. Responses serve as a measure of understanding in the analysis.

After all repetitions of the prisoner's dilemma game were completed, one round was randomly chosen for payout. The game was calibrated such that participants, independent of treatment, earned an average of approximately 2,700 Tanzanian Shilling (TZS).[9] Each session lasted about two hours.

5 Hypotheses and Testing

On the one hand, one may reasonably expect that social information does not work on teams. The literature documents that teams act selfish and rational. If defection is the dominant strategy (like in our experiment), a rational and selfish decision maker should ignore a social information message that tries to induce pro-social behavior.

On the other hand, one may reasonably expect that a social information message does work on teams. This conjecture draws on the many successful applications of norm-nudges with individuals. Also in teams, the social information message is received and processed by individuals. Maintaining that individuals trust the source of social information and that the message has normative implications, at least for some individuals, there is no reason to believe that the message has a *negative* effect on cooperation. Hence, we pre-registered[10] directed hypotheses that predict a positive effect of social information on cooperation.

Since the decision structure may affect how the social information message is perceived and how the social dilemma game plays out in intra- and inter-team processes, we discuss the arguments for a positive effect of social information on cooperation separately for majority voting and dictatorial decisions.

Majority Voting

We highlight three reasons why a social information message works when teams use an egalitarian decision structure such as majority voting. First, team members may fear

[9] 2,700 TZS translates to approx. 1 Euro. The median daily catch earnings for a fisherman is about 5,000 TZS. All decisions in the experiment were made on tablet computers using the oTree software (Chen et al., 2016). Screenshots of all relevant choice situations (incl. end of the round feedback) and the experimental instructions are available in Appendices A-6 and A-7.

[10] The pre-analysis plan is available at: `https://doi.org/10.1257/rct.5542-1.0`.

less exploitation by other teams. Therefore, they see no need to protect the in-group by defecting. Second, team members may be motivated by preferences for equitable outcomes (fairness) across teams. When other teams are expected to cooperate, cooperation of the own team is the fair response. Hence, team members with fairness preferences are more likely to vote for cooperation. Third, participants could experience disutility when the actions of the own team differ from the actions of other teams, or when the own vote differs from the votes of the other team members, or both. If the social information message is understood as a statement on the likely action of other teams, preferences for conformity increase the likelihood to vote for cooperation.

These three motivations differ in underlying preferences, but they have the same observable implication for outcomes:

Hypothesis 1a *Average cooperation by teams with majority voting is higher with social information.*

Dictatorial Decisions

Also for teams with a hierarchical decision structure, the reduced fear of exploitation, preferences for fairness, and preferences for conformity suggest a positive effect of social information on cooperation. Yet, a hierarchical structure differs from an egalitarian structure because the dictator cannot evade the responsibility for the team's outcome.

On the one hand, responsibility may increase the effect of a social information message. First, if team dictators themselves have a preference for fairness or conformity with other teams, they should act in line with the social information message as they alone determine the team's decision. Second, when dictators believe that the members of their team have such preferences and they are unwilling to let their team members down, they would also want to act in line with the intervention.

On the other hand, responsibility may decrease the effectiveness of a social information message. The obligation to represent the team may induce loss aversion and thereby crowd out cooperation. Similarly, dictators may feel the responsibility to maximize team payoffs. While these adverse effects of responsibility would not cause the intervention to backfire, it could force dictators to ignore the message.

Responsibility thus has an ambiguous impact on the effectiveness of social information. Nevertheless, a reduced fear of exploitation, preferences for fairness, and preferences for conformity still suggest an increase of average cooperation due to the norm-nudge intervention:

Hypothesis 1b *Average cooperation by teams with a dictatorial decision is higher with social information.*

There is no prior evidence for the effect of a norm-nudge on team decisions and findings on how a variation in the team's decision structure affects cooperation decisions are inconclusive. While majority voting and dictatorial decisions differ by the amount of responsibility that is given to the individual team member, our discussion above highlights that the effect of responsibility on cooperation and its interaction with the norm-nudge is ex-ante ambiguous. Therefore, we formulate a null hypothesis:

Hypothesis 2 *The effect of social information does not differ between egalitarian and hierarchical decision structures.*

Role Experience

In our experiment, some participants have role experience (Huckman et al., 2009). That is, they have experience with their role in the experiment because it coincides with their current role in the decision structure of their fishing crew. Role experience could moderate the effect of the social information intervention.

On the one hand, the social information message could be more effective when individuals have role experience. Individuals that are familiar with taking decisions in a hierarchical/egalitarian structure may be more receptive to the social information message and have a better idea what to expect from other teams. Then, social information is useful to inform own choices and one may expect that role experience amplifies the effect of the treatment.

On the other hand, the effect of the social information message could also be weaker for individuals with role experience. If these individuals use internalized responses in familiar decision situations, they may put less weight on the social information message. In contrast, those that find themselves in an unfamiliar decision situation may view the information about others' behavior as especially valuable.

While we expected that the extent of familiarity with an hierarchical or egalitarian decision structure matters with respect to the social information treatment, we did not pre-register any hypothesis in this regard. Given the ex-ante ambiguous effect of role experience, we treat it as an open question.

Statistical Methods

The main treatment effect of interest is the difference in average team cooperation over all five rounds between treatments with social information (SI) and without social information (noSI), see Hypotheses 1a and 1b. In teams that reach a decision through majority voting, all three team member decisions are necessary to determine a team action such that the outcome of interest is the team's aggregate decision. In teams that use a dictatorial decision, each individual team members makes a simultaneous and private decision on behalf of the three person team before a random draw determines whose decision is implemented as the team's action. Hence, each individual decision is analyzed as a team decision.[11] We average the binary cooperation decisions over all five rounds and observe a cooperation rate (in discrete steps of 0.2 including zero and one) for $N = 156$ (78 in SI, 78 in noSI) teams that use majority voting and a cooperation rate for $N = 180$ (90 in SI, 90 in noSI) team dictators.

To test Hypotheses 1a and 1b, we first present descriptive results and report non-parametric tests. Throughout, we take the non-normal distribution of our outcome variable into account and report one-sided Wilcoxon Mann-Whitney two-sample tests according to the pre-registered hypotheses. Additionally, we conduct power analyses for Hypotheses 1a and 1b. Here, we follow advice by (Faul et al., 2007) and conduct compromise power analyses that consider a logistic parent distribution, the observed effect size, the given sample size, and an error probability ratio of $\beta/\alpha = 4$, balancing type I (α) and type II error (β) risks.

Second, we support our results with regression analyses. We use fractional probit models and report average marginal effects to ease interpretation.

We first analyze the model separately for each decision structure. An interaction of social information and decision structure is included for a pooled data analysis that compares the effect of social information between the egalitarian and hierarchical decision structure to test Hypothesis 2. We include additional interaction terms when we study heterogeneous treatment effects with respect to role experience. In all specifications, standard errors are clustered on the session level.

[11] Following Selten (1965), the elicitation method of asking everyone to make a decision before randomly determining which decision is carried out allows for an incentive compatible way of gathering data not only on those decisions that were implemented but also on those that were not implemented.

6 Results

We first analyze the main treatment effect of interest: Does a social information message increase average cooperation when decisions are made by teams? Since the effect of the social information intervention likely depends on the decision structure and in turn on the motivations associated with partaking in a majority decision or being a team dictator, we begin by studying egalitarian and hierarchical team decisions separately. In Section 7, we turn to the empirical expectation of the individual participants and discuss how they may explain our results. Finally, we study how the effect of the social information treatment varies with participants' role experience in Section 8.

6.1 The Effect of Social Information under Majority Voting

Figure 4 plots the distribution of cooperation rates for majority decisions by social information treatment. Note that teams decide to cooperate or defect five times, such that the cooperation rate of each team can take six distinct values (0, 0.2, ..., 1). In both treatments, most teams use a strategy of zero cooperation across all rounds. Yet, with social information, the share of teams that cooperate in all five rounds doubles from 14% to 28%. The average cooperation rate in the no social information treatment is 33%, see left panel of Figure 4. With social information, the average cooperation rate increases by 14 percentage points to 47% , $p = .028$, combined $N = 156$. The test has 76% power with $\alpha = .060$. Hence, we observe a positive treatment effect of social information.[12]

Our results suggest that the social information message is successful in changing team decisions reached with a majority voting mechanism. This is supported by a fractional probit regression that controls for demographics, fishing related characteristics, and comprehension. For the average marginal treatment effect, see column (1) in Table 2. The regression model predicts that social information leads to a marginally significant increase (at the 10% level) in team cooperation by, on average, 14.9 percentage points. We therefore accept Hypothesis 1a: Social information increases cooperation by teams under majority voting.

Due to the aggregation of individual votes, majority voting may mechanically lead to a low or high cooperation rate on the team level. To see this effect, suppose the individual propensity to vote for cooperation is p. The probability P that a three-person team cooperates under majority voting when members' votes are independent

[12]For robustness analyses on the treatment effect (session level analysis and limiting observations to the first round), see Appendix A-2.

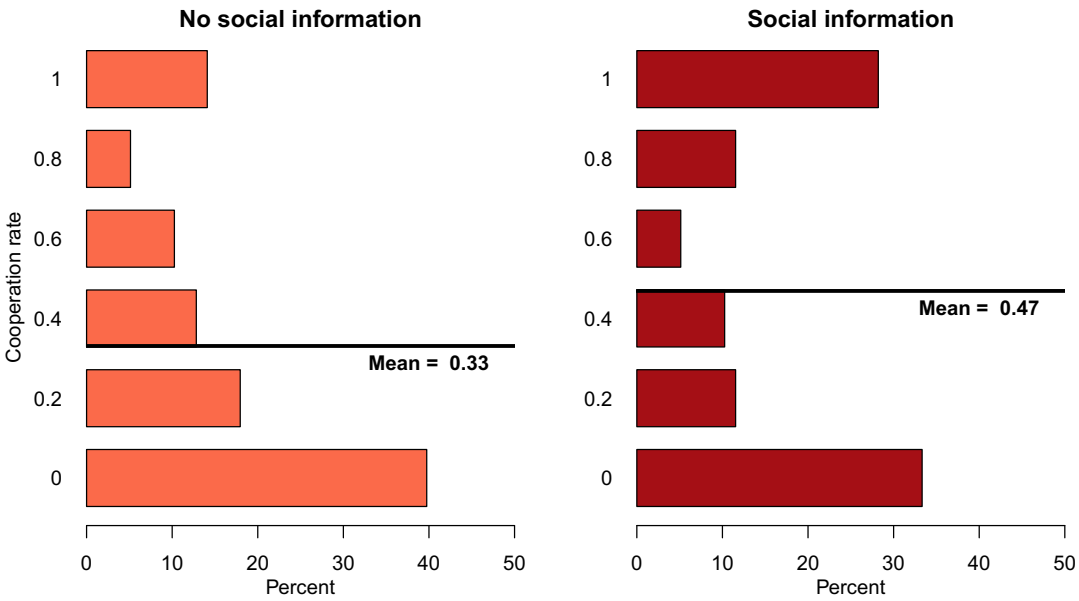

Figure 4: Average team cooperation rate of majority decisions by social information treatment (combined $N = 156$). For each team there are five decisions to cooperate or not such that the cooperation rate can take six distinct values (0, 0.2, ..., 1).

from each other is then given by $P = p^3 + 3p^2(1-p)$. P is a sigmoid function on the domain $p \in [0, 1]$ with $P < p$ for $p \in [0, 1/2)$, and $P > p$ for $p \in (1/2, 1]$. Hence, there is a difference between the individual propensity to vote for cooperation and the resulting cooperation rate of teams (unless $p = 1/2$).

Indeed, we observe such a difference in our data. Without social information, 38% of all participants vote to cooperate, but the average team cooperation rate is 33%. With social information, 48% of the participants vote for cooperation and the average team cooperation rate is 47%. The treatment difference for individual votes is 9.2 percentage points and hence smaller than the 14 percentage point treatment difference on the team level. Nevertheless, the treatment difference for individual votes is statistically significant with $p = .016$, combined $N = 468$.

6.2 The Effect of Social Information under Dictatorial Decisions

Figure 5 plots the distribution of cooperation rates for dictatorial decisions by social information treatment. In both treatments, the majority of team dictators either cooperate always or never. Without social information, the most frequent strategy is zero cooperation across all rounds. With social information, the most frequent strategy is

full cooperation. We consequently observe a strong positive treatment effect of social information. The average cooperation rate is 16 percentage points higher with social information (54%) than without social information (38%), a significant increase in cooperation of 16 percentage points, $p = .008$, combined $N = 180$. The test has 84% power with $\alpha = .040$.

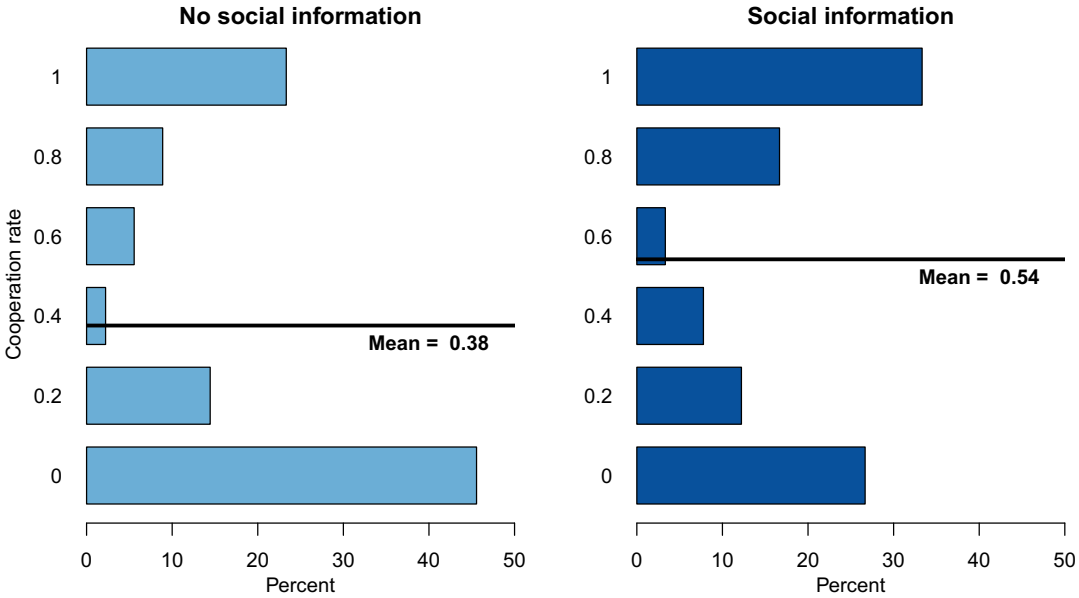

Figure 5: Average cooperation rate of dictatorial decisions by social information treatment (combined $N = 180$)

Our results on the treatment difference strongly suggest that the social information message is successful in changing team decisions when teams use a hierarchical structure. This is supported by a significant coefficient for the social information treatment in a fractional probit regression. For the average marginal treatment effect, see column (2) in Table 2. The model predicts that social information leads to an increase in team cooperation by, on average, 18.2 percentage points (significant at the 5% level). Hence, we accept Hypothesis 1b: Social information increases cooperation by teams when decisions are made by a dictator.

6.3 Comparing Majority Voting and Dictatorial Decisions

We find that our social information treatment increases team cooperation in the prisoner's dilemma for both of the imposed decision structures. In column (3) of Table 2, we present average marginal effects of a fractional probit model that compares the dictato-

Table 2: Average marginal effects from fractional probit models on team cooperation rate for majority voting and dictatorial decisions

	Team Cooperation Rate		
	Maj. voting	Dict. decision	Pooled
	(1)	(2)	(3)
Social info	0.149	0.182	0.142
	(0.079)	(0.088)	(0.073)
Dict. decision			0.059
			(0.086)
Social info × dict. decision			0.043
			(0.112)
Controls	Yes	Yes	Yes
N	156	180	336

Notes: The table reports average marginal effects from team-level fractional probit regression models on the team cooperation rate. Robust standard errors are clustered at the session level (in parentheses). Margins are calculated at mean values of all covariates. Controls include age, age squared, crew size, an indicator whether the crew mainly targets dagaa, and a measure for comprehension (see Appendix Table A-5 for coefficients). All controls variables are averaged among the three team members for teams that use majority voting.

rial decision structure with majority voting. That is, we regress the team cooperation rate, where we consider individual choices when decisions are made by team dictators ($N = 180$) and majority voting outcomes otherwise ($N = 156$), on the social information treatment, an indicator for the dictatorial decision structure, and an interaction term.

While we find that the joint effect of social information and dictatorial decisions is significantly different from zero (at the 5% level), the interaction term is not significant. Hence, we cannot reject Hypothesis 2. Moreover, we document no differences between egalitarian and hierarchical decision structures for team cooperation rate in the baseline (without social information). For robustness of the result with respect to limiting observations to the first round, see Appendix A-2.

7 Empirical Expectations

It is a common finding that a descriptive norm-nudge does not work through a pure demand effect (*i.e.*, participants interpreting the message as a directive for own behavior) but rather that those who receive information about cooperative behavior of others, expect them to cooperate and subsequently cooperate themselves (Croson et al., 2009).

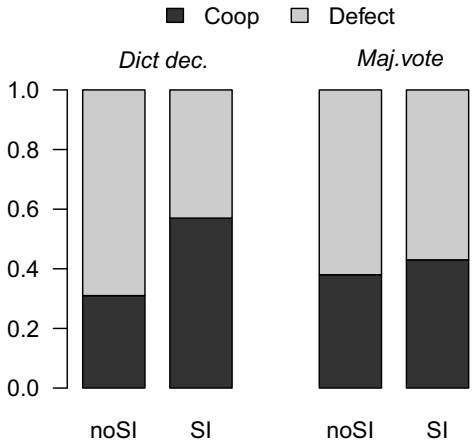

Figure 6: Participants' empirical expectations by decision structure and social information treatment. The dark areas show the share of participants that expect other teams to cooperate.

We test whether this channel is active also in our experiment. The change in empirical expectations cannot happen on the team level but only in the perception of the individual member. We therefore turn to the outcomes of individual team members in this section.

First, we analyze how the provision of social information affects empirical expectations, *i.e.*, the belief about what other teams do. Figure 6 shows the distribution of empirical expectations by social information treatment and decision structure in our sample. For dictatorial decisions, we find that empirical expectations are significantly affected by social information. Without social information, 31% of the participants believe that other teams will cooperate. With social information, this share increases by 26 percentage points to 57%. The difference is significant with $p < .001$, combined $N = 180$. To our surprise, we cannot document a significant effect of social information on empirical expectations when decisions are determined by majority voting. Without social information, 38% of participants believe that other teams are cooperative. With social information, this share is 43%, an insignificant increase with $p = .129$, combined $N = 468$. Hence, we find that empirical expectations are responsive to the social information treatment only when the team's action is determined by a dictatorial decision.

To analyze more formally how social information affects empirical expectations and how this translates to a change in behavior, we conduct a mediation analysis (for details, see Appendix A-4). That is, if social information changes empirical expectations and these beliefs are a significant predictor of cooperation decisions, then the treatment runs through a change in empirical expectations. First, the mediation analysis confirms that social information leads to a significant increase in cooperative empirical expectations

with dictatorial decisions but not with majority voting. Second, we find that empirical expectations are a significant predictor for cooperation in both decision structures. Hence, the mediation analysis indicates that for dictatorial decisions the treatment effect is transmitted to a behavioral response through a change in the expectation of other teams' actions. For majority voting, we cannot document this relationship as empirical expectations are not responsive to social information.

Nevertheless, social information leads to an increase in team cooperation under both decision structures. The key difference between the two decision structures is the degree of responsibility given to the individual. That is, participants cannot evade responsibility when they have to make the team decision as a dictator. Those participants may take the social information message as a signal of what should be done. In particular, if they themselves have a preferences for conformity with other teams or they believe that their team members would want their fairness or conformity preferences represented, social information would induce cooperation. Similarly, social information may reduce participant's fear of being exploited and thereby decrease the need to defect for in-group protection. Conversely, the diffusion of responsibility under majority voting may mean that the information about the behavior of other teams is less relevant for own decisions. In an egalitarian decision structure, participants may care more about benefiting the in-group than conforming with the actions of other teams. Consequently, the social information may be disregarded and empirical expectations do not change.

It may therefore be interesting to take a look at participants' personal normative beliefs to see whether the social information message has changed what participants think is the morally right thing to do, and if so, how this change translates into differences in behavior. We conduct a mediation analysis on personal normative beliefs in Appendix A-4.

In sum, we find that the treatment effect in a hierarchical decision structure is mediated by significant changes in empirical expectations. This result is consistent with a reduced fear of exploitation, preferences for fairness, and preferences for conformity. Interestingly, cooperation is increased also for an egalitarian decision structure, but we do not find a treatment effect of social information on empirical expectations. While this points to the role of responsibility as a key difference between egalitarian and hierarchical decisions structures, an exact identification of the various channels through which social information affects behavior under different structures is beyond the scope of this paper. Certainly, it is an interesting avenue for future research.

8 Experience Moderates the Effect of Social Information

The random assignment of the decision structure in the experiment enables us to identify whether role experience moderates the social information treatment on team cooperation. Some of the participants in the experiment can apply their real world experience with making decisions in an egalitarian/hierarchical decision structure (as proxied by their fishing crew's decision making practice, see Figure 3) while other individuals are put in the position to make a decision using an unfamiliar structure. In other words, some team dictators in our experiment dictate their team's decisions also in real life and some teams in the majority voting mechanism also use an egalitarian approach to determine their crew's decisions. Everyone else uses a decision structure in the experiment that they do not use while fishing on the lake.[13]

We test for heterogeneous treatment effects of social information with respect to role experience using a fractional probit regression on individual cooperation. To ease interpretation of the results, we plot the average marginal treatment effects with and without role experience for both decision structures in our experiment, see Figure 7 (for the regression coefficients, see Appendix Table A-6). Our model predicts that participants without role experience are moderately affected by the social information treatment (left part of Figure 7). For those without role experience in the majority voting mechanism, social information increases cooperation by, on average, 12.4 percentage points (significant at the 5% level). For team dictators without role experience, the treatment increases cooperation by, on average, 11.5 percentage points (not significant at the 10% level). These results suggest that participants who find themselves in an unfamiliar decision structure view the social information message as useful input to their own decisions. This is consistent with the literature on social norms, see Cialdini and Trost (1998): the expected behavior of others is most likely adequate for the given situation.

The right part of Figure 7 plots the average marginal treatment effect for participants with role experience. Our results are striking. Team dictators with role experience are particularly responsive to the social information treatment: the regression model predicts an increase in cooperation of 51.9 percentage points (significant at the 1% level). In contrast, the social information treatment seems to fail with experienced team members in the majority voting mechanism (7.9 percentage point increase, insignificant at the 10% level).

[13] Out of the 180 participants in the dictatorial decision mechanism, 29 are team dictators in real life and for the majority voting mechanism, 218 out of 468 participants have role experience in an egalitarian structure. We address questions of response consistency within teams in Appendix A-5. For a comparison of participant characteristics across experience, see Appendix Table A-3.

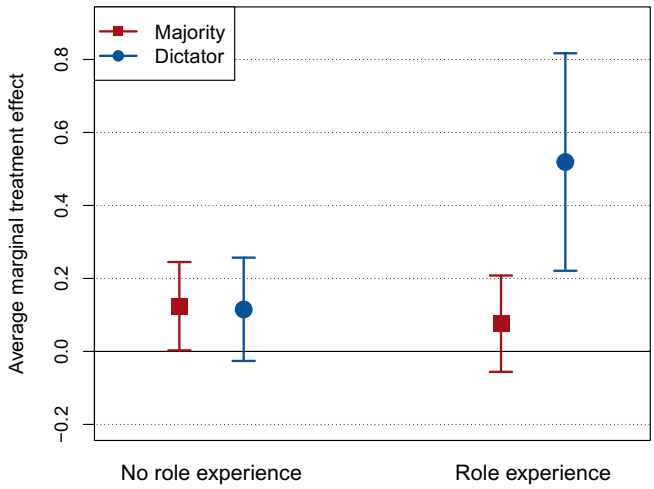

Figure 7: Average marginal treatment effect of social information on individual cooperation conditional on role experience in the imposed decision structure. Whiskers indicate a 95% CI.

These results are neither due to the fact that real life team dictators (captains or owners) cooperate more per se, nor due to the fact that fishermen from boats with an egalitarian structure are less cooperative. For a detailed robustness check, see Appendix Table A-7. While captains cooperate less than crew members and owners in the baseline (without social information), the treatment effect is significant and positive across all roles. When we include the real world boat decision structure, we see that captains and owners who have the responsibility for their boat in real life, make significantly less cooperative choices when in the experimental role of a team dictator, but they cooperate substantially more upon receiving social information.

We find that the effect of role experience depends on the team decision structure. In particular, experienced leaders in a hierarchic structure are receptive to social information while members of egalitarian teams are not. An explanation to this effect may be that team dictators face a "no-revolution constraint" (Cabrales and Hauk, 2011). They cannot act with impunity but have to pay attention to their surroundings to avoid social condemnation that could threaten their position of power. Therefore, experienced dictators (those that are in power in real life) would have a higher tendency to adhere to social norms. As such, pro-social leadership emerges from cooperative norms and the leaders' tendency to honor them (Henrich et al., 2015). Here, our results show policy makers may leverage this tendency to induce cooperative decision making in hierarchical organizations. Given that pro-social leaders are found to increase others' cooperation (Jack and Recalde, 2015; Kosfeld and Rustagi, 2015), our results indicate potential multiplicative effects of social information as policy tool.

9 Discussion

Collective action problems such as climate change, corporate collusion, or community resource management are social dilemmas that need to be solved by teams. While formal regulations are often unavailable or fail to address those dilemmas, informal management tools may induce a shift in social norms that govern behavior. The related literature has – by and large – documented that social information can successfully nudge individual behavior towards socially desirable outcomes. We complement these findings by showing that a social information message can also change collective actions, *i.e.*, team decisions.

The teams in our experiment are crews from different fishing boats at Lake Victoria that face the social dilemma of natural resource use in their daily lives. These crews make their harvest decisions in either hierarchical or egalitarian structures, a feature that we mimic in the experiment by contrasting two decision making mechanisms (majority voting and dictatorial decision). We find that social information increases cooperation for both egalitarian and hierarchical decision structures. Under majority voting, average team cooperation increases from 33% to 47%, while team cooperation increases from 38% to 54% for dictatorial decisions. These are large effects, which for the dictatorial decisions, is comparable to 19 percentage points increase in cooperation due to introducing costly punishment reported by Weng and Carlsson (2015).

Somewhat surprisingly, the observed behavioral change is accompanied by a change in empirical expectations only for team dictators. Exploring whether the norm-nudge works stronger for those participants that use the experimentally imposed decision structure in their daily life, we find that this is not the case for egalitarian teams. For dictatorial decision making, however, we find that captain and owners with role experience are particularly responsive to the provision of social information. This is an interesting finding that warrants further research: Are members of egalitarian teams less responsive to norm-nudges, because the relevant reference network are the other members of their own team (and not the behavior of other teams), or because they are less likely to be pivotal in determining their team's decision?

Our finding of a more robust treatment effect of social information on team dictators echoes with the notion of a greater effectiveness of pro-social incentives when given to individuals (Gatiso et al., 2018). While it is sometimes argued that in cases where cooperation may increase social welfare, individuals should be preferred as decision makers (Charness and Sutter, 2012), an outright change from team to individual decision making is rarely a viable policy option. We add nuance to this discussion by highlighting that the bias towards rational and self-interested behavior in teams can be overcome without

dissolving teams as such. Instead, increasing responsibility for one team member, paired with information on the pro-social behavior of other teams holds promise to improve outcomes.

Our study is a first step to study the effect of a norm-nudge when decisions are taken by teams. It builds a bridge to the field and considers a relevant population that naturally works in small teams and faces the social dilemma of resource use in their daily lives. Our study opens fruitful opportunities for future research. One task for future work is to evaluate the external validity of the experimental intervention (see *e.g.*, Fehr and Leibbrandt (2011); Carpenter and Seki (2011); Kosfeld and Rustagi (2015) for important studies that link experimental behavior to field outcomes). Another task for future work is to explore several features of team decision making that we have deliberately controlled in the present experiment. In the following, we discuss what we believe to be the three most interesting avenues.

First, we allow for only very limited communication among team members and across teams. Irrespective of the decision making structure imposed in the experiment, team members can observe each others' choices, but they cannot freely express the reasons for their decisions. Similarly, while participants can express their general disapproval with cooperating or defecting, they cannot publicly speak to convince others in their team or in other teams that one action is preferable to another. There is little evidence on how social information and direct communication interact. Intuition suggests that social information may be more effective if people can use communication as an additional tool to coordinate on a mutually beneficial action. It may help to make social identities more salient (Abrahamse and Steg, 2013) and enforce social norms even before transgressions occur (Kinzig et al., 2013). While restricting communication allows us to identify the difference between hierarchical and egalitarian decision structures,[14] the restriction is plausibly more artificial for egalitarian teams than for teams that use an hierarchical structure in real life. Egalitarian teams would naturally discuss which decision to take (and may even do so until consensus is reached), but a captain or owner may take decisions autonomously, without much deliberation with other crew members. Nevertheless, also dictators may want to know the opinion of their crew. In fact, previous research has shown that representatives cooperate more when they can communicate with their

[14]With free communication, it would have been impossible to tell whether a team reached a decision in an egalitarian way, or whether one person was more more influential because he was more powerful than than others (and not because he had the better argument). For an innovative attempt to allow free communication yet classify whether a specific team member proposes a certain rule of action, see Andersson et al. (2020). In that study, two to three research assistants code the interactions of each team.

team (Iida and Schwieren, 2016). More work is needed to explore how the within-team power distribution affects outcomes by gradually increasing the involvement of the other team members in the decision.

Second, we use a simple game to represent the social dilemma of common-pool resource use. While the experimental setup is abstract, both the take-frame and the binary choice set capture essential features of resource extraction in our field setting at Lake Victoria. Other features may be less realistic: We impose repeated one-shot interactions with a perfect stranger matching such that there are no spillover effects over time. Thus, teams cannot build a reputation and behavioral patterns of reciprocity or directed altruism cannot consolidate. Also, the absence of payoff linkages across rounds implies that there is no room for history-dependent strategies. At least in theory, depleting a slow-growing resource stock could be used as an effective threat to enforce cooperation (Polasky et al., 2005). Similarly, key cooperation decisions may be more gradual in other socio-ecological systems. While explaining the coordination problem is easiest with a binary choice set, it would be interesting to learn how things play out when teams choose an option from a continuous set.

Third, we use unitary teams because they serve as an intuitive starting point to establish whether a norm-nudge can change team decisions. Unitary teams are a good approximation in many settings (for example, fishing crew members are usually paid in shares) but other settings may have more complicated and nested structures. In particular, many scenarios at the workplace pose questions of free-riding incentives within teams or issues of self-selection into teams. Here, future research should study whether norm-nudges can be used as team incentives to improve the governance of multi-level public goods (Buchan et al., 2009; Gallier et al., 2019) or to discourage inefficient competition (Sheremeta, 2018).

10 Conclusion

Common pool resource dilemmas in developing countries are routinely characterized by two conditions that make governance difficult: First, conventional policy tools such as output quotas, input restrictions, or taxes and subsidies, are insufficient, unavailable, or non-enforceable. Second, outcomes are determined by team decisions, and teams are likely to act non-cooperative.

In contrast to conventional tools, information-based polices do not have direct material consequence. These types of interventions may therefore be considered to be the weakest form of economic policy. Still, a growing literature documents the success of

norm-nudges in affecting individual behavior. Given the pervasiveness of team decision making, it is imperative to learn more about the effect of norm-nudges when decisions are taken by teams. Here, we presents a first, encouraging indication that social information can increase cooperation of teams in a Prisoner's Dilemma. More work is needed to learn about the generalizability of our findings to other field settings, the interactions with other strategic intra- and inter-team structures, and which levers maximize the effectiveness of information-based policies.

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Appendix

A-1 Sample Characteristics

Our sample consists of $N = 648$ fishermen from 36 sessions in 23 landing sites at Lake Victoria, Tanzania. In Table A-1, we present participant characteristics for both imposed decision structures in the experiment with mean comparison tests across social information treatments. Participants are on average between 35 and 38 years old and we observe only a total of four female participants indicating that the Lake Victoria fisheries are dominated by men. The fishermen in our sample rely heavily on their income from fishing as about 70% of household earnings come from daily fishing activities. We elicit self-reported preferences (Likert scale from 0 to 5) and observe that fishermen are somewhat risk averse (mean value around 2), and state moderate preferences for altruism (mean value around 3.8). The majority of participants have strong social image concerns (mean value around 3.1). All preferences are bi-modally distributed with peaks at 0 and 5, respectively. 21% of our participants have previously participated in an economic experiment within the research project.

Apart from a small difference in average age for the sample of team dictators, participant characteristics are balanced across social information treatments.

Table A-1: Participant characteristics with mean comparison tests across social information treatments

	Dictator			Majority		
	SI	noSI	p-val	SI	noSI	p-val
Age	35.28	38.50	.028	35.63	35.83	.827
Female	0	0	-	0.013	0.004	.316
HH income (% fish)	62.00	65.29	.380	70.15	70.85	.757
Risk preference	2.14	1.93	.514	2.05	1.79	.188
Altruism preference	3.71	3.64	.822	3.94	3.87	.704
Social image concern	3.09	3.03	.860	3.19	3.18	.983
Prior participation	0.244	0.250	.930	0.228	0.177	.166
N	90	90		234	234	

Notes: Comparison of individual participant characteristics with mean comparison tests between social information (SI) and no social information (noSI) treatments for both dictatorial decision and majority voting mechanism. All displayed test statistics are mean-comparison t-tests with non-adjusted p-values.

Furthermore, we compare sample characteristics across social information treatments for the fishing crews in our data, see Table A-2. In case members of the same crew in our experiment give conflicting answers to questions where every member should give the same answer, we consider the modal response within the team. Fishing at Lake Victoria is dominated by crews of three or four members, and around 30% of crews in our sample mainly target the Dagaa species. Dagaa is usually targeted by somewhat larger crews. Also, we observe that about 40% of all crews use a hierarchical decision structure where either the captain or boat owner dictates the location for fishing. The crew-level sample characteristics are unbalanced for average age in the team dictator subsample and for crew size as well as main target species for the majority voting subsample.

Lastly, we report sample characteristics with mean comparison tests across role experience for both imposed decision structures. We find that the sample is balanced across role experience

Table A-2: Boat characteristics with mean comparison tests across social information treatments

	Dictator			Majority		
	SI	noSI	p-val	SI	noSI	p-val
Average age	35.28	38.50	.061	35.63	35.83	.859
Crew size	3.23	3.40	.326	3.55	3.86	.048
Main gear (Dagaa)	0.100	0.167	.456	0.282	0.423	.066
Hierarchic organization	0.407	0.483	.579	0.487	0.480	.930
N	30	30		78	78	

Notes: Comparison of boat level characteristics with mean comparison tests across social information treatments between boats that use a participatory approach to decision making and boats that use hierarchic decisions. All displayed test statistics are mean-comparison t-tests with non-adjusted p-values.

with the exception of the household's income share from fishing for team dictators. We include a richer set of participant characteristics in our robustness analysis, see Appendix A-3.

Table A-3: Participant characteristics with mean comparison tests across experience

	Dictator			Majority		
	Role exp.	No role exp.	p-val	Role exp.	No role exp.	p-val
Age	34.14	37.42	.102	36.19	35.33	.359
Female	0	0	-	0.009	0.008	.891
HH income (% fish)	71.62	62.11	.061	69.08	71.74	.240
Risk preference	1.97	2.05	.843	1.79	2.03	.229
Altruism preference	3.75	3.66	.811	3.84	3.96	.507
Social image concern	3.62	3.95	.119	3.23	3.14	.647
Prior participation	0.286	0.240	.608	0.202	0.203	.970
N	29	151		218	250	

Notes: Comparison of individual participant characteristics with mean comparison tests between experienced (Exp.) and inexperienced (no Exp.) participants for both dictatorial and majority coordination mechanism. All displayed test statistics are mean-comparison t-tests with non-adjusted p-values.

A-2 Robustness of Main Result

We present robustness for the non-parametric tests with respect to the three pre-registered hypotheses: the treatment effect of social information on team decisions with majority voting (see Hypothesis 1a), the treatment effect on dictatorial decisions (see Hypothesis 1b), and the comparison of treatment effect across decision structures (Hypothesis 2).

Robustness for Treatment Effect under Majority Voting

First, we limit observations to team contribution decisions in the first round. Thereby, we isolate the immediate effect of the social information message on outcomes as behavior in the first round cannot be influenced by the end-of-round feedback about the votes of other team members and the action of the other team. The treatment effect of social information under majority voting is particularly pronounced in the first round. Here we observe an average team cooperation rate of 28% without and 47% with social information, a difference of 19 percentage points that is significant with $p = .007$, combined $N = 156$. The finding's robustness is supported by a fractional probit model, see column (1) in Table A-4.

Second, we consider session level averages. We use a perfect stranger matching protocol such that we have five repetitions of the one-shot procedure. Because one might still be concerned that the different teams are not independent units of observations, the most conservative approach is therefore to treat sessions as the only strictly independent observations. Doing so leaves us with a combined N of 26. We find that the 14 percentage point treatment difference is still significant with $p = .042$.

Robustness for Treatment Effect under Dictatorial Decisions

For robustness checks of the treatment effect under dictatorial decisions, we repeat the approaches above.

First, we limit observations to the first round as team dictators have not yet observed their team members' choices when making their first decision. With social information, 58% of team dictators cooperate in the first round while 43% cooperate without social information. The treatment difference of 15 percentage points is significant with $p = .027$, combined $N = 180$. For the respective fractional probit regression model, see column (2) in Table A-4.

Second, we consider the session as the most conservative unit of observation. This leaves us with five sessions in each of the control and treatment group. We find $p = .124$ for the 16 percentage point treatment difference.

Comparison across Decision Structures

To check for robustness of our result regarding a comparison of the social information treatment effect across team decision structures (Hypothesis 2), we also limit observations to the first iteration of the game, see column (3) Table A-4. The model shows robustness for the result that considers all five rounds: while there is a social information treatment effect for both majority voting and dictatorial decisions, there is no difference in the effect across treatments. We also find that the first round's dictatorial decisions in the baseline are, on average, more cooperative than the first round's majority decisions (significant at the 5% level).

Table A-4: Average marginal effects from fractional probit models on team cooperation rate for majority voting and dictatorial decisions in the first round

	Team Cooperation Rate		
	Maj. voting	Dict. decision	Pooled
	(1)	(2)	(3)
Social info	0.223	0.170	0.203
	(0.088)	(0.095)	(0.073)
Dict. decision			0.182
			(0.084)
Social info × dict. decision			-0.033
			(0.120)
Controls	Yes	Yes	Yes
N	156	180	336

Notes: The table reports average marginal effects from team-level fractional probit regression models on the team cooperation rate in the first round. Robust standard errors are clustered at the session level (in parentheses). Margins are calculated at mean values of all covariates. Controls include age, age squared, crew size, an indicator whether the crew mainly targets dagaa, and a measure for comprehension. All controls variables are averaged among the three team members for teams that use majority voting.

A-3 Regression Analyses

In Table A-5, we show regression coefficients from fractional probit models on team cooperation rates. The corresponding average marginal effects are reported in Table 2. For completeness, we report coefficients for all control variables and an additional set of self-reported preferences (including altruism, risk, and social image concerns). All control variables are averaged for teams that use majority voting. We observe that team cooperation slightly increases with (average) age and that the crews that target Dagaa cooperate more. Interestingly, social image concerns generally correlate with less cooperative responses under the dictatorial decision structure, but not under majority voting. The significant and positive social information treatment effect is robust across all specifications.

Table A-5: Regression results from fractional probit models on team cooperation rate for majority voting, dictatorial decisions, and the pooled sample

	Team Cooperation Rate					
	Maj. voting		Dict. dec.		Pooled	
	(1)	(2)	(3)	(4)	(5)	(6)
Social info	0.386	0.368	0.460	0.478	0.374	0.375
	(0.208)	(0.206)	(0.221)	(0.219)	(0.199)	(0.197)
Dictatorial decision					0.151	0.161
					(0.230)	(0.237)
Social info × Dict. dec.					0.096	0.101
					(0.293)	(0.294)
Age	0.086	0.085	0.094	0.118	0.093	0.103
	(0.084)	(0.077)	(0.045)	(0.045)	(0.038)	(0.040)
Age^2	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Crew size	-0.068	-0.060	-0.043	-0.050	-0.058	-0.058
	(0.140)	(0.133)	(0.101)	(0.122)	(0.083)	(0.094)
Main gear (Dagaa)	0.380	0.449	0.284	0.307	0.332	0.347
	(0.245)	(0.248)	(0.197)	(0.235)	(0.155)	(0.171)
Comprehension	-0.475	-0.431	-0.555	-0.501	-0.521	-0.459
	(0.437)	(0.444)	(0.302)	(0.284)	(0.243)	(0.240)
Altruism preference		0.179		0.074		0.093
		(0.083)		(0.044)		(0.038)
Risk preference		0.092		-0.030		0.000
		(0.077)		(0.031)		(0.031)
Social image concern		-0.038		-0.075		-0.069
		(0.072)		(0.028)		(0.027)
N	156	156	180	180	336	336

Notes: The table reports regression coefficient from team level fractional probit regression models on cooperation rate. Robust standard errors are clustered at the session level (in parentheses). All observable characteristics are averaged among the three team members for teams that use majority voting.

Table A-6 reports fractional probit regressions on the individual cooperation rate. Here, we both report results with respect to the main treatment effect of social information on individual behavio (columns (1) and (2)) and with respect to the heterogeneity analysis on role experience (columns (3) and (4)). The corresponding marginal effect of column (3) are plotted in Figure 7. Additionally, the models in column (2) and (4) includes a richer set of control variables. We find robustness for the main result and heterogeneous treatment effect of social information with respect to role experience.

Table A-6: Individual level regression on the effects of role and boat structure on average cooperation

	Individual Cooperation Rate			
	(1)	(2)	(3)	(4)
Social information	0.261	0.266	0.317	0.317
	(0.119)	(0.123)	(0.159)	(0.162)
Dictatorial decision	-0.000	0.018	0.095	0.115
	(0.171)	(0.179)	(0.196)	(0.207)
SI × Dict. dec.	0.187	0.161	-0.026	-0.073
	(0.237)	(0.244)	(0.248)	(0.257)
Role experience			0.073	0.084
			(0.177)	(0.179)
SI × role experience			-0.123	-0.112
			(0.230)	(0.230)
Dict. dec. × role experience			-0.814	-0.772
			(0.341)	(0.364)
SI × Dict. dec. × role experience			1.292	1.374
			(0.484)	(0.496)
Age	0.034	0.038	0.037	0.043
	(0.022)	(0.024)	(0.023)	(0.026)
Age^2	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Crew size	-0.042	-0.023	-0.043	-0.023
	(0.036)	(0.039)	(0.035)	(0.038)
Main gear (Dagaa)	0.222	0.190	0.222	0.193
	(0.094)	(0.096)	(0.095)	(0.097)
Comprehension	-0.017	0.014	-0.019	0.016
	(0.136)	(0.133)	(0.138)	(0.135)
HH income (% fish)		-0.003		-0.002
		(0.002)		(0.002)
Altruism preference		0.034		0.031
		(0.024)		(0.025)
Risk preference		0.007		0.012
		(0.024)		(0.025)
Social image concern		-0.028		-0.032
		(0.026)		(0.027)
Prior participation		-0.090		-0.081
		(0.110)		(0.116)
N	648	638	648	638

Notes: The table reports regression coefficients from individual level fractional probit models on average cooperation. Robust standard errors are clustered at the session level (in parentheses).

In Table A-7 we present further robustness for the heterogeneous treatment effect with respect to role experience. In particular, we dissect the role experience measure into its two components: (i) the fisherman's role on the fishing boat (captain, owner, or crew member) and (ii) the decision structure used by the fishing crew for determining the fishing location (hierarchical and egalitarian).

In column (1), we regress a fisherman's role interacted with the social information treatment and the imposed decision structure on the individual cooperation rate. Compared to regular crew members (baseline role), captains that make decisions as team dictators without social information are less cooperative. Although not significant, the coefficient that compares crew members and owners without social information in the team dictator structure indicates a difference in the same direction. When turning focus to the three-way interaction of a fisherman's role with social information and the imposed decision structure, we find insignificant but substantially positive coefficients. This is a first suggestive indication that the social information treatment in the dictatorial decision structure is more effective with real-life captains and owners. Note that there are fishermen without dictatorial decision power among the owners and captains in model (1), namely owners and captains of egalitarian fishing crews.

To get a better indication for whether the boat's decision structure in which fisherman usually take decisions drives our results, we regress the decisions structure of a fisherman's crew interacted with the social information treatment and the imposed decision structure in the experiment on the individual cooperation rate, see column (2). The boat structure is split into three categories: (i) egalitarian boats (the baseline), (ii) boats on which captains take the decision (C-boat), and (iii) boats on which owners take the decision (O-boat). We again observe an indication that for dictatorial decisions in our experiment, social information is more effective with captains and owners that decide in hierarchical decision structures. That is, the three-way interactions of social information with C-boat and O-boat and dictatorial decision structure are substantially (and in the case of C-boat significantly so) positive. This indicates that social information is more effective for dictatorial decisions when fishermen work on hierarchical boats in real-life. Yet, model (2) cannot disentangle whether the effect is driven by the real-life team dictators on these boats (the captains or owners taking the decision) or the regular crew members on the same boats.

To disentangle between the effect of a fisherman's role and the boat's structure, we combine both aspects in model (3). That is, we repeat the regression similar to models (1) and (2), but now interact social information and the decision structure with indicator variables on whether a captain in the respective decision maker on his boat (captain on C-boat) and whether an owner is the respective decision maker on his boat (owner on O-boat). Results illustrate that it is indeed the real-life dictators with authority in decision making that drive our treatment effect of social information in dictatorial decision making. While owners on O-boats and captains on C-boats cooperate less than everyone else in the dictatorial decision structure without social information, they are substantially and significantly more receptive to the treatment, i.e., they cooperate significantly more than everyone else with social information.

Altogether, the regressions in Table A-7 show that the role experience result highlighted in Section 8 are not driven by the fact that real life team dictators cooperate more per se (if anything, captains are less cooperative than crew members), nor due to the fact that fishermen from boats with an egalitarian structure are less cooperative (model (2) reveals no significant differences without social information).

Table A-7: Individual level regression on the effects of role and boat decision structure on the cooperation rate

	Individual Cooperation Rate		
	(1)	(2)	(3)
Social info	0.293	0.192	0.272
	(0.137)	(0.175)	(0.128)
Dictatorial decision (Dict. dec.)	0.178	0.058	0.136
	(0.245)	(0.210)	(0.187)
Social info × Dict. dec.	0.005	-0.319	-0.044
	(0.312)	(0.283)	(0.230)
Role: captain	-0.082		
	(0.167)		
Role: owner	0.327		
	(0.224)		
Social info × Captain	0.164		
	(0.259)		
Social info × Owner	-0.439		
	(0.267)		
Dict. dec. × Captain	-0.707		
	(0.360)		
Dict. dec. × Owner	-0.388		
	(0.301)		
Social info × Dict. dec. × Captain	0.521		
	(0.481)		
Social info × Dict. dec. × Owner	0.496		
	(0.412)		
Boat structure: captain takes decision (C-boat)		-0.119	
		(0.157)	
Boat structure: owner takes decision (O-boat)		0.028	
		(0.313)	
Social info × C-boat		0.160	
		(0.249)	
Social info × O-boat		-0.036	
		(0.360)	
Dict. dec. × C-boat		-0.113	
		(0.238)	
Dict. dec. × O-boat		-0.027	
		(0.417)	
Social info × Dict. dec. × C-boat		0.859	
		(0.379)	
Social info × Dict. dec. × O-boat		0.834	
		(0.543)	
Role: Captain on C-boat			0.091
			(0.157)
Social info × Captain on C-boat			0.246
			(0.311)
Dict. dec. × Captain on C-boat			-1.122
			(0.280)
Social info × Dict. dec. × Captain on C-boat			1.226
			(0.531)
Role: Owner on O-boat			0.604
			(0.318)
Social info × Owner on O-boat			-0.662
			(0.361)
Dict. dec. × Owner on O-boat			-0.985
			(0.461)
Social info × Dict. dec. × Owner on O-boat			1.520
			(0.621)
Individual Controls	Yes	Yes	Yes
N	624	624	624

Notes: The table reports regression coefficients from individual level fractional probit models on average cooperation. Robust standard errors are clustered at the session level (in parentheses). All models only include those participants that self-reported their role and the decision structure used within their crew. Individual controls include age, age squared, crew size, an indicator whether the crew mainly targets dagaa, and a measure for comprehension. In all models, no social information with majority voting are set as the baseline category. Additionally, the baseline role in model (1) is set to regular crew member, in model (2) to an egalitarian structure, and in model (3) to everyone that is not a captain on a C-boat or an owner on an O-boat.

A-4 Mediation Analyses and Personal Normative Beliefs

Table A-8 presents average marginal effects of a mediation analysis for empirical expectations and personal normative beliefs. For dictatorial decisions, we find clear evidence that the social information treatment effect is mediated by a change in empirical expectations. First, social information significantly increases the likelihood that dictators expect other teams to cooperate by almost thirty percentage points, see column (1). Second, expecting the other team to cooperate predicts own cooperation such that the treatment effect is transmitted to a behavioral response, see column (3). Both effects are significant at the 1% level.

Table A-8: Average marginal effects from a mediation analysis of the effect of social information on cooperation through empirical expectations (EE) personal and normative belief (PNB) for both coordination mechanisms

	Dict. decision			Majority Voting		
	EE	*PNB*	*Ind.Coop.Rate*	*EE*	*PNB*	*Ind.Coop.Rate*
	(1)	(2)	(3)	(4)	(5)	(6)
Social information	0.275		0.055	0.065		0.084
	(0.083)		(0.085)	(0.050)		(0.042)
- PNB (cooperate)		0.171			0.062	
		(0.076)			(0.042)	
- PNB (cond.coop.)		0.001			0.001	
		(0.009)			(0.002)	
- PNB (defect)		-0.170			-0.063	
		(0.076)			(0.042)	
EE			0.235			0.573
			(0.065)			(0.052)
EE (cooperate)			0.423			0.187
			(0.091)			(0.058)
EE (defect)			-0.158			-0.158
			(0.051)			(0.051)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	468	468	468

Notes: The table reports average marginal effects from individual level probit models (for empirical expectations), ordered probit models (for personal normative beliefs), and individual level fractional probit models (for cooperation rates). Robust standard errors are clustered at the session level (in parentheses). Margins are calculated at mean values of all covariates. Individual controls include age, age squared, crew size, an indicator whether the crew mainly targets dagaa, and a measure for comprehension.

For majority decisions, we find that social information induces a small and insignificant change in empirical expectations, see column (4). So while empirical expectations do drive behavior (see column (6), significant at the 1% level), little of that predictive power originates from the social information treatment. In fact, the treatment effect that is documented by our descriptive results (see Figure 4) and non-parametric tests appears to be due to a small direct effect of the social information message on behavior (the marginal effect predicts a 8.4 percentage point increase, significant at the 10% level). Those that receive information about the cooperative behavior of other teams have a slightly increased likelihood to subsequently cooperate themselves but they do not necessarily expect other teams to cooperate.

Next, we turn to personal normative beliefs. Figure A-1 shows the distribution of personal

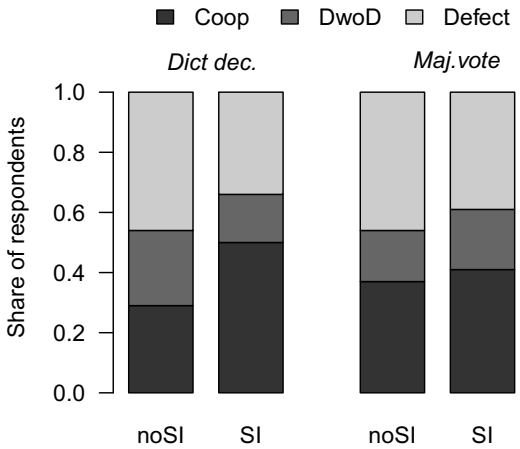

Figure A-1: Participants' personal normative beliefs by decision structure and social information treatment. The dark areas show the share of participants that think on ought to cooperate. The light areas indicate defection and the medium gray area indicates the share of "do what others do" responses.

normative beliefs by decision structure. We observe a treatment effect of social information on personal normative beliefs for individuals that make dictatorial decisions. While 29% of the participants in the hierarchical decision structure hold the belief that cooperation is the right thing to do without social information, the share increases to 50% with social information. The likelihood to express a personal normative belief that indicates defection and conditional cooperation (*i.e.*, to "do what others do") decreases by ten and twelve percentage points, respectively. A chi-square test for univariate frequency distributions establishes that these differences are significant, $p < .001$ combined $N = 180$. For majority decisions, personal normative beliefs are only weakly affected, $p = .099$ combined $N = 468$ for the same test. The share of cooperative beliefs increases by four percentage points from 37% without social information to 41% with social information. The likelihood to express the belief that indicates defection and conditional cooperation decreases by seven percentage points and increases by three percentage points, respectively.

Finally, we turn to a mediation analysis for personal normative beliefs. We observe a significant effect of social information on personal normative beliefs when decisions are made by dictators, see column (2) in Table A-8. With social information, participants are around 17 percentage points more likely to hold an unconditional preference for cooperation and 17 percentage points less likely to prefer defection than without social information. The intervention does not affect the likelihood to hold a preference for conditional cooperation. Furthermore, we find evidence that participants' normative belief drives behavior. This indicates that the treatment effect is also mediated by a change in personal normative beliefs. Compared to those stating a preference for conditional cooperation, unconditionally cooperative dictators cooperate approximately 19 percentage points more and those that state a preference for defection cooperate around 16 percentage points less, see column (3) in Table A-8. We also conduct a mediation analysis of personal normative beliefs with respect to majority voting, see columns (5) and (6) in Table A-8. We find that personal normative beliefs are not responsive to the social information treatment in this decision structure and can therefore not transmit any treatment effect.

A-5 Role Experience

We test for robustness of our exploratory result with respect to role experience presented in Section 8. The role experience measure relies on self-reported characteristics: a fisherman's role and the crew's decision making structure for determining the fishing location. Assuming that only one decision structure is used by the fishing crew to determine the fishing location, and that this structure does not change over time, all three team members should give the same response when asked about their crew's structure. However, this is not the case, indicating that there is either structural or temporal variation with respect to who determines the fishing location. Out of 216 fishing crews in our experiment, there are 36 teams in which all three team members reported the same decision structure. In 148 teams, we observe a two-to-one split while in 32 teams, the three team members give fully conflicting answers.

The results presented in Table 7 in section 8 consider each individual participant's reported mode of decision making with respect to the crew's fishing location, see Figure 3. In other words, we allow for conflicting scenarios within teams. There are several approaches to show robustness of this result. First, we drop all teams where the three members report three different decisions structures and categorize the decisions structure of a team with a 2 to 1 split as using the structure that is reported by the majority. We repeat the regression analysis that is used in the main text and plot average marginal treatment effects of social information conditional on role experience in Figure A-2. The heterogeneous treatment effect with respect to role experience is robust to this alternative specification of our role experience measure.

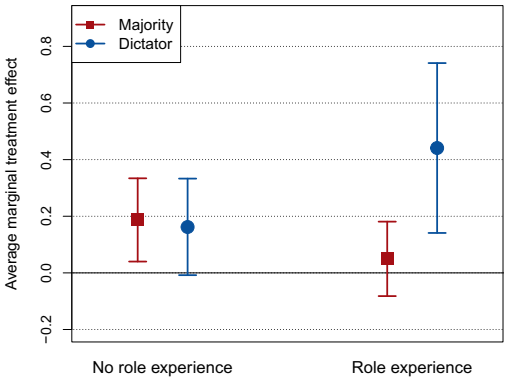

Figure A-2: Average marginal treatment effects of social information with an alternative categorization of role experience: forced consensus for teams with a two-to-one split and teams with full disagreement dropped. Whiskers indicate a 95% CI.

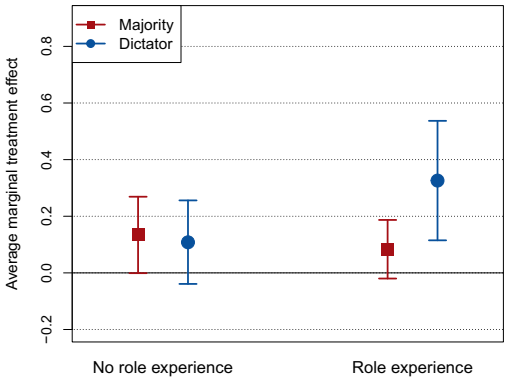

Figure A-3: Average marginal treatment effects of social information with an alternative categorization of role experience: include additional information on decision maker for gear choice. Whiskers indicate a 95% CI.

Moreover, we include self-reported data on another decision relevant in the harvesting by a fishing crew at Lake Victoria: the crew's decision maker with respect to gear choice. Unfortunately, we did not record any data on this question for the first five experimental sessions. While adding the information on who decides which gear to use introduces some imbalance in how the role experience measure is constructed, we are able to assign role experience to our participants (at least for a large part of the sample) in an arguably more nuanced way. Once more, we plot the average marginal treatment effect of social information conditional on having role experience and find robustness for the heterogeneous treatment effect, see Figure A-3.

A-6 Screenshots

Figure A-4 displays a screenshots for the cooperation decision in the experiment. The decision screen displays the round number (in Swahili: "Mzunguko") at the top of the page. On the screen participants are asked to make a contribution decision. "Hatua" translates to the word "action". Options are to cooperate or defect, using pictograms for illustration.

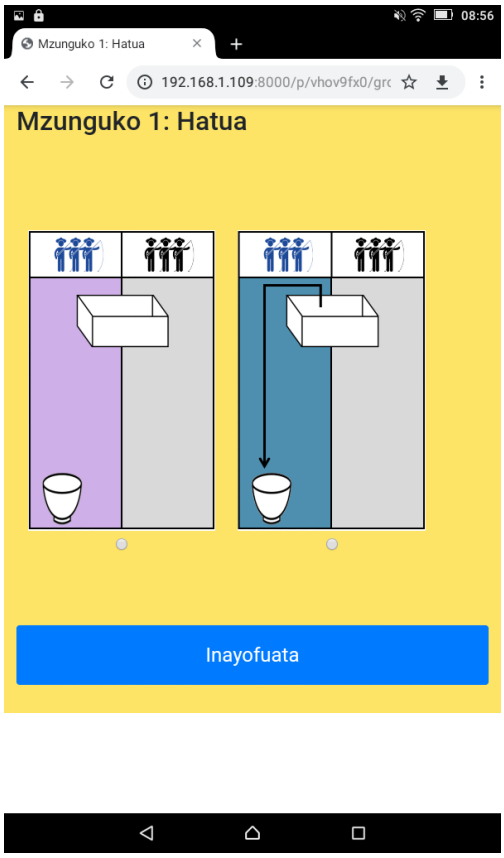

Figure A-4: Screenshot of the contribution decision. Left button means cooperation (leave the points), right buttom means defection (take the points).

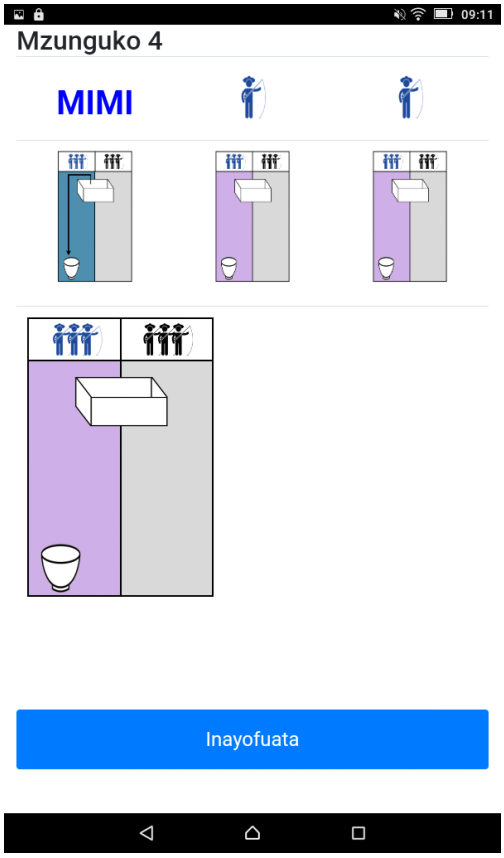

Figure A-5: Screenshot of the outcome information in a majority decision. In the top row, all three team member votes are displayed. The pictogram below denotes the resulting team decision.

Figures A-5 and A-6 display screenshots for the outcome information given after teams make majority or dictatorial decisions, respectively. For both types of decision making, the top row displays the individual decisions made by each of the three team members. The choices are illustrated using the same pictograms that are used for visualization of cooperate and defect during the contribution choice, see Figure A-4. In Figures A-5 and A-6 one's own decision is denoted by "mimi", translating to the word "you". The other two team members' decisions are denoted by a stick figure pictogram. At the bottom, the resulting team cooperation decision is displayed. When teams decide with a majority decision (see Figure A-5), the resulting team cooperation is the majority aggregation of the three individual decisions displayed above. When teams decide

with a dictatorial decision (see Figure A-6), the team cooperation decision is signified by a blue frame around one of the individual decisions displayed above.

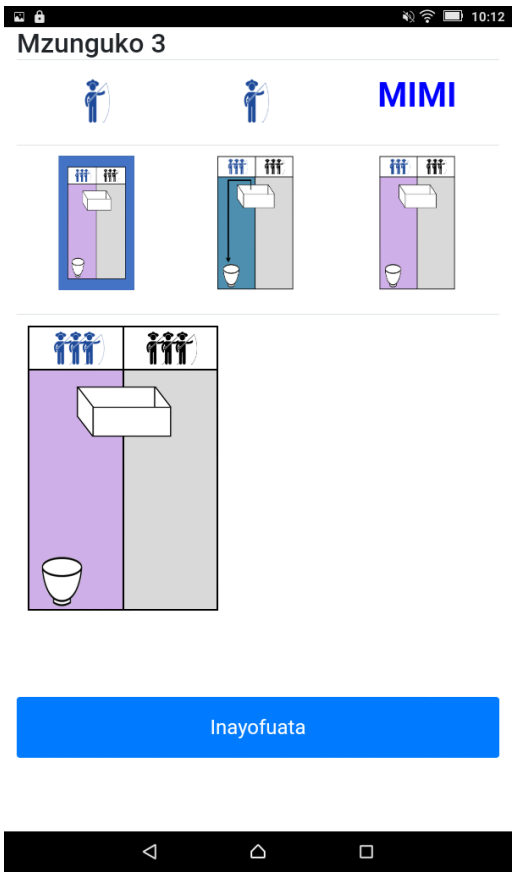

Figure A-6: Screenshot of the outcome information in a dictatorial decision. In the top row, all three team member decision are displayed with the blue frame indicating who was randomly chosen as the dictator. The pictogram below denotes the resulting team decision.

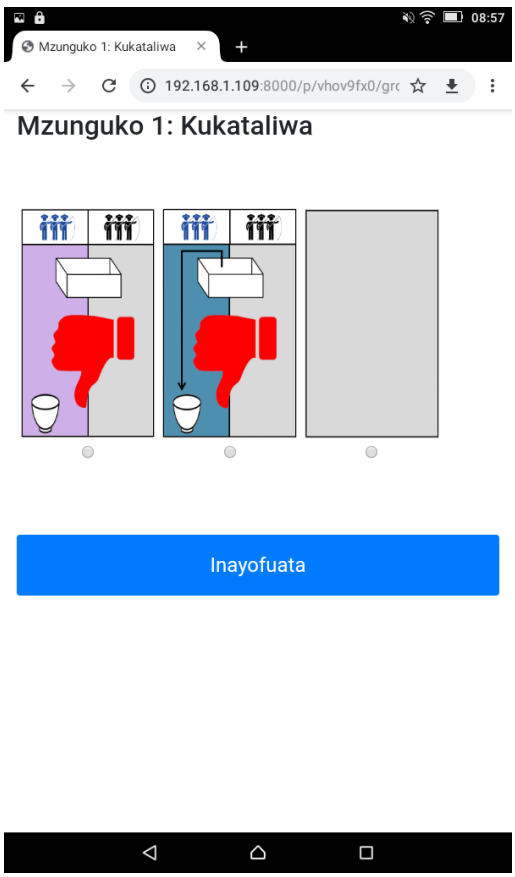

Figure A-7: Screenshot of the disapproval choice. Disapproval with the respective choice is signalled by the thumbs down. The most right option depicts the option to disapprove of nothing.

Lastly, Figure A-7 displays a screenshot for the disapproval decision. Disapproval (in Swahili: "Kukataliwa") of either cooperation (to leave the points, leftmost pictorial) or defection (to take the points, middle pictorial) is signaled by pressing the button that shows a red thumbs down picture over the respective choice pictorial. Also, participants could opt for an outside choice depicted by a grey rectangle that signifies the disapproval of nothing.

A-7 Experimental Instructions

Experimental Setup 2020 – Script

Introduction

- Welcome, and thank you all for participating in our survey.
- The meeting will take about *2 hours*.
- We ask you to use a tablet to answer questions and make choices.
- Your answers on the tablet are fully anonymous.
- You can earn money in this survey. How much you earn will depend on your choices and in some cases luck.
- Note that you cannot lose money.
- Taking part is voluntary and you can leave at any time without giving reasons.
- However, if you leave earlier, we cannot calculate and pay out your earnings. Therefore, we can only pay you if you stay until the end.

Why is this important and what is the role of fishers?

- We work with fishers because they have something important to say. You are out on the water every day and know about the challenges to catch fish in an ever-changing environment.

Consent Forms

- We ask you to sign a consent form beforehand to ensure your willingness to participate.
- You find the consent forms in the *blue* folders. We ask you to sign these forms, and we will collect them afterwards.

General Instructions

- Now that you all have a tablet in hand, we explain the survey to you.
- Use the folder as a shield around your tablet so that no one can see what choices you make.
- You are not allowed to talk to others.
- Should you have a question, please raise your hand and we will come and help you.
- The survey consists of five parts. In parts 1, 3, and 4 you can earn money. Before each part we will explain it to you.
- Every page has a "next" button. Please only press the "next" button when we give you a sign.
- Also, some pages will ask you to enter a code, before you can press the "next" button. Please wait for the instructor to give you the code.

Handling exercises

  - Now open your folder and enter the number **40** in the field on the top of your screen and select the **blue team** of the two pictures displayed. Afterwards press next.

Part 1 (Team Game)

Instructions

- Thank you for finishing the exercises on the tablet. We are now starting with the first part of the survey.
- For the first part, you are in a team of three fishermen from your boat. All other participants in the survey are in teams of three fishermen from other boats.
- Your team will not change for this part of the survey.
- The actions of your team have financial consequences.

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- Your team can earn points. The points your team earns will be exchanged to Shilling at the end of the survey and then equally split among all three team members. Each point is worth 500 TZS for each member. That means, the whole team earns 1,500 TZS for every point.

Rule Explanation

- *Please take a look at this poster and listen to the explanation.*
- There are six teams. Each team is matched with another team, so that there are three pairs.
- All teams are randomly matched with each other so that you do not know which other team you are matched with, neither during nor after the survey.
- Your team (in blue) and the other team (in black) share a collective account. There are 8 points in the collective account. This is your team's account and this is the other team's account.
- Each team can either take 4 points out of the collective account into their team account or leave the points in the collective account.
- The remaining points in the collective account will be increased and then equally split between both teams.
- When 0 points remain because both teams took 4 points from the collective account, no points will be increased.
- On your tablet, this means leave the points and this means take the 4 points.

Alternative 1 (Majority)

- How is the team's action determined? First, all three team members have to choose on their tablet on their own what they want the team to do.
- Then, the option that gets at least two votes will be implemented as the action of the whole team.
    - If two, or all, members of your team choose to take 4 points from the collective account, the team's action will be to take 4 points from the collective account.
    - However, if two, or all, members of your team choose to leave the points in the collective account, the team's action will be to leave the points in the collective account.
- The other team's action is determined in the same way.

Alternative 2 (Representative)

- How is the team's action determined? To determine your team's action, all three team members have to choose the action they would make as the team's representative.
- After all three members have made a private choice, one member will be randomly selected. The choice of this member will be implemented as the team's action.
- All three members are equally likely to be randomly chosen. This means that your own choice is always important.
- The other team's action is determined in the same way.

Disapproval Explanation

- After both teams have acted, every participant in the room has the chance to voice their disapproval
- This means that You can which action should not be done.
    - By pressing this button, you say that teams should not take the points from the collective account.

- By pressing this button, you say that teams should not leave the points in the collective.
- By pressing this button, you say nothing..

- At the end you will see how what each participant has said.
- Disapproval is a private choice and does not have any financial consequences.

Repetition

- The situation will be repeated for a total of five rounds. The rules for all rounds are the same and your team will not change. In each round, your team will be randomly matched with a new team that you have never been matched with before and will never be matched with again.
- Remember that points translate to real money. How much you will earn depends on your own choice, the choice of your team members and the action of the other team. Protect your choice from the looks of others.
- Only one round will be paid out. It will be randomly determined which round is paid out by drawing a ball out of a bag at the end of the survey. Thus, each round is equally important. *Show the bag and the numbered balls*

Comprehension

To make sure that the situation is well understood, we now go through different scenarios. Please enter the **Code: 2020** and press "next".

Take a look at the magnetic board and listen to the explanation:

- Scenario 1: Imagine that your team and the other team both take 4 points from the collective account into their respective team accounts. Now 0 points remain in the collective account. There will be no points added to the collective account. You see the situation on your screen. The blue team is your team, the black team is the other team. How many points would your team earn in this situation? Please enter your answer in the tablet and press "next". If your answer is incorrect, please try again.
    - What is the correct answer? Your team took 4 points and the other team also took 4 points. Both teams got 0 points from what was left in the collective account. In total, your team would earn 4 points. Note that the other team would also earn 4 points. Please press "next".
- Scenario 2: Image that your team and the other team both leave the points in the collective account. Now 8 points remain in the collective account. The 8 points that remain in the collective account will be increased to 12 points and split equally among the two teams. This means that both teams will earn 6 points from the collective account. You see the situation on your screen. Again, the blue team is your team, the black team is the other team. How many points would your team earn in this situation? Please enter your answer in the tablet and press "next". If your answer is incorrect, please try again.
    - What is the correct answer? Your team left the points and the other team also left the points. Both earned 6 points after the points left in the collective account were increased. So your team would earn a total of 6 points. Note that the other team would also earn a total of 6 points. Please press "next".

- Scenario 3: Imagine your team takes 4 points from the collective account and the other team leaves the points in the collective account. 4 points remain in the collective account. The 4 points that remain in the collective account will be increased to 6 points and split equally among the two teams. This means that both teams will earn 3 points from the collective account. You see the situation on your screen. Again, the blue team is your team, the black team is the other team. How many points would your team earn in this situation? Please enter your answer in the tablet and press "next". If your answer is incorrect, please try again. Please press "next".
    - What is the correct answer? Your team took 4 points and the other team left the points in the collective account. Both earned another 3 points after the points left in the collective account were increased. So your team would earn a total of 7 points. Note that the other team would earn a total of 3 points. Please press "next".
- Scenario 4: Imagine your team leaves the points in the collective account and the other team takes 4 points from the collective account. 4 points remain in the collective account. The 4 points that remain in the collective account will be increased to 6 points and split equally among the two teams. This means that both teams will earn 3 points from the collective account. You see the situation on your screen. Again, the blue team is your team, the black team is the other team. How many points would your team earn in this situation? Please enter your answer in the tablet and press "next". If your answer is incorrect, please try again.
    - What is the correct answer? Your team left the points in the collective account and the other team took 4 points. Both teams earned 3 points after the points left in the collective account were increased. So your team would earn a total of 3 points. Note that the other team would earn a total of 7 points.

Change poster form grey to colors

- Is the situation clear? Remember that it is only possible to either take 4 points from the collective account or leave the points in the collective account.

Social Information

Only in treatment condition with social information:

- You are not the first landing site where fishermen participate in this survey**.**
  In a previous landing site, most teams left the points in the collective account.
  Please press "next".

Belief Elicitation

In all treatment conditions:

- Please press "next". Now we ask you two questions.
    1. First, what do you personally believe is the right thing to do? *Please have a look at this poster.* Your options are:
        1. Leaving the points in the collective account.

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2. Taking the 4 points from the collective account.
3. Or do what other teams do. This means that you think one ought to take the points from the collective account when other teams take the points, while one ought to leave the points in the collective account, when other teams leave the points.

After your choice, please press "next".

2. Second, what do you guess most teams in this survey will do? Your options are:
    1. Most teams leave the points in the collective account.
    2. Most teams take the 4 points from the collective account.

    You will earn 1 point if your guess is correct, so think carefully. After your choice, please press "next". Note that whether your guess was correct will be revealed at the end of the survey.

Contribution

- Now we get to the stage, where we ask you to make the first choice.
- Remember you are in a team with two other fishermen. Your team matched with another team of three fishermen but you will never know who is in the other team, nor will they know who you are.

Alternative 1 (Majority):

- To determine a team's action, all three team members first have to choose on their own what they want the team to do.
- The team's action will then be determined by majority. That means the option that is chosen by at least two members will be implemented as the action of the whole team. The other team's action is determined in the same way. This means:
    - If two or all members of your team choose to take 4 points from the collective account, the team's action will be to take the points from the collective account.
    - If two or all members of your team choose to leave the points in the collective account, the team's action will be to leave the points in the collective account.
- Remember that the points your team earns translate to real money if the round is chosen for payout.
- Make a choice on your tablet and press "next".

Alternative 2 (Representative):

- To determine your team's action, all three team members first have to choose on their own what they want the team to do.
- After all three members have made a private choice, one member will be randomly selected. The choice of this member will be implemented as the team's action. The other team's action is determined in the same way.
- All three members are equally likely to be randomly chosen. This means that your own choice is always important.
- Remember that the points your team earns translate to real money if the round is chosen for payout.

- To make a choice, press the corresponding button on your tablet and press “next”.

Disapproval

- Now we come to the disapproval.
- Here, you can choose what action you want to disapprove of. This means that you can say which action you dislike.
    - You can disapprove of leaving the points in the collective account.
    - You can disapprove of taking the points from the collective account.
    - Or you can do nothing.
- To make a choice, press the corresponding button on your tablet and press “next”.

Setup result poster 1

Feedback - action

- Thank you for completing both choices.

  Alternative 1 (Majority):

- On your tablet, you can now see what happened in this round. You see what your team members have chosen and what is your team’s action. Your own choice is the one indicated by the word “Me”. Please press “next”.

  Alternative 2 (Representative):

- On your tablet, you can now see what happened in this round. You see what your team members haven chosen. Your choice is the one indicated by the word “Me”. The choice that was randomly selected to be the team’s action is highlighted in blue! Below you see your team’s action. Please press next.

Feedback - earnings

- This screen shows you how the situation turned out. You see your team’s action on the left and the action of the other team on the right. Below you see the total points earned by your team. Please press “next”.

Feedback - disapproval

- This screen shows you the results from the disapproval.
- The numbers below the pictures show you how many participants of all participants in the session have disapproved of the different actions.

Repetition

- You have finished round 1. Now you will repeat what we have just done for other 4 rounds without our help.
- The rules for all rounds are the same. In each round, your team will be randomly matched with a new team that you have never been matched with before and will never be matched with again.

- In every round, we will ask you again what you believe most other teams will do. With a correct guess, you can earn 1 point. Then you have to make a choice whether to take 4 points or leave the points. Lastly you always have the opportunity to vote on what action to disapprove of.
- Only one round will be paid out. Thus, each round is equally important.
- Please press “next” to start.

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