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The Effects of Communication in Social Dilemma Situations: Evidence from a Public Good Field Experiment

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The Effects of Communication in Social Dilemma Situations:
Evidence from a Public Good Field Experiment

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JEL-classification: C71, C93, D83, H41, Q5

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Highlights:

- Public good field experiment
- Framework disentangling communication effect on cooperation
- Comparing unrelated against coordinative communication
- Relevance of interpersonal relationships
- Norm to keep one's own promises more important than increased expectations after communicating about the social dilemma

Abstract:

Communication is well known to boost cooperation rates in social dilemma situations, but the exact mechanisms behind this have not yet been entirely understood. This paper studies the role of two forms of communication on public good provisioning in a field experiment conducted with farmers from small, rural communities in northern Namibia. In line with previous experimental findings, I observe a strong increase in cooperation when face-to-face communication is allowed before decision-making. I additionally introduce a condition where participants cannot discuss the dilemma but talk with their group members about an unrelated topic prior to learning about the public good game. It turns out that this condition already leads to significantly higher cooperation rates, albeit not as high as in the condition where discussions about the social dilemma are possible. This partly contrasts previously existent theories and findings. After ruling out better comprehension of the game and increased expectations of one's group members' contributions as the main drivers for the communication effect, I could instead identify the relevance of interpersonal relationships and the personal norm of keeping promises.

Keywords: communication, cooperation, field experiment, public good, norms

1. Introduction

One particular measure that has been observed to increase cooperation rates remarkably is allowing participants in social dilemma situations to talk to each other prior to making their decisions (Dawes 1980; Sally 1995; Balliet 2010; Ostrom 2010). Despite quite some research on the topic, exact mechanisms for this effect still remain mostly unclear (Lopez and Villamayor-Tomas 2017; Koessler et al. 2020). This study adds to solving the puzzle of identifying what determines decisions to cooperate and contributes to understanding how communication is able to raise cooperation in social dilemma situations.¹ Disentangling single elements may help harnessing the potential of communication in solving the dilemma: Does the simple act of talking reduce social distance, generate mutual trust and affect social preferences? Does talking about the social dilemma problem increase comprehension and create norms of cooperation? Or does it require mutual commitment to cooperate from all members in order to build positive expectations about the others' behavior? Based on previous theories and findings, I hypothesize that communication, in particular face-to-face communication, affects cooperation over various channels, some of which go beyond the mere content of the conversation. I develop a theoretical framework, shortly review relevant literature and then present results from a field experiment that compares three conditions: no communication as the baseline (Treatment 1), unrelated communication (Treatment 2) and coordinative communication (Treatment 3). The crucial distinction between the two communication treatments lies in whether or not group members already know about the upcoming public good game when they talk to their group members. This design therefore allows me to distinguish what I call the non-coordinative elements in communication from the coordinative ones. My study is conducted as a field experiment in northern Namibia with villagers from small, rural communities which brings about two advantages: Firstly, participants do already know each other, so that a communication effect cannot only be attributed to simply identifying and getting acquainted with one's group members. Secondly, it allows me to compare how communication interacts with different levels of previously existing social ties between participants, which has, to my knowledge, not yet been investigated before.

¹ Communication, in particular in experimental settings, usually refers to unrestricted face-to-face discussions between a group of participants that face such a social dilemma (Bicchieri and Lev-On 2007). Procedural standards in economic experiments further ensure anonymity of individual decisions which allows all individuals to reveal their true preferences without having to worry about retaliation by other participants during or after the experiment. Participants consequently only get to know their own and the group outcome but are unable to discover the individual decisions of the other group members (unless all group members unambiguously defect or cooperate, in which case the other's behavior can be deduced from the group outcome). Real money is offered in economic experiments to make preferences and decisions salient.

2. Theoretical framework

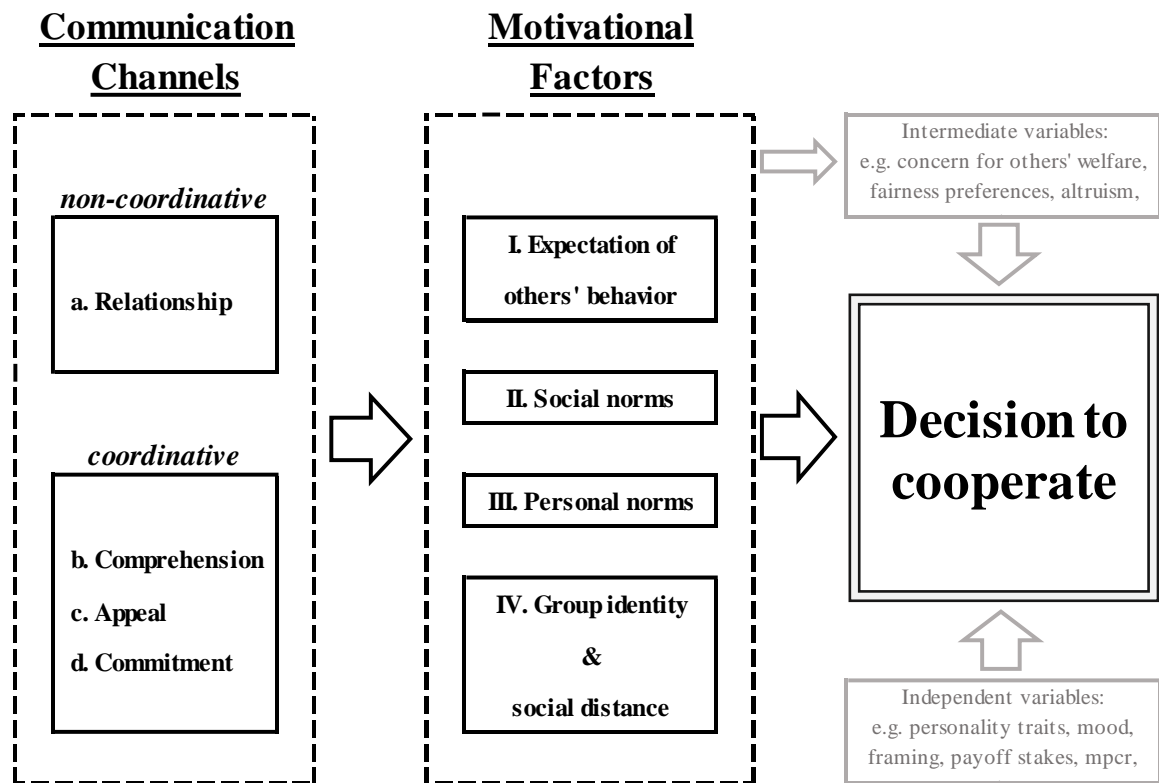
In their seminal researches on the topic, Dawes et al. (1977) identified three possible origins for the communication effect on cooperation: 1. *getting acquainted*, 2. *discussions as exchange of relevant information and appeal to cooperate*, and 3. *commitment to reassure one's own good intentions*. Endorsing its simplicity, I base my theory and experimental design on their concepts. As a substantial refinement, Dawes et al.'s second point is split up into "comprehension" and "appeal"; four potential communication channels consequently build the first major part of my framework (cf. Dawes et al. 1977; Kerr and Kaufman-Gilliland 1994).² These four channels I identify as relevant are depicted on the left-hand side of Figure 1³ as (a.) relationship with one's group members, (b.) comprehension of the dilemma situation, (c.) appeal to cooperate, and (d.) commitment.

However, communication can change outcomes in social dilemmas only by affecting individual motivations to cooperate. Beyond the four communication channels, I do, in the next step, also consider how these channels affect such motivations. Relevant elements here are expectations of others' behavior, social and personal norms as well as group identity and social distance. The framework is based on existing literature insofar as the elements included have been suggested as motivational drivers relevant for cooperation, but they have not yet been set in relation with each other. While the study attempts to decompose and structure single communication channels, they are, *ex-ante*, not meant to be distinctly linked to specific motivational factors. Next to motivational factors that affect cooperation, any decision about cooperation also depends on other, independent as well as certain intermediate variables, most of which will not be considered in detail. For a comprehensible build-up of the framework, I will, in the following paragraphs, firstly introduce and structure the motivational factors (i.e., the middle part of Figure 1) as they will later become relevant for discussing the suggested communication channels.

² Dawes et al. (1977) as well as Kerr and Kaufman-Gilliland (1994) mention that communication may improve comprehension of the dilemma situations.

³ Own illustration.

Figure 1: Theoretical framework of decision making after communication³



I. Expectations of others' behavior

As the first motivational factor, I include expectations of how the other participants behave in the social dilemma. It seems intuitive that an individual's willingness to cooperate is higher if everybody else is also cooperating, even though it does not change the fact that defection still results in the higher payoff (i.e., the dominant strategy). In a situation where nobody else cooperates, on the other hand, said individual will likely not want to cooperate either. This is based on the concepts of conditional cooperation and reciprocity, which is widely acknowledged in economic literature on cooperation (Axelrod and Hamilton 1981; Fischbacher et al. 2001; Croson 2007; Kocher et al. 2008, Fischbacher and Gaechter 2010; Chaudhuri 2011). If an intervention, such as communication, is able to increase (mutual) expectations, then it will likely lead to higher cooperation outcomes (Kerr and Kaufman-Gilliland 1994). Expectations about others' behavior are also termed "beliefs" in economic literature (e.g., Fischbacher and Gaechter 2010).

II. Social norms

As the second factor, the framework considers the role of norms in cooperation. A social norm is understood as what is believed to be the appropriate conduct, or what someone believes that others expect them to do (Berkowitz 1972; Schwartz 1977, Cialdini et al. 1990; Cialdini et al. 1991; Brewer and Crano 1994; Kallgren et al. 2000, Fehr and Gaechter 2000). It is not formally composed or enforced, but can be socially enforced, also through sanctions (Brewer and Crano 1994; Fehr and Gaechter 2000; Bicchieri and Lev-On 2007). In short, it can also be considered an informal rule. Communication may introduce, activate or strengthen such norms. Since social norms are believed to be followed by the majority, this will also raise expectations of others' cooperative behavior. Next to directly affecting the decision to cooperate, they therefore also have an indirect, and presumably positive, impact through elevating beliefs, which triggers conditional cooperation. Breaking norms may result in the feeling of guilt, which can be interpreted as an intrinsic cost that individuals try to avert (Posner and Rasmusen 1999; Ostrom 2000; Charness and Dufwenberg 2006, Kessler and Leider 2012).

III. Personal norms

For the purpose of the presented framework, there is reason to distinguish between social and personal norms.⁴ In contrast to social norms, which reflect someone's perception of how they are expected to behave or of what is considered as normal behavior, a personal norm describes what one believes the right thing to do according to their own, personal standards (Schwartz 1973; Schwartz 1977; Ajzen 1991; Cialdini et al. 1991). If either or both types of norms prescribe cooperation as the right conduct, individuals who abide to such norms will likely act accordingly.

⁴ Cialdini et al. (1990) further distinguishes social norms into what is believed to be the normal (descriptive norms) and what is believed to be the appropriate behavior (injunctive norms). Beliefs about what is normal should consequently be reflected by expectations, whereas this is not necessarily the case for norms of appropriate behavior. In social dilemma situations, however, the concept of conditional cooperation renders it unlikely that social norms can be effective if they are not expected to be followed by others as well. In this sense, a norm that is believed to prescribe the appropriate behavior but is not followed by the majority can somewhat overlap with the concept of a personal norm. If an individual abides by a norm without believing in their peers doing so as well, then that individual adheres, according to my understanding of the concept, to a personal norm. In similar terms, Ajzen (1991), Smith and McSweeney (2007), Ravis et al. (2009), Schram and Charness (2015) as well as Mittelman and Rojas-Méndez (2018) distinguish between social and moral norms.

IV. Group identity and social distance

The fourth factor in my framework is built by group identity and social distance amongst participants. Group identity is in this context understood in a rather narrow sense as the perception of being part of a social group (Tajfel et al. 1971; Turner 1982; Spears 2011). It is somewhat similar to social distance, which describes the relationship between groups or individuals, how close they are, not spatially but in the degree of understanding and intimacy in their personal as well as social relationships to each other (Park 1924).⁵ In theory, these two factors can be kept separate.⁶ In practice, however, social distance and group identity are mostly interdependent and affect each other. For example, members that share a common group identity feel socially closer to each other and socially close individuals likely develop some form of group identity (cf. Park 1924; Driedger and Peters 1977).⁷

With decreases in social distance or elicitation of group identity, one's group members become more relatable so empathy and concern for their welfare may increase (cf. Schelling et al. 1968; Kerr and Kaufman-Gilliland 1994; cf. Bouas and Komorita 1996; Bohnet and Frey 1999). A number of studies have observed higher cooperation rates and willingness to help each other with socially closer individuals (Essock-Vitale and McGuire 1985; Yamagishi and Sato 1986; Thompson et al. 1998; Kollock 1998; Monsutti 2004; Peters et al. 2004; Bowles and Gintis 2004; Goette et al. 2006; Ruffle and Sosis 2006; Haan et al. 2006; Castro 2008; Boone et al. 2008; Apicella et al. 2012; Chuah et al. 2014). Similar preferences have also been found in increased trust and altruism (Glaseser et al. 2000; Buchan and Croson 2004; Rachlin and Jones 2008; Goeree et al. 2010; Cadsby et al. 2008; Etang et al. 2011; Binzel and Fehr 2013; Candelo et al. 2018). Such preferences can also be explained with evolutionary theories (Caporeal et al. 1989).

⁵I prefer this pristine definition of social distance, whereas other studies sometimes describe social distance through actual manifestations, such as social and ethical affiliations, shared practices and customs or conformity in behavior (Akerlof 1997; Leeson 2008). Obviously, this overlaps with the concept of group identity. My study does, however, neither claim to define terms nor does it intend to empirically examine the differences between group identity and social distance.

⁶Group identity could, for instance, also evolve with non-identified group members, e.g., being member of a large group, in which case it might not directly affect social distance (cf. Driedger and Peters 1977; Kramer and Brewer 1986; Bicchieri 2002). Similarly, being friends with or being related to someone might affect decisions to cooperate without the formation of a specific group identity.

⁷Most literature on the communication effect therefore refers to only "group identity" and do not consider "social distance" as an additional factor.

According to the social identity theory and the self-categorization theory, a stronger identification with the group shifts the focus of attention away from the individual towards the collective target, which means that members of a group with a strong perceived group identity are more likely to seek maximizing the group benefit instead of their individual payoff (Turner 1975; Tajfel et al. 1979; Turner 1982; Kramer and Brewer 1984; Brewer and Kramer 1986; Dawes et al. 1990; Kerr and Kaufman-Gilliland 1994).

As depicted in Figure 1, the introduced motivational factors must not be understood as separate and independent, or even mutually exclusive. On the contrary, if communication decreases social distance or strengthens group identity, norms may become more salient and expectations of other's cooperative behavior might rise (Brewer and Kramer 1986; Roth 1995; Hoffman et al. 1996; Bohnet and Frey 1999; Bicchieri 2002).⁸ Similarly, establishing or strengthening norms may also raise expectations, in particular, if one's own perceptions of appropriate conduct are being projected onto others.

Next, the four communication channels will be explained, which can be divided into "coordinative" and "non-coordinative" elements as illustrated in Figure 1. As "non-coordinative" I consider any conversation content that is not about the social dilemma, whereas "coordinative"⁹ describes those channels that include discussions about the actual dilemma. For each channel, it will be considered how, in particular, they may manipulate aforementioned motivational factors and thereby, ultimately, affect the decision to cooperate.

a. Relationship (non-coordinative)

The first channel of interest is what I consider the "relationship" channel of communication. It encompasses any conversational content that affects each group member's relationship to each other, their social closeness and how they see themselves and the others in the group. This can entail non-coordinative topics like greeting each other, introducing oneself or others, and any type of small talk that is not about the social dilemma and the upcoming decision. However, also coordinative discussion topics, such

⁸ So far, the discussion about the communication effect in cooperation has indeed focused mostly on either group identity or norms as the relevant explanation, with some authors favoring the latter (Kerr and Kaufman-Gilliland 1994; Bicchieri 2002).

⁹ Instead of "coordinative" one could also use the terms "strategic", "relevant" or "dilemma-related" to describe this condition.

as explanations, appeals and commitments are not excluded from potentially affecting the group members' relationships to each other (cf. Schulz von Thun 1981).¹⁰

The relationship channel primarily decreases social distance and creates or strengthens the feeling of belonging to the group, which results in higher cooperation outcomes, as suggested by my framework (Kramer and Brewer 1984, Brewer and Kramer 1986; Dawes et al. 1988; Orbell et al. 1988; Kerr and Kaufman-Gilliland 1994). A direct and, even more so, an indirect impact on norms and expectations is (to some extent) also possible. Finally, the social effect of communication could, in theory, also have a negative effect on cooperation if participants only learn through communication that they do not like their group members or do not find them trustworthy.

b. Comprehension (coordinative)

As the second potential channel, communication can increase comprehension of the situation if some participants have not entirely understood the nature of the social dilemma. In experimental settings, discussions can help clarifying the rules and game mechanics (Dawes et al. 1977; Kerr and Kaufman-Gilliland 1994). It is, however, not clear what effect increased understanding could possibly have on cooperation outcomes. Conceivably, comprehending how mutual cooperation is in everyone's best interest could establish it as the preferable option, from a normative point of view. On the other hand, better comprehension of the social dilemma could also cause an individual to realize that defection always leads to a higher individual payoff and consequently to switch from an intuitive intention to cooperate to a deliberate decision to free-ride (cf. Kahnemann 2011).

¹⁰ The communication channels presented in this study show a striking similarity to the "four-sides model" on general communication by Schulz von Thun (1981). In his model Schulz von Thun states that each message in a conversation includes not only the factual content, but also transmits information about the relationship between the participants, a self-revelation of the sender and an appeal to the receiver(s). To be precise, it needs to be clarified that in Schulz von Thun's original model, the three sides "self-revelation", "relationship" and "appeal" are all contained, mostly indirectly, in the actual words that are transmitted. In my model, on the other hand, "appeal" and "commitment" happen, primarily, on a factual level. Indeed, the experiment was partly motivated by Schulz von Thun's concept.

c. Appeal (coordinative)

The third relevant channel to consider is the (mutual) appeal to cooperate that likely arises in group discussions (Dawes et al. 1977). Such an appeal to cooperation is ideally supported by all group members and can thereby create or activate a social norm to cooperate in a very direct way (cf. Orbell et al. 1988). The direction of the effect on cooperation is generally expected to be positive. The important distinction to the first channel lies in whether individuals make their decision to cooperate out of their own deliberations or whether they are persuaded by the others to do so. Theoretically, however, there could also be a crowding-out if an individual feels pushed too harshly by the others' prompt for cooperation. The "appeal" channel also includes making threats of punishment. Even if such threats are not plausible, they could still have an effect on a socio-psychological and interpersonal level and that could go into either direction, from timid obedience to defiant defection.¹¹

d. Commitment (coordinative)

The fourth and last potential channel is commitment, which has repeatedly been suggested as the most influential one in explaining the effect of communication on cooperation (Orbell et al. 1988; Ostrom et al. 1992; Kerr and Kaufman-Gilliland 1994; Bicchieri 2002). Commitment happens in group discussions if one or several members state their intentions to cooperate or even promise to do so.¹² Such statements are not necessarily binding and plausible as the actual, individual decisions can, depending on the setting, not be enforced or monitored.^{13, 14} A cunning free-rider might even deliberately lie about their intention to cooperate in order to gain higher payoffs from

¹¹ In repeated games, threats can be plausible: Conditional cooperators may even announce during the discussion their willingness to cooperate in further rounds but only if the other group members also cooperate. Even from a free-rider's perspective, an early break-down of intragroup cooperation is not desirable and threats to cease cooperation are therefore plausible if decisions in the social dilemma have to be made several times with the same group.

¹² While the theory in this framework distinguishes between appeal and commitment, in practice, these two are likely strongly linked to each other. Announcing one's willingness to cooperate can be understood as an appeal to others to do so as well and an appeal for mutual cooperation can be interpreted by others as a statement of one's own intentions to do so.

¹³ Since non-binding commitment is technically not really commitment, it is often referred to in relevant studies as "cheap talk" or "signaling" of intentions.

¹⁴ The actual decisions as well as the final payments to each participant are generally kept anonymous in economic experiments. Free-riders do therefore not need to fear social sanctions or reputational effects. This might be different in real situations where monitoring and enforcement are possible and sometimes, economic experiments also allow (costly) punishment of deviators within the mechanics of the game. This as well as any other particular alterations in the cooperation scenario will then likely also play a role in the respective conversation. Similarly, if decisions are to be made over several rounds, reciprocal effects are possible and will likely affect decisions as well as the content of the conversations.

the others' cooperative efforts. Keeping promises and not lying to people are, however, considered strong and rather universal social norms. Indeed, Bicchieri (2002) argued that the communication effect in cooperation was based on the norm of promise keeping rather than a general norm to cooperate or increased group identity. Commitments made during group discussions might therefore evoke trust and rise expectations of high cooperation, even if they are not technically binding. Those, who condition their decisions on the expectation of their group members' behavior, will then cooperate more (Orbell et al. 1988). In other words, the effectiveness of non-binding commitment is based on the premise that a deliberate lie is a violation of norms far worse than simply not cooperating (cf. Orbell et al. 1988). For participants in experiments, it might be difficult to distinguish the consequences of breaking norms in the experimental setting from doing so in reality. Lying, in particular, was found to be psychologically similar in experiments as in the real world and is therefore easily associated with the danger of negative consequences and retaliation (Dawes et al. 1988). It was pointed out that keeping promises could be both a social and a personal norm (Kerr et al. 1997; Bicchieri and Lev-On 2007).

To sum up, there may well be a double effect of commitment: Firstly, individuals who made a commitment during the group discussion might feel bound to fulfill their own promise due to social and personal norms. Secondly, based on mutual trust in such commitments, expectations about the other group members' intentions to cooperate increase, which reciprocally further boosts cooperation.

3. Discussion of empirical literature and development of hypotheses

Several previous experimental studies have tried to disentangle the non-coordinative elements of the communication effect from the coordinative ones. Most of them follow an approach that is complementary to ours as they minimize any unrelated communication while only leaving the option to coordinate by sending written messages, partly anonymously, for example on paper or in chats through computer terminals. Summing up findings, it turns out that, while written communication also significantly increases communication, it is not quite as effective as face-to-face communication (Frohlich and Oppenheimer 1998; Bochet et al. 2006; Bicchieri and Lev-On 2007; Balliet 2010). In his meta study, Balliet (2010) observes the same across a large number of studies and points out the relevance of this finding: The mere content of conversations can easily be exchanged by modern communication means like emails and

telephone, yet on many occasions in business, politics and science, meeting in person remains important, even though it involves higher costs and consumes more time for travelling in order to meet each other.¹⁵ Jensen et al. (2000) and Broosig et al. (2003) test even finer nuances by comparing various communication modalities like written messages, phone and video calls as well as face-to-face communication. It is found that the broader or “richer” a communication medium is, the better it is able to increase cooperation outcomes (Bicchieri and Lev-On 2007). The missing pieces in written communication in comparison to face-to-face communication are commonly explained by body language, facial expressions, eye gaze, the tone of voice and possibly other, more subtle cues (Roth 1995; Kurzban 2001; Bicchieri and Lev-On 2007).¹⁶

On the other hand, it must be considered that, by allowing only written messages, the non-coordinative channel is not necessarily entirely eliminated. Visual and tonal cues might not be available, but phrasing style and choice of words are still able to transmit information that go beyond the pure content and can further affect the relationship between the conversation partners. Wilson and Sell (1997) tested communication in a public good experiment over a computer terminal, where players could say nothing verbally but only signal their intended contributions as numbers. By doing so communication was truly reduced to the (non-binding) commitment channel. Interestingly, they did not find an increase in contributions; on the contrary, (forced) signaling of one’s intentions resulted in lower contributions than a baseline without any communication¹⁷. Similarly, Chen and Komorita (1994) as well as Bochet et al. (2006) conducted experiments that allowed participants to state their intended contributions to a public good, but there were no positive effects on cooperation compared to no-communication conditions, either. Also, Dawes et al. (1977) already added public signaling in addition to unrestricted communication about the dilemma but it did not raise contributions above the level of unrestricted communication without signaling. Results from these studies indicate that non-binding commitments or stated intentions to cooperate alone are insufficient in explaining the communication effect.

In order to find out about the role of interpersonal relationships affecting cooperation, attempts have been made to test the effect of non-coordinative communication only, without the

¹⁵ One could even interpret communication as a second order dilemma: everyone wants to enjoy benefits of higher efficiency after communication, but nobody likes to bear the cost of establishing communication.

¹⁶ Kurzban (2001) tested some of these cues individually and found some evidence for increased cooperation after group members exchange mutual eye gaze or light physical contact, but this observation only seems valid in male sample groups.

¹⁷ In the literature this type of non-binding signaling is often termed as “cheap talk”. I do, however, avoid the term as the reader might easily confuse “cheap talk” with irrelevant “smalltalk”, which means quite the opposite in this context.

possibility of coordination. A promising way to do so is to allow only unrelated (i.e., non-coordinative) communication between participants.¹⁸ This can be understood as the counterpart to the studies previously discussed, as the idea is not to eliminate the non-coordinative channel but to remove the coordinative elements; testing whether unrelated discussions without coordination already affect decisions to cooperate. Dawes et al. (1977) were the first to test this by asking groups of participants to estimate the population proportions of different income levels of a particular US state as a communication task. Similarly, Bouas and Komorita (1996) hypothesized that finding consensus on any topic that was relevant to the participants could evoke group identity in group discussions. Both studies, however, found no effect of unrelated discussions. Higher cooperation rates in comparison to no talking were only achieved by groups that could actually discuss the dilemma. On the other hand, Kurzban (2001) found an increase in cooperation after allowing unrelated, non-coordinative communication via computer messages, which indicates that there can still be some effect even if the communication does not happen face-to-face, but leaves us with an inconclusive overall picture on the role of non-coordinative communication.¹⁹ Looking at trust games, however, there is empirical evidence supporting a positive effect of unrelated communication (Buchan et al. 2006)

In conclusion, coordinative communication alone, without free, unrestricted discussion, is not found to be effective in increasing cooperation, and evidence for the effect for non-coordinative, social communication without the possibility to coordinate is, at best, mixed. Possibly, coordination is only effective, if both the coordinative and the relationship channels are activated. In particular, appeals to cooperate and commitments made during discussions might only be salient in groups that have built a certain amount of social closeness and trust to each other (Hardin 2003; Simpson 2007; Barbalet 2009).

¹⁸ This is sometimes termed as irrelevant communication. If the communication was truly irrelevant, however, one would not need to bother testing its effect. What is meant by “irrelevant” in this context is that the communication is not about the social dilemma, but about some other topic. Instead, I use “unrelated” or “non-coordinative” communication as preferable terms.

¹⁹ Kurzban (2001) admit that there were some methodical problems with the implementation of the unrelated communication treatment. Participants were allowed to write in a chat for 30 seconds just before decision making and they were told not to discuss dilemma or make pledges in this chat. Some participants did, however, not obey this instruction.

For my experiment, I extend and improve the previously applied approaches by asking the participating groups to discuss a given but unrelated topic with their group members before instructing them about the public good game. The particular advantage is that, even though a discussion topic was given in order to homogenize conversations, the content was not externally restricted and, possibly more importantly, not perceived by participants as restricted in any way. Previous studies have prohibited coordinative talk as participants were already aware of the upcoming game (cf. Bouas and Komorita 1996; Kurzban 2001). In my view, this could have detrimental and incalculable behavioral side effects. In the field setting of this study, social relations are partly pre-defined, as participants do already know each other. If communication effects on cooperation are found in this setting, then it can be concluded that they derive from the actual interaction in the conversation and not just from mere identification and getting-to-know each other.²⁰ Also, pre-existing social ties between participants measured as the number of family members and friends in their group are considered as one scalable manifestation of social distance, which is considered as a central element in my framework. Lab-experiments with student samples do not usually take into account existing social relationships between participants. Effects of communication can be expected to be different in field settings, where participants come from small communities, knowing each other rather well. Indeed, previous evidence on the communication effect from field experiments is more heterogeneous than results from the lab. While positive effects of communication on cooperation are regularly observed (e.g., Cardenas et al. 2004; Cardenas and Ostrom 2004; Velez et al. 2010), this was not always the case (Velez et al. 2012). Ghate et al. (2013) found that communication was not necessary to increase cooperation if participants already show a high level of trust. Having a closer look at the interaction between social ties and communication might therefore be worthwhile and could help finding out from which factors in particular communication effects originate. In-group favoritism is a rather well-established finding in economic psychology (Tajfel et al. 1979; Akerlof 1997; Buchan et al. 2006). To my knowledge, this has not yet been considered in studies on the effect of communication on cooperation.

²⁰ Dawes et al. (1977) consider “getting acquainted” as one possible explanation for the communication effect. This condition is sometimes understood as identification of fellow group members (Kerr and Kaufman-Gilliland 1994). However, in all treatment conditions of this study, group members are able to see and identify each. If identities were kept anonymous in the no-communication treatment, then the effect of communication could not be distinguished from effects of identification, which is, to my understanding, not supposed to be part of studying communication. The distinction between identification and anonymity was actually also examined by us as part of the same research project and results will be reported in another paper (Hoenow and Pourviseh, in preparation).

With the experiment presented in this paper three hypotheses will be tested: Firstly, it is compared if non-coordinative communication is able to increase cooperation compared to a no-communication baseline group as established in hypothesis 1:

H1: Non-coordinative communication in groups has an effect on cooperation

Secondly, I compare between two distinct forms of communication, namely coordinative and non-coordinative discussions. The second hypothesis is therefore formulated as:

H2: The effect of non-coordinative communication is different from coordinative communication

And thirdly, I test for interactions between both communication conditions and pre-existing social relations as given in the village-community setting of the research sites.

H3: Communication effects depend on or interact with previously existent social relations in groups

4. Method

4.1 Research setting and participants

The experiments were conducted from April to June 2017 in 12 randomly selected rural villages in Kapako district (Kavango West) and Ndiyona district (Kavango East).^{21,22} For the selection, villages that had formerly been visited for similar research projects were left out. Further preconditions were that there were more than 80 inhabitants and the village was not more than a day's drive away from the nearest tar road²³. The original total sample size was 216 participants, 72 in each of the three treatments. After data cleaning and dropping observations from participants that failed to answer the control questions correctly, I ended up with 172 valid observations. All tables, figures and results reported are based on the cleaned dataset if not otherwise indicated. Table 1 summarizes the socioeconomic characteristics of the sample.²⁴

²¹ The experiment was embedded in a bigger study about cooperation, deforestation and development in rural Kavango, which, in turn, constituted a part of the SASSCAL research project (see funding and acknowledgements).

²² The names and the positions for all villages are shown in the supplementary materials (A.1).

²³ A sufficiently large number of inhabitants was necessary in order to allow a comparable and random sampling. Distance from the tar road had to be limited as particularly villages that were hidden deep inside the forests were not only difficult to find but also usually rather small and sometimes deserted. For logistical reasons and due to limitations in time and resources, I could therefore not make the endeavor to include them in the sample to draw from.

²⁴ A table for socioeconomic characteristics split by treatments conditions can be found in the supplementary materials (A.2). There, I also test for equality of subsamples and it turns out that most, but not all, variables are equally distributed. It is therefore reasonable to add these as control variables in the regression models.

Table 1: Summary statistics and variable description

Variable	Obs	Mean	Std.Dev.	Min	Max	Variable Info
Control_wrong*	216	0.20	binary	0	1	Control question wrong answer
Expectation	172	5.91	2.72	0	10	Belief of others' contribution
Trust in group	171	2.50	0.83	0	3	Trust in group members (0-3)
Family	172	1.19	1.18	0	3	Relatives in group
Friends	172	0.69	0.98	0	3	Friends in group
Age	172	35.99	14.49	18	84	Age of participants
Female	172	0.60	binary	0	1	Gender (1 for female)
Schooling_years	172	7.15	3.64	0	14	Years of schooling
Head_of_hh	172	0.41	binary	0	1	Head of household
Migrant_10	172	0.18	binary	0	1	Moved to village (<10years ago)
Socialladder	172	2.72	2.37	1	10	Self-assessed social status
Cattle_owned	172	9.16	17.16	0	120	Number of cattle owned

*variable "control_wrong" shows all 216 observations, i.e., includes uncleaned data
Source: own calculations based on collected data

The majority of the rural population in Kavango is engaged in agriculture with crop farming as the primary component of their livelihood and cattle farming taking the second relevant role (Namibian Ministry of Lands and Resettlements 2015). Farming is often on subsistence level and only partly integrated into markets. The Kavango region is further characterized by a young and growing population, most of which enjoyed some years of formal school education. The addressed particular advantage of choosing Kavango villagers as participants for this research are pre-existing social ties between them. Villages are small in population size²⁵ and villagers do usually live in the same place for many years or even a lifetime, which means that the majority of the participants could be expected to have known each other before the experimental workshops. In addition, there are village meetings as well as social and religious gatherings held regularly and some households work together in certain agricultural tasks. Kinship relations can also be found between many households.

In preparation of the experimental workshops, each village's headperson was visited several days ahead in order to arrange an appointment for a village meeting so that all villagers could be informed and invited in time. It was made clear beforehand that some monetary compensation would be offered for participating but also that only a certain number of participants would be able to take part in the research workshops. At the beginning of each village meeting, 24 participants were randomly drawn by lot amongst those who expressed willingness to participate. This selection procedure was considered fair by almost everybody. The same lots also determined the allocation to one of two treatment groups per village. These treatment groups of 12 players each were then spatially separated and we explained to them the procedure of the workshop as well as the instructions of the public good game according to the

²⁵ On average 642 inhabitants.

respective treatment condition.^{26,27} Each treatment group was supervised by one experimenter and one local research assistant for interpretation. The allocation of both was ex-ante randomized, so that all treatment conditions were played by all combinations of experimenters and assistants. For the public good game the 12 persons per treatment were later again split into three groups of 4 players.

The rules of the game were made very clear with the help of posters and giving examples for outcomes, but without valuing or recommending any particular behavior for the game (Figure 2)²⁸. Special attention was paid to making clear that the game was not a “zero sum” situation about dividing the money, but that cooperating actually increased the total benefits for the group as a whole. Tests for comprehension were carried out with the group and individually in private before the game started.²⁹ While individual control questions were asked, research assistants also asked about the player’s belief about their other group members’ average contribution. Correctly stated beliefs were incentivized with an additional 20N\$ reward in the final payments.³⁰ The assistants also gave additional help and instructions to those who did not understand all instructions right away. We did however make sure that everybody was as fit as possible for the decision making in the real game and did not require assistance once the game started. Hence, all game decisions could be made by the players individually and anonymously. For the decision making in the public good game, plastic coins were used as game currency. These were to be put into two differently colored envelopes, one of which represented the individual and the other one the group account. Players sequentially moved with both envelopes to a separate location to make their contribution decision in private. The envelopes that contained the players’ decisions were then put into a basket, so that contributions were kept anonymous and could afterwards only be attributed to the players’ ID numbers, guaranteeing some degree of anonymity in decision making not only towards the group members but also towards the researchers. Participants’ names were never asked and can therefore not be linked

²⁶ Protocols and instructions were translated by the local assistants from English into the respective local languages and then translated back into English by another assistant in order to ensure that all translated instructions were on point. Also, all wordings and phrases used in the instructions were discussed intensively with the local assistants in preparation of the experiment as to make all instructions clear and easily understandable.

²⁷ Experiment protocols and game instructions can be found in in the supplementary materials (B).

²⁸ Own illustration.

²⁹ If one or both of the control questions were answered wrongly, the player would still participate in the experiment and receive their payment but the respective observation would not be considered in the analysis. This led to slightly unequal sample sizes for the two treatments.

³⁰ Stated beliefs were considered correct if the actual average (not including the player’s own contribution) was in a range of ± 1 coin of the estimation. For example, if a player guessed 7 coins and the average contribution of the other three group members was 6.33 coins, the 20N\$ bonus was granted. Getting correct information about expectations is important in order to gain insights about reasons behind potential effects. The additional incentives mean to make participants put some effort into guessing the correct number and not just give a short, thoughtless statement.

to their ID-numbers in the game. A research assistant stayed with the remaining group members to make sure they did not talk or communicate in any way while waiting for their turn. After making their decisions, players proceeded to go to the snack area for a break and were then interviewed individually for the survey. Survey questions can be found in the supplementary materials (C.) and include, amongst others, questions about socioeconomics, the relationship with their group members and trust. Following Bogardus (1925), pre-existent social relationships were measured in three categories, as “family”, “friend” and “other”³¹. Trust in one’s group members was collected as an ordinal variable on a scale from 0 (“not at all”) to 3 (“trust completely”). Payments according to the participants’ and their group members’ decisions were done in the very end individually and in private. The whole workshop took about 4 hours in each village. Payoffs averaged at 97N\$ (= 7.32US\$) per participant, which is more than an average local wage for a day’s work. The theoretical range was between 25 and 145N\$ (≈ 2 and 11 US\$), including the bonus payment for correctly stated expectations.³²

4.2 The public good game

For the experiment, an unframed, single-round, standard public good game was chosen. Participants could earn real money according to their own and their group members’ decisions. There were always 4 players in a group playing the game together. Each player received a private endowment of 10 coins and had to decide about how much to keep and how much to contribute to a group account. The game was framed neutrally with coins, private and group accounts, so that associations towards any particular applications were avoided.³³ It was possible to contribute any number of coins between 0 and 10. After all players had made their decision, contributions to the group account got doubled and then distributed equally to all four players regardless of how much each player contributed individually. The socially optimal

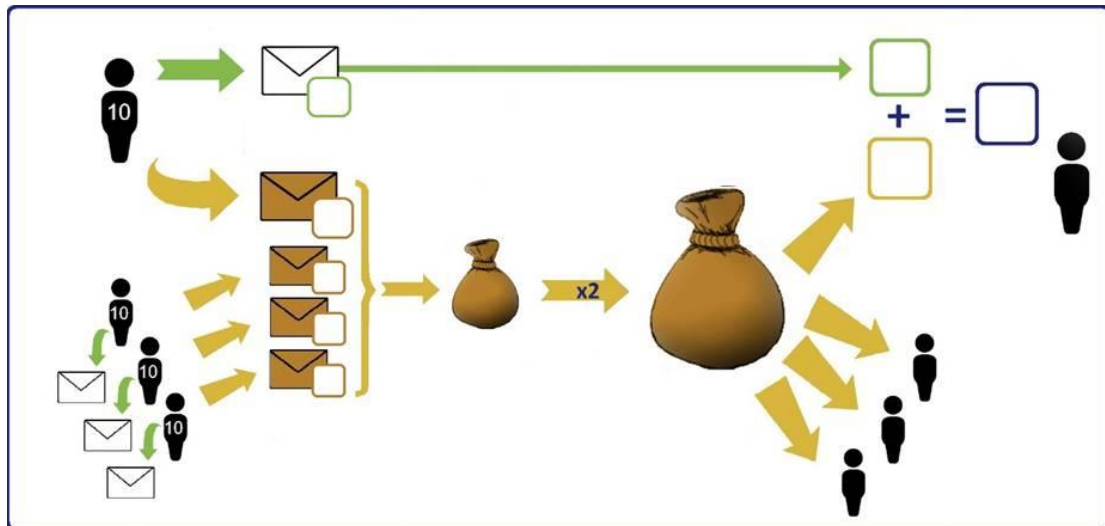
³¹ Originally, there were two more subcategories “acquaintances” and “stranger/unknown” but it turned out that there were so few strangers mentioned that I decided to group these two categories together into one. Fewer categories also reduce problems with multicollinearity of explanatory variables in the regression model.

³² Payoffs were set after pre-testing for calibration and allowing a reasonable final compensation for participating. A game currency was used in order to keep the number of coins used in the game low and with a range of possible contributions between 0 and 10 it can easily be compared to similar studies. On the downside, is required an additional step to calculate how much one unit of game currency was in real money. The conversion rate was one to five (1coin = 5 N\$ and 1 US\$ = 13N\$).

³³ It happened twice that some participants asked the experimenters about what the game is supposed to represent and started to discuss possible applications during the game instructions. These discussed applications included collecting money for building a new well or a school for the community, which, in my view, equals a framing. We made the decision to drop all observations from these two villages right there in the field and re-sampled two randomly selected villages as substitutes. If, on the other hand, similar discussions and suggested applications occurred in the group discussion in treatment 3, we could firstly not find out as conversations were private and secondly, it would be considered a legitimate element of such group discussions.

outcome was reached when everyone decided to contribute all of their endowment, i.e., 10 coins. Individually, however, one could always reach a higher pay off by not contributing at all (Nash equilibrium). Since the public good game was one-shot and anonymous, no reciprocity effects over rounds were possible and contributions supposedly measured the participants' pristine preferences (Rand and Nowak 2013).³⁴

Figure 2: Poster used to explain the public good game²⁸



The public good game payoffs can be formalized with the following equation for individuals U_i (equation 1) and for the group as a whole S (equation 2):

Equation 1:

$$U_i(e_i, c_i, c_j) = e_i - c_i + \frac{m}{n} c_i + \frac{m}{n} \sum_{j=1}^{n-1} c_j$$

Equation 2:

$$S(e_i, c_i) = \sum_{i=1}^n U_i(e_i, c_i) = n * U_i(e_i, c_i) = n * e_i - n * c_i + m \sum_{i=1}^n c_i$$

U_i = Utility of player i

e_i = endowment player i

c_i = contribution decision of player i , $\in \{0, \dots, 10\}$

c_j = contribution decision of player j , $\in \{0, \dots, 10\}$

m = multiplier of group account

n = number of players in the group

S = Sum of all players' utilities

³⁴ In a repeated game, on the other hand, it might be in one's own interest to cooperate in the beginning in order to keep cooperation rates up and benefit from sustained cooperation.

With an endowment (e) of 10 coins, a group size (n) of 4 player and the social multiplier (m) set to 2, the payoff equation becomes (equation 3):

Equation 3:

$$U_i(c_i, c_j) = 10 - c_i + \frac{2}{4}c_i + \frac{2}{4}\sum_{j=1}^3 c_j$$

$$U_i(c_i, c_j) = 10 - \frac{1}{2}c_i + \frac{1}{2}\sum_{j=1}^3 c_j$$

With c_i being the only variable that player i can manipulate, it becomes obvious that contributing nothing is the individually best option. For the group payoff (equation 4), there is:

Equation 4:

$$S(c_i) = 4 * U_i(c_i) = 40 - 4 * c_i + 2 \sum_{i=1}^4 c_i$$

$$S(c_i) = 40 - 4 * c_i + 2 * 4 * c_i$$

$$S(c_i) = 40 + 4c_i$$

This shows that, for the group, contributing as much as possible leads to the highest utility. Since c_i is capped at 10, this is the social optimum in the game. The minimum payoff in the experiment is 5 coins (25N\$) for someone, who contributes everything while in a group with three free-riders. The maximum payoff is 25 coins (125N\$) for a free-rider in a group with three cooperators.³⁵

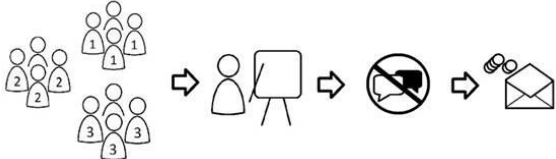
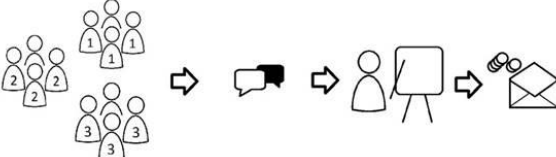
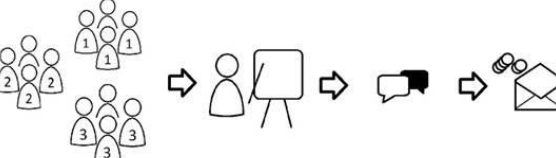
The following figure (3)³⁶ summarizes the three treatment conditions. In order to keep everything except the communication conditions comparable, participants in the no-communication group could identify their group members and were given a few moments of time before making their decisions to substitute for potential deliberations about the explained social dilemma situation. While the second treatment only allows unrelated discussions, the third treatment can be considered as what is usually understood by communication. Discussions were never listened to or even recorded, in fact, for the second and the third treatment condition experimenters and research assistants deliberately moved out of hearing distance from the groups so that they could talk freely.³⁷ Groups were spatially divided for discussions so that other groups could not be listened to and influence the content of discussions or the outcome.

³⁵ Plus, the bonus for correctly estimating the other players' contribution, the maximum amount that can be earned is $125 + 20 = 145N\$$.

³⁶ Illustrations used within Figure 3 are my own.

³⁷ As a measure of compliance to the intended treatment conditions, we ex post asked participants in the survey about the content of their discussions. While this elicitation method might not be specifically precise, it still turned out that 87% in the second treatment complied with their task of discussing agriculture and 55% of participants in

Figure 3: Graphical illustration of treatment conditions³⁶

Treatment and Description
<p>Treatment 1: No Communication</p> <p>In the baseline treatment participants play the public good game with revealed identities of their group members. The participants are allocated in groups of four according to the numbers on their ID-cards. They are, however, not allowed to communicate with each other. Before decision making starts, an explicit statement is made by a research assistant that the groups are playing the game together as allocated.</p> 
<p>Treatment 2: Non-coordinative (unrelated) Communication</p> <p>In the non-coordinative communication treatment participants are asked to discuss a given but unrelated topic for five minutes in groups before learning about the public good game. They are allocated in groups of four according to the numbers on their ID cards and given the task to discuss how different rainfall and changes in climate affects agricultural outputs and how adaptation measures could be taken.³⁸ No communication is allowed after learning about the game rules.</p> 
<p>Treatment 3: Coordinative Communication</p> <p>In the coordination treatment participants learn about the rules of the public good game first and are then allowed to talk to their group members for five minutes before making their decisions. Hence, players have the opportunity to discuss the social dilemma and coordinate their actions.³⁹ Decisions are still made in private.</p> 

the third treatment answered that they coordinated decisions with their group members, even though in this treatment no particular discussion topic was suggested externally. For privacy reasons, we did not ask more detailed questions about the content of discussion, such as whether agreements or promises were made.

³⁸This topic was chosen because it is not a controversial one but something that is related the participant's everyday life. Each participant should be able to understand the subject and be able to contribute something to the group discussion if they like to. At the same time, it is sufficiently relevant as to not make participants wonder about the topic's purpose or get excessively bored discussing it. In pre-testing of the experiment, participants were initially allowed in this treatment to talk about anything they like, but it happened several times that participants felt insecure as they did not know what to talk about with their group members so no real discussion took place. It was therefore decided to externally specify the topic as a basis for discussion.

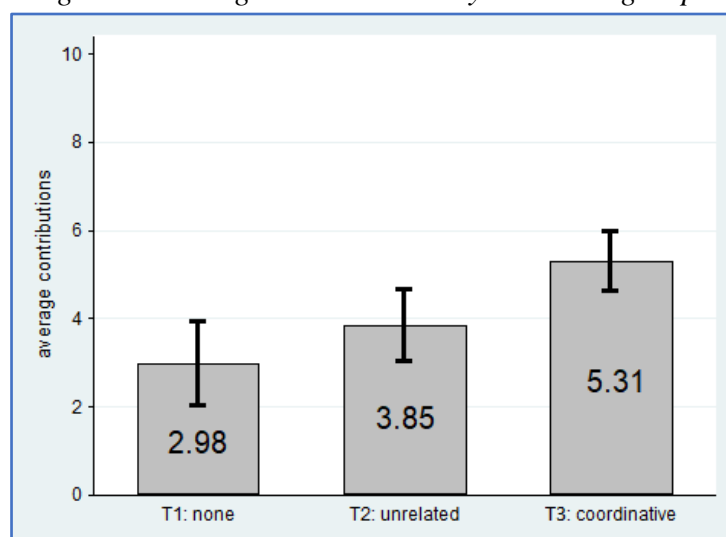
³⁹ Participants in this treatment were not specifically encouraged to discuss the dilemma or to coordinate, but were just told that they were allowed to talk to each other about anything.

4.3 Course of analysis

The main results about contributions to the public good game are firstly presented graphically (figure 4)⁴⁰. Next, average contributions are tested for significant differences by Mann-Whitney U-tests (table 2) and finally, regression analyses for each single treatment and for the whole sample are applied (table 3). In the regression analyses I also investigate effects of pre-existent social ties and how they interact with each communication treatment. After showcasing the contributions to the public good games, I also look into trust and beliefs about other group members' contributions in order to obtain further insights about the reasons for the communication effect (figure 5)⁴¹. While beliefs were stated as incentivized estimates of the others' average contributions, trust was added as a survey question on how much a participant trusts their group members. In a next step, I analyze comprehension by checking whether communication affects the share of participants who correctly understood the game mechanics, i.e., answered both control questions correctly (table 2). In this context it is also investigated if and how comprehension affects contributions to the public good. All regression tables show ordinary-least-squares estimations with standard errors clustered on group-level⁴² and include a set of control variables as presented in table 1. Tests for multicollinearity, heteroscedasticity and normal distribution of residuals as well the distribution of the dependent variable can be found in the supplementary materials (A.3).

5. Results

Figure 4: Average contributions by treatment group⁴⁰



⁴⁰ Own illustration based on collected data, created with Stata 15 statistical software.

⁴¹ Own illustration based on collected data, created with Stata 15 statistical software.

⁴² Group-level of four players playing the public good game (and not treatment sampling group-level).

Table 2: Comparisons between treatments and tests

Treatment No:	T1	T2	T3	T1-T2	T1-T3	T2-T3
Communication:	none mean (sd)	unrelated mean (sd)	coordinative mean (sd)	difference (p)	difference (p)	difference (p)
Contribution	2.98 (3.52)	3.85 (2.60)	5.31 (2.91)	0.87** (0.042)	2.32*** (0.000)	1.45*** (0.004)
Expectation	5.90 (2.71)	5.60 (2.87)	6.18 (2.62)	-0.30 (0.573)	0.28 (0.672)	0.58 (0.317)
Trust in group	2.46 (0.84)	2.36 (0.88)	2.56 (0.80)	-0.10 (0.563)	0.11 (0.441)	0.21 (0.185)
Mean of within- Group std. dev.	2.451 (1.496)	2.588 (1.435)	1.543 (1.206)	0.14 (0.782) ^A	-0.90* (0.053) ^A	-1.04** (0.024) ^A
Observations (Share of 72)	52 (0.72)	55 (0.76)	65 (0.90)	3 (0.567)	13*** (0.006)	10** (0.025)
Contribution if misunderstood	4.15 (3.99)	5.06 (4.19)	6.86 (3.58)	1.17 ^B (0.323)	1.20 ^B (0.356)	1.55 ^B (0.165)
Share correctly Stated expectations	29%	36%	55%	8% (0.404)	27%*** (0.004)	19%** (0.037)

- A: T-test for mean of within-group std.dev. (on group level, therefore 18 observations per treatment)
- B: based on the answers given to both control questions; comparisons not across but within each treatment group
- P-values in parentheses for test results according to Mann-Whitney U-tests
- Chi-squared test for control question comparison and correctness of estimated expectations
- Standard deviations in parentheses for mean values
- Significance levels: * p<0.10, ** p<0.05, *** p<0.01
Source: own calculations based on collected data

5.1 Contributions to the public good

Comparing average contributions across the three treatments reveals a clear levelled effect of communication: non-coordinative communication as in treatment 2 raises cooperation significantly, but not as much as coordinative communication as in treatment 3 (table 2 and figure 4). Both increases are significantly different from the baseline group as well as from each other according to Mann-Whitney U-tests tests (table 2). This result is also confirmed by the regression analysis (table 3): The last column (T123) combines observations from all treatments and shows positive, significant coefficients for unrelated and coordinative communication, which predict an even larger effect in the multivariate model than the simple differences in the average contributions presented in table 2.

*Result 1: Non-coordinative communication has a significant, positive effect on cooperation and amounts up to roughly half of the total effect of coordinative communication.*⁴³

⁴³ According to the regression coefficients, the effect of non-coordinative communication amounts up to 51.28% of the total communication effect with coordinative discussions, whereas in a direct comparison of average increases we are looking at 27.18%.

Table 3: Regression models for contribution to public good

dependent variable:	T1	T2	T3	T123
Contribution	no comm.	unrelated	coordinative	combined
Expectation	0.047 (0.80)	0.301*** (0.01)	0.706*** (0.00)	0.385*** (0.00)
Family	1.107*** (0.00)	-0.228 (0.52)	-0.318 (0.39)	0.044 (0.84)
Friends	0.908** (0.04)	0.143 (0.71)	-0.642 (0.10)	-0.015 (0.95)
Age	0.036 (0.38)	0.020 (0.66)	-0.037 (0.10)	-0.001 (0.95)
Female	-0.203 (0.84)	0.088 (0.92)	-1.342** (0.04)	-0.723 (0.19)
Schooling_years	-0.202 (0.29)	-0.073 (0.52)	-0.020 (0.86)	-0.131* (0.07)
Head_of_hh	-0.852 (0.48)	0.796 (0.38)	0.118 (0.87)	-0.037 (0.94)
Migrant_10	1.789 (0.18)	0.438 (0.69)	0.072 (0.91)	1.002 (0.10)
Social_ladder	-0.096 (0.63)	-0.055 (0.68)	0.032 (0.79)	0.035 (0.72)
Cattle_owned	0.012 (0.81)	0.011 (0.62)	-0.001 (0.97)	0.001 (0.91)
T_Unrelated				1.313** (0.04)
T_Coordination				2.467*** (0.00)
_cons	0.684 (0.79)	1.952 (0.44)	3.905* (0.06)	1.618 (0.22)
N	52	55	65	172
F	3.90	4.98	7.66	4.94
p>F	0.007	0.002	0.000	0.000
R2	0.256	0.235	0.539	0.264

p-values in parentheses

Significance levels: * p<0.10, ** p<0.05, *** p<0.01

Source: own calculations based on collected data

5.2 Group composition and social ties

The group composition measuring pre-existent social ties only shows a significant impact in the baseline treatment (T1). Both the share of family members and the share of friends in the group lead to higher contributions to the public good. Interestingly though, they do not seem to affect decisions to cooperate anymore in either communication treatment (T2 and T3).

Result 2: Previously existent social ties have a positive effect on cooperation outcomes but only in the condition without communication.

5.3 Expectations of others' contributions and trust in group members

In order to find out more about the reasons for the increases in cooperation after communication, I now look at the beliefs about the other group members' contributions. As visible in figure 5, there is very little variation in average belief across all treatments. Mann-Whitney U-tests of all treatments against each other, confirm that the differences are not significant (table 2).

Figure 5: Average Expectations and Trust⁴¹

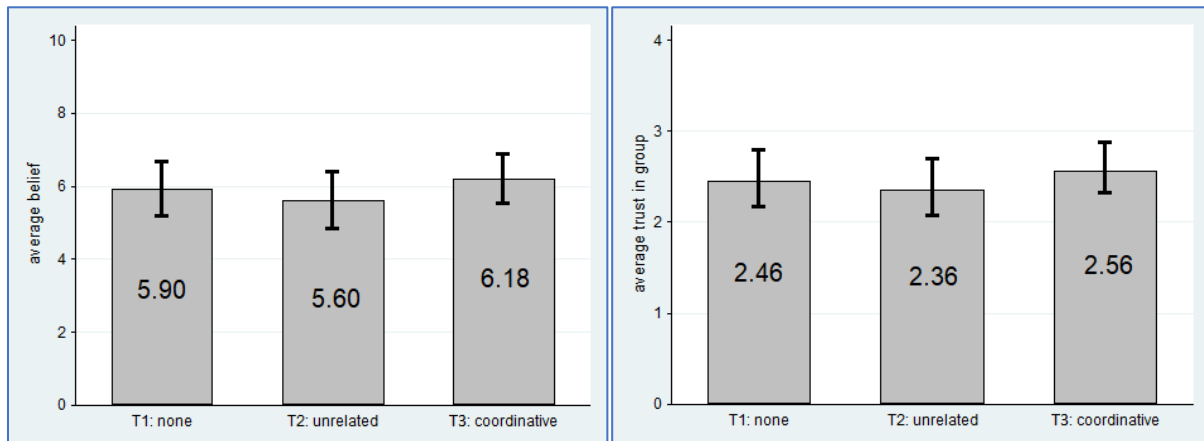


Table 4: Regression models for expectations about others' contributions

dependent variable:	T1	T2	T3	T123
Expectation	no comm.	unrelated	coordinative	combined
Family	0.212 (0.37)	-0.624 (0.16)	-0.189 (0.64)	-0.157 (0.48)
Friends	0.092 (0.87)	-0.261 (0.58)	0.127 (0.76)	0.070 (0.81)
Age	-0.014 (0.67)	0.033 (0.42)	0.001 (0.95)	0.005 (0.78)
Female	-0.568 (0.45)	1.663** (0.02)	-1.638* (0.07)	0.127 (0.82)
Schooling_years	-0.054 (0.73)	0.085 (0.44)	-0.144 (0.19)	-0.036 (0.64)
Head_of_hh	0.778 (0.47)	-0.249 (0.75)	-1.467* (0.08)	-0.031 (0.95)
Migrant10	-1.885** (0.04)	1.924** (0.05)	0.530 (0.58)	0.420 (0.49)
Social_ladder	-0.024 (0.83)	-0.209 (0.24)	0.096 (0.55)	-0.136 (0.21)
Cattle_owned	-0.028 (0.54)	0.002 (0.89)	0.014 (0.35)	0.006 (0.58)
T_Smalltalk				-0.119 (0.88)
T_Coordination				0.244 (0.74)
_cons	6.904*** (0.00)	4.244* (0.07)	8.364*** (0.00)	6.263*** (0.00)
N	52.000	55.000	65.000	172.000
F	1.54	5.79	1.42	0.72
P > F	0.212	0.002	0.255	0.716
R2	0.138	0.287	0.146	0.035

p-values in parentheses

Significance levels: * p<0.10, ** p<0.05, *** p<0.01

Source: own calculations based on collected data

Results from regressions on expectations as the dependent variable are in line with results from the tests (table 4). The regression models further reveal that social ties do not affect expectations in any treatment condition. The variability for expectations, measured as standard deviation, is not different across treatments, either (table 2). It stands out, however, that average beliefs about the other players' contributions are higher than the actual average contributions, especially in treatment 1 and treatment 2, which means that, on average, players deliberately contributed less than what they expected their group members to contribute (table 2).⁴⁴

I also measured the correctness of stated beliefs: In treatment 3 more than half of the participants (55%) correctly guessed the average contribution of their group members compared to 29% and 36% for treatment 1 and 2, respectively. Within-group variation of contributions and expectation was also much smaller (table 2) in the coordinative communication condition, i.e., behavior was more homogenous in groups, which is likely a result of discussions and agreements on a certain amount to contribute.

Individual expectations were also added as an explanatory variable in the main regression table (table 3). This is possible as it has just been shown that there is no correlation between expectations and treatments conditions. It turns out that, on individual level, expectations do have a positive and significant correlation with contributions in both communication treatments (T2 and T3) and the combined regression model (T123), but not in the no-communication condition (T1) (table 3). This finding corroborates the concept of conditional cooperation and, in turn, demonstrates that measurement of expectations was not defective in my study.

Similarly, trust in one's group members as elicited in the survey questions is compared, but is not found to be affected by the treatment condition, either (figure 5 and table 2). With "3" being the highest possible value, perceived levels of trust were predominantly reported as rather high by the majority of participants.

Result 3: Expectations and trust are not affected by either type of communication treatment, but on individual level higher expectations correlate with higher contributions

⁴⁴ This is, generally, not an uncommon finding. People are conditionally cooperative but usually try to stay below the groups' average contribution in order to benefit a bit more rather than take the risk of contributing more than average and thereby receiving a smaller payoff than the others (Fischbacher and Gächter 2010).

5.4 Comprehension

Significantly more participants answered both control questions correctly after coordinative discussions in treatment 3 (90%) compared to treatment 1 (72%) and treatment 2 (76%), which shows that talking with one's group members about the social dilemma and game mechanics increases comprehension (table 2). However, comparing contributions between those, who have answered both control questions correctly, and those, who have not, clearly shows that contributions from the latter were higher in all treatments.⁴⁵ While taking into account that answering two control questions might not exactly reflect the level of comprehension for all participants, it should be safe to conclude that increased comprehension can be ruled out as the reason for higher contributions after coordinative communication.⁴⁶

Result 4: Coordinative communication increases comprehension, but increased comprehension does not raise cooperation (on the contrary, better comprehension is rather associated with lower cooperation).

6. Discussion

First of all, it could be shown that, contrary to a number of previous empirical findings, cooperation is raised through unrelated communication even without the possibility to coordinate (cf. Bouas and Komorita 1996; Bichieri and Lev-On 2007). As unrelated talk does not allow explanations, appeals or making commitments, increases in cooperation rates must be the result of changes in group members' relationship to each other, i.e., working over the non-coordinative channel. Following the theories presented in my framework, this particularly stresses the relevance of social distance and group identity as motivational factors which are affected by communication.

Coordinative communication, however, resulted in even higher rates of cooperation than talking about an unrelated topic. Concerning potential reasons for this finding, I can firstly rule out better comprehension: While coordinative communication indeed helped increasing

⁴⁵ But not significantly different from them, which is – despite high absolute differences – a consequence of the low number of participants who gave wrong answers.

⁴⁶ Presented average contributions are based on the cleaned data and do therefore not include observation from participants who misunderstood the game and the communication effect. They can hence not be influenced by those who answered the control questions wrongly, either way. It can be deducted however, that comprehension is not a binary measurement, but that even amongst those who answered the control questions correctly, degrees of comprehension vary and the direction of a potential effect on cooperation is equivalent.

comprehension of the dilemma, better comprehension could not be associated with higher contributions. Interestingly, neither trust in one's group members nor expectations of their contributions were affected by the different communication conditions, leading to the conclusion that neither the coordinative nor the non-coordinative communication raises cooperation primarily via trust and expectations (cf. Bornstein and Rapoport 1988).⁴⁷ If communication worked through affecting the next potential motivational factor in my model, social norms, it should, by all means, also be reflected in altered average expectations. In other words, one would not follow a social norm to cooperate without believing others do so as well. The same applies to not lying as a social norm, i.e., not breaking promises of commitment made in the discussion, as believing in one's group members' promises to cooperate would then also show in elevated expectations. This was, however, not found to be the case. This leaves us with three remaining, viable options for relevant motivational factors in the communication effect: Personal norms, group identity and social distance, whereof the latter two remain, as explained in my theory framework, somewhat empirically indistinguishable.

Concerning social distance, results have shown a significant effect in the baseline condition, where no communication is allowed: Both, the number of family members and the number of friends in one's group increased contributions to the public good, which means that there is some general, positive effect of social closeness on cooperation decisions and is in line with existing literature (Essock-Vitale and McGuire 1985; Yamagishi and Sato 1986; Thompson et al. 1998; Kollock 1998; Monsutti 2004; Peters et al. 2004; Bowles and Gintis 2004; Goette et al. 2006; Ruffle and Sosis 2006; Haan et al. 2006; Castro 2008; Boone et al. 2008; Apicella et al. 2012; Chuah et al. 2014). However, once participants are allowed to talk to each other, social ties do apparently not play a relevant role anymore. It seems as if effects of previously existent social ties are overridden by spontaneous alterations in intragroup relationships induced by communication. In other words, the effect of a short, and even unrelated, discussion on the relationship between participants is more important than previous, long-term social ties.

It was not found that a higher number of family members and friends in the group raises trust or expectations in any treatment condition. This means that rather than following a social norm or a feeling of having to meet certain expectations, contributing more in the presence of socially close group members is actually an independent, personal preference. Such can be explained by in-group favoritism, and also finds support in evolutionary theories on kin selection (Tajfel et al. 1971; Tajfel et al. 1979, Caporeal et al. 1989, Peters et al. 2004; Candelo et al. 2018)

⁴⁷ Bornstein and Rapoport (1988) found communication to increase expectations in a public good experiment.

So far, I have established that group members' relationship to each other affects the decisions to cooperate, both through long-term previously existent social ties and spontaneous changes induced by unrelated discussions. Coordinative discussions, as in treatment 3, do, however, result in even more cooperation than unrelated ones. Can this difference also be explained by further changes in group members' relationship to each other?

It could be hypothesized that finding agreement on an important, relevant topic, such as the mutual consent to cooperate, could evoke an even stronger group identity and reduce social distance further than just talking about unrelated issues (Dawes et al. 1988; Orbell et al. 1988; Kerr and Kaufman-Gilliland 1994; cf. Bouas and Komorita 1996; Bicchieri 2002; Spears 2011).⁴⁸,⁴⁹ However, Bouas and Komorita (1996) experimentally tested if unrelated communication creates group identity and could not find any empirical support for this theory.

While this option cannot be entirely ruled out on the basis of my empirical observations, I present, in the following, a better explanation for the additional increase in cooperation after coordinative discussion. This explanation is based on personal norms, which are the last remaining factor according to my framework and will turn out as perfectly in line with results from previous studies. The relevant personal norm in this situation is the one to fulfill one's own appeals and promises to contribute made during discussion, despite not necessarily believing in one's group members' pledges. In other words, individuals feel bound to stick to their commitments not because these were made as social contracts, but due to their own standards and norms of appropriate conduct. This explanation is in accordance with existing literature on the communication effect which found the adherence to commitments rather than the creation of a general norm to cooperate as the central reason for increased cooperation after communication (Orbell et al. 1988; Ostrom et al. 1992; Kerr and Kaufman-Gilliland 1994; Bicchieri 2002). My interpretation is further corroborated by results from Vanberg (2008), who analyzed the motives for promise keeping in general and distinguishes the preference for keeping promises per se from the motivation to not disappoint those who one has made such promises to. Based on results from a dictator game experiment Vanberg found that promises are kept due to the personal feeling of being obliged to do so, and not in order to avoid letting others down. Now, what does this result imply for theories explaining decision making in social

⁴⁸ According to this theory, unrelated discussions about agriculture and climate would have led to consent on this topic, thereby increasing group identity. This effect would be even stronger in the coordinative discussions, resulting in mutual agreement that contributing is the preferable option (even independent from commitments made and actual decisions). Possibly, a discussion about something controversial like politics or religion could have led to disputes and consequently a decrease in cooperation. This is an interesting aspect for further research.

⁴⁹ Spears (2011) point out that group identity can become salient depending on the content of the conversation in group discussion.

dilemma situations? While my data generally confirm the concept of conditional cooperation, I have found evidence that decisions are individual, independent preferences and not based on the perception of being bound to fulfil social norms or to meet others' expectations.

Two reasons were brought forwards to support this proposition: Firstly, there was no effect of either communication condition on trust and beliefs, but nonetheless communication led to higher cooperation rates. Secondly, and similarly, there was a preference to cooperate more with socially close group members, but no association with raised trust or expectations, either.⁵⁰

As an alternative interpretation, which would have similar effects and consequences, it could be suggested that is it not the deliberate adherence to a personal norm of keeping promises but an intuitive, and possibly irrational, stickiness to commitments made during discussions (Orbell et al. 1988; Kahnemann 2011). What speaks against this hypothesis is that previous experimental studies have found no effect of signaling one's intentions without the possibility to freely discuss the dilemma (Dawes 1977; Chen and Komorita 1994; Wilson and Sell 1997; Bochet et al. 2006). If there is no effect of (non-binding) pledges without communication, it can be deduced that they only work if participants have attained a certain level of relationship that make the norm of promise keeping salient in the respective context.⁵¹ In other words, personal norms of keeping promises are potentially not important towards socially distant partners (Hoffman et al. 1996; Hardin 2003; Simson 2007; Barbalet 2009).

7. Conclusion

Results show that discussions are effective through both altering the relationship between participants and coordination about the dilemma. Indeed, communicating about an unrelated topic already led to an increase in cooperation that amounts up to nearly half of the effect of coordinative communication. After ruling out alternative explanations, it could be concluded that the effect of coordination primarily originates from making commitments, which is supported by previous empirical studies on the topic. Surprisingly though, evidence at hand reveals that these commitments are effective not through raising expectations about each other's

⁵⁰ As implicated before, errors in measurements seem highly unlikely as both, variables for trust and expectations, were collected independently and expectations explicitly incentivized in order to make statements more salient. Also, expectations were found to confirm concept of conditional cooperation, thus supporting their validity.

⁵¹ While I did not test a condition that allows signaling one's intentions without any free communication (which would have constituted the counterpart to the unrelated communication) I can draw from the plentiful evidence that previous literature provides (see sources above). A suggestion for future research could be such a condition with participants that (partly) know each other and analyzing whether non-binding pledges are more effective with socially close group members. According to the theories derived from my results, this should be the case.

behavior, but through the personal norm of complying with one's own commitments made during discussions.

The shift of focus from adherence to the (possibly not effective) social norms of cooperating to the personal norm to keep promises might be an interesting tool for achieving higher cooperation outcomes. It can be assumed that personal norms work in certain situations independently from social norms and expectations about others' compliance.

However, considering previous studies that did find non-binding pledges alone as insufficient to increase cooperation, it can be derived that commitments do not work in every situation, but require a certain level of interpersonal relationship amongst group members as accomplished, for example, by face-to-face conversations, in order to activate personal norms of promise keeping. Strengthening group members' relationship to each other is, therefore, another relevant element that is conducive to cooperation in groups. This could be unambiguously proven by my results, which show higher cooperation with socially close group members as well as significant increases achieved by unrelated discussions.

To conclude, my study has contributed to the disputed debate about whether communication in social dilemma situations increases cooperation through commitments or strengthening of interpersonal relationships and finds both elements to be relevant. Taking into account, however, that average expectations about one's group members' contribution were above one's own contributions in all treatments, and especially so without communication, it should perhaps be worded differently: Individuals behave less selfishly after communication.



References Chapter IV

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Supplementary Materials Chapter IV

A. Appendix

A.1 Map of selected villages

A.2 Table for split sample of treatment groups

A.3 Post-regression testing

B. Experimental Protocols

B.1 Village meeting

B.2 General instructions

B.3 Game instructions public good game

B.4. Examples

B.5 Control questions for public use

B.6. Treatment conditions

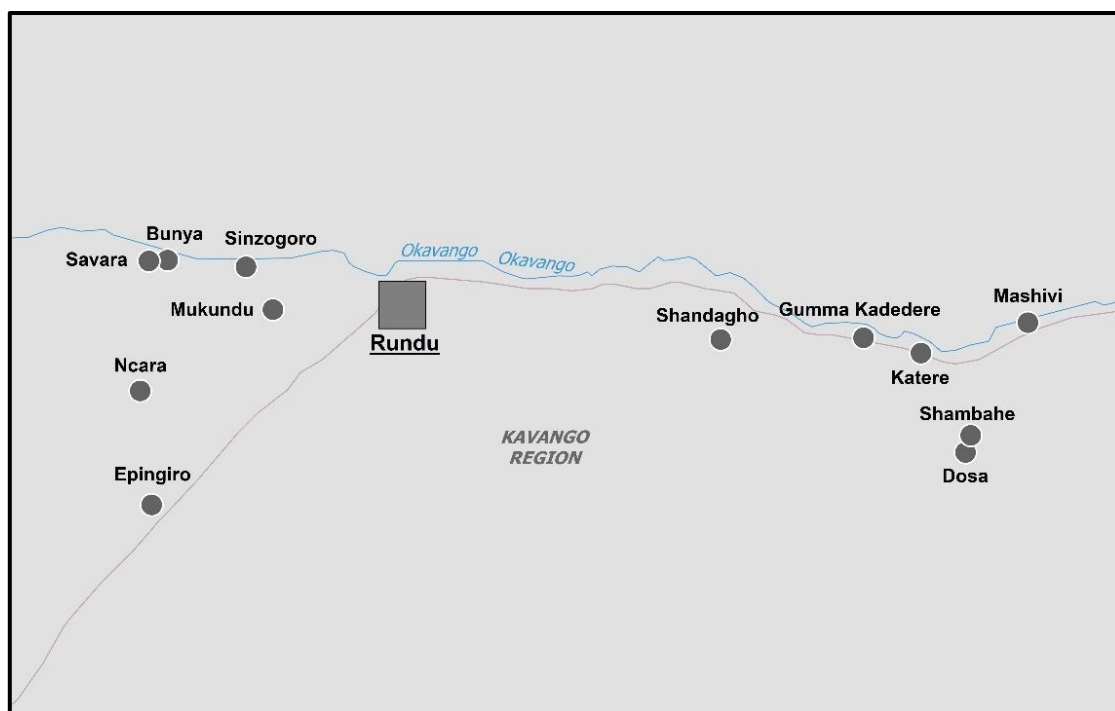
B.7 Decision making

C. Survey Questions

D. Information for data and analysis script request

Supplement A: Appendix

A.1 Map of selected villages



A.2 Table for split sample of treatment groups

Treatment Number:	(T1) no comm. mean	(T2) unrelated mean	(T3) coordinative mean	Test for equality p-value
Family	1.42	1.42	0.82	0.0123**
Friends	0.77	0.58	0.71	0.8719
Age	38.73	32.71	36.58	0.1877
Female	0.42	0.67	0.68	0.008***
Schooling_years	6.69	7.73	7.03	0.1043
Head_of_hh	0.54	0.36	0.35	0.088*
Migrant10	0.21	0.15	0.18	0.669
Social_ladder	2.17	3.24	2.72	0.1128
Cattle_owned	6.60	11.45	9.28	0.4186
Observations	52	55	65	

P value for Kruskal-Wallis test or Chi2-test in case variable value is binary

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: own calculation based on collected data

A.3 Post-regression testing

Contribution	Distribution of dependent variable	Distribution of residuals	Qnorm plot for residuals
T1: no communication			
T2: unrelated			
T3: coordinative			
T123: combined			

Contribution	T1: no communication	T2: unrelated	T3: coordinative	T123: combined																																																																																																																																																						
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Supplement B: Experimental Protocols

B.1 Village meeting

[VILLAGE MEETING]

[freely presented by Christian, interpreted by Moses (assistant)]

To begin with, we would like to thank you all for coming here today. My name is Christian Hoenow. I am from the Marburg University in Germany. Together with the Ministry of Agriculture, Water and Forestry we are conducting research under the SASSCAL project. [NAME OF EXPERIMENTERS] are also part of the project.

Doing research means we are just here to collect data, but we do not bring any type of development project into the village. What you answer in the workshop will not have any impact on future projects.

Today we would like to conduct two small workshops with a certain number of people. During this workshop we will also ask you several questions. Unfortunately, not everyone from this village can participate since each workshop can only include a certain number of participants.

Since we want everyone to have the same chance to participate, we have prepared a bag with as many cards as people present. Each adult that is older than 18 years now will draw a card. We will ask you to fully concentrate on the workshop and we will be asking many questions. If you already know that you cannot attend for up to 5 hours, or do not wish to answer many questions, you should please not draw. Participation is, of course, voluntary!

- If you draw a red card, you will participate in the first workshop, which is conducted by Christian
- If you draw a blue card, you will participate in the second workshop, which is conducted by Adrian
- If you draw a white card, you unfortunately cannot participate in any of the events.

Do you have any questions?

[let every adult draw a card]

Now that everyone has drawn a card, we would like to ask all participants with a white card to leave the area. Thank you very much for attending the meeting.

Those who have drawn a blue card, please follow Adrian. He will right away start with the meeting.

[wait for everyone to leave except Christian's participants]

[continue with general instructions in each group]

B.2 General instructions

[GENERAL INSTRUCTIONS]

To begin with, we would like to thank you all for coming here today.

We will conduct a workshop and at the end you will receive some payment for participating.

The money is not our private money, but it is provided by the German government.

All information collected today will be used for research only. Neither the government of Namibia, Germany nor any other organization will receive the data for other purposes. Also, neither your names nor any village-specific information will be linked to the results. All answers will remain anonymous to others.

The schedule for today looks as follows:

1. We will explain the procedure of the workshop.
2. We will conduct a small workshop.
3. After the games each of you answers a short questionnaire.
4. Finally, you will receive the money.

Before starting, I would like to give you some general information:

1. If at any time, you think that this is something that you do not wish to participate in for any reason, you are free to leave. You will however only receive a payment if you stay until the end of the workshop.
2. If you already know that you will not be able to stay for at least 5 hours, then you should leave right away.
3. We require your complete and undistracted attention. Please, follow the instructions carefully and do not use your phone or engage in any other distracting activity.
4. It is not allowed to talk to each other during the workshop, unless we tell you to. You can ask questions after raising your hand. If you talk to each other when you are not allowed to, you will be excluded from the workshop and the payments.
5. Everyone of you has received a unique ID card. Please keep this ID until the end. You must return the ID before receiving the money at the end of the workshop.

After knowing these rules, is there anybody who does not want to participate?

Do you have any questions?

[continue with treatment conditions]

B.3 Game instructions public good game

[COMMUNICATION GAME INSTRUCTIONS]

We will now explain the procedure of the workshop. Please pay attention as for participating it is necessary that you understand everything. Also, we will later ask you questions individually to check whether you understood everything correctly. Each one of you will now receive an envelope that contains 10 Experimental Coins (EC). Each EC is worth 5 N\$. **[show coins]**. You will have to decide whether to contribute that money to a group account or not. What you put in the brown envelope is what you want to contribute to the group account, whereas what you wish to keep must be put in the white envelope **[show envelopes]**.

You can contribute any amount between 0 and 10 EC. The coins that you do not contribute are yours and you can keep them for sure. After the game we will change them for you: 5N\$ for every EC. [See graph with exchange rate] In total you can get between 25 and 125N\$, depending on your decisions and the decision of the others players in your group. You are playing the game with three other players, i.e., in groups of four.

- The number of ECs that were contributed to the group account are doubled. This doubled amount is then equally divided by all four players in the group.
- That means every player receives one fourth of the doubled group account.
- In total you will earn the ECs that you keep plus the share that you receive from the group account
- Note that the game is not about luck and not about being better than others. Everyone will receive exactly the amount as determined by the rules explained.

B.4 Examples

Example 1

[use poster and fill with example numbers]

4 players contribute half of their endowment to the group account.

- There are then $5 \times 4 = 20\text{EC}$ in the group account.
- The 20EC in the group account are then doubled ($20\text{EC} \times 2 = 40\text{ EC}$) and divided equally to all 4 players.
- This means each player in the group receives $40\text{EC} / 4 = 10\text{ EC}$ from the group account.

Each player then ends up with the amount that he/she kept, which is 5EC and the amount that he/she received from the group account, which is 10EC. In total it results in 15EC for all players.

Example 2

[use poster and fill with example numbers]

3 players contribute all of their ECs to the group account and 1 player does not contribute anything.

- There are then 30EC in the group account.
- The 30EC in the group account are then doubled ($30\text{EC} \times 2 = 60\text{ EC}$) and divided equally to all 4 players.
- This means each player in the group receives $60\text{EC} / 4 = 15\text{ EC}$ from the group account.

The one player that did not contribute receives 15EC from the group account plus 10EC that he/she kept for himself/herself, which is 25 EC in total.

The three players that contributed everything receive 15 EC each from the group account.

Example 3

[use poster and fill with example numbers]

Imagine now that the one player also contributes. So, everyone contributes everything.

- Then the total contributions are $4 \times 10 = 40$. Multiplied by 2 = 80. 80 divided equally amongst all four players is 20EC for everyone.
- Then the three players get 20 instead of 15, and the one player who now also contributed also receives 20, instead of the 25 he/she would receive if NOT contributing.

B.5 Control questions for public use

We would now like to ask you a few questions to check if everybody understood:

[try to involve all participants]

1. If no one contributes anything, that means everyone keeps his/her initial ECs. Then how much does every player end up with?
[10]
 2. If everyone contributes all of his/her initial ECs, then how much does every player get? **[20]**
 3. Are the payoffs for everyone higher, lower or the same if all 4 players contribute 8EC, compared to when all players contribute 5EC?
[higher]
 4. If you do not contribute anything are your own payoffs higher, lower or the same compared to when you contribute?
[always higher]
 5. What is your payoff if you contribute all of your 10EC but no one else contributes anything?
[then only 10EC in the group account, $10 \times 2 = 20$, divided by four = 5ECs for everyone. Since you did not keep any of your initial EC, your final payoff is 5EC.]
 6. How much does everyone else receive in this case?
[keep 10 for themselves + get 5 from your contribution = 15]
 7. If you end up with 10 coins, how many N\$ will you get for that later?
[5 x 10 = 50 N\$]
- Very good. Is there anything unclear about the rules or how the payoffs are calculated?
 - Should we have another example?

B.6 Treatment conditions

[TREATMENT 1: ANONYMOUS GROUPS]

[read Game Instructions]

In the following game you will be playing in groups of 4 players. As you see, we are 12 players here. Therefore, we will have 3 groups playing the game simultaneously. But you do not know who your three team members are. It will not be revealed after the game is over either. The other groups are playing the same game, but what they do does not influence your group or your payoffs. They do just play the same game simultaneously. The group allocation is entirely random according to your ID numbers.

Remember that you are not allowed to talk to each other

[TREATMENT 2: GROUP IDENTITY REVEALED]

[read Game Instructions]

In the following game, we will divide you into groups of four. That means each of you is playing the game with three other players. The other groups are playing the same game, but what they do does not influence your group or your payoffs. They do just play the same game simultaneously.

[allocate groups]

[groups should sit together, but keep distance to avoid communication between groups]

This is the group you will be playing with. Remember that you are not allowed to talk to each other.

[then wait for 2 minutes in silence before starting the game]

[TREATMENT 3: UNRELATED TALK]

[allocate groups]

[groups should sit together, but keep distance to avoid communication across groups]

We ask you to now please talk to each other for 5 minutes with your group members about how the different weather in this and in the last years affected the harvest. Also, think about which types of crops are doing good and which are doing bad in the different weather conditions.

[move away, wait 5 minutes, return to groups]

Please stop talking now as we are going to explain the rules of the game to you.

We will now explain what we are going to do in the workshop, you will be doing the workshop in groups of four, i.e., with the same 3 people that you just talked with.

The other groups are playing the same game, but what they do does not influence your group or your payoffs. They do just play the same game simultaneously.

[continue with game instructions]

[after reading out game rules and examples note this:]

your group is the group as allocated in the beginning during the discussions!

[TREATMENT 4: COORDINATION]

We will now explain to you the rules of the game.

In the following game we will divide you into groups of four. That means each of you is playing the game with three other players. The other groups are playing the same game, but what they do does not influence your group or your payoffs. They do just play the same game simultaneously.

[read Game Instructions]

[allocate groups]

[groups should sit together, but keep distance to avoid communication across groups]

You are now allowed to talk to your group members for 5 minutes. After the 5 minutes you will make your decisions in private. You may talk about anything you like.

[move away, wait 5 minutes, return to groups]

Please stop talking now as we are going to start with the decisions.

[DECISION MAKING]

Your contribution will not be disclosed to the other participants. You will find out about the total contributions in your group at the end when we pay you, but no one will find out about how much other single players contributed. That means your own contribution is also anonymous to the other players. We will not disclose your decisions and you are under no obligation to tell anyone about how much you contributed.

In order to ensure anonymity in decision making, you will one-by-one come to the booth and make the decision there, in private. Please do not show other players how much you contributed, also not after you have made your contribution decision.

[show both envelopes and how to do it]

- Are there any questions about the procedure?

Before we start with the decisions, we would like to ask you two control questions, in order to check whether you have really understood the game. The answers you give here will not affect the money you earn, it is just for us as additional feedback information. [Assistant (me)] will ask you these questions, then you go directly to the booth and make your decision, then put the brown envelope, which contains your contribution to the group account into the box.

Please now come to the booth. We will call you one by one. Please remember to not talk to each other or communicate in any other way while waiting until everyone has made their decision. Also remember that there is no right or wrong in this game.

After the decision you may directly move to the snack area. There, you may talk again freely.

[one-by-one to assistant to answer two control questions in private, then to booth to make decision, in convenient order]

[have a break with snacks and cold drinks for everyone]

Thank you all for participating. You will now answer some short questionnaire and afterwards you will get the payments.

Post-experimental individual survey after PG game

	<p>ARE YOU THE HEAD OF HOUSEHOLD?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>
	<p>WHAT IS YOUR POSITION IN THE HOUSEHOLD?</p> <p><input type="radio"/> wife</p> <p><input type="radio"/> brother/sister</p> <p><input type="radio"/> son/daughter</p> <p><input type="radio"/> elder</p> <p><input type="radio"/> other</p>
	<p>HOW MANY ADULTS LIVE IN YOUR HOUSEHOLD ? <i>Members of the same household: People who sleep and eat in the same place. Adult = 16 years and above</i></p>
	<p>HOW MANY CHILDREN LIVE IN YOUR HOUSEHOLD? <i>child = 0 to 15 years</i></p>
	<p>WHAT IS YOUR RELIGION?</p> <p><input type="radio"/> Lutheran</p> <p><input type="radio"/> Catholic</p> <p><input type="radio"/> Traditional</p> <p><input type="radio"/> Evangelic</p> <p><input type="radio"/> None</p> <p><input type="radio"/> Don't know</p> <p><input type="radio"/> Refuse to answer</p> <p><input type="radio"/> Other</p>
	<p>SPECIFY OTHER.</p>

2/13

Post-experimental individual survey after PG game

Post-experimental individual survey after PG game

by_ enumerator

ENUMERATOR

James

Moses

Zypriaan

Other

SPECIFY OTHER.

PLAYER ID
put the exact ID number here

TREATMENT GROUP

1. Group Anonymity

2. Identification

3. Smalltalk

4. Coordination

PLAYER GENDER

Male

Female

General

AGE

YEARS OF SCHOOLING (INCLUDING ALL SCHOOLS)

SINGLE, MARRIED, DIVORCED, WIDOWED, PARTNERSHIP

Single

Married

Partnership

Divorced

Widowed

1/13

Post-experimental individual survey after PG game

ACQUAINTANCES
(Mugeni)

UNKNOWN

Methodical Questions

WHICH OF THE FOLLOWING DID YOU TALK ABOUT WITH THE OTHER THREE GROUP MEMBERS DURING THE EXPERIMENT?

Greet each other

Smalltalk: Agriculture

Smalltalk: About participants

Smalltalk: Joking

Smalltalk: About money

Expectations of the experiment

Discuss how to decide

Explain the rules to other participants

Other

SPECIFY OTHER.

DO YOU THINK THE PAYMENTS OFFERED ARE LITTLE, FAIR OR TOO MUCH? (REAL PAYMENTS NOT MADE YET, BUT ROUGHLY KNOW THE MIN AND MAX AMOUNT TO EARN)

too much

fair

too little

WHAT DO YOU THINK IS THE REASON FOR CONDUCTING THESE GAMES?
DO NOT READ ANSWERS

Qualify for village support

find out about the community

distribute money

don't know

Other

SPECIFY OTHER.

Post-experimental individual survey after PG game

YOUR MOTHER TONGUE?

English

Portugues

Rushambyu

Rukwangali

Ruliyemba

Gciriku

Mbukushu

Kimbundu

Chokwe

San

Oshwambo

Nama/Damara

Afrikaans

Ojjiherero

Anonymity Relations

HOW MANY OF THE OTHER PLAYERS IN THE WORKSHOP ARE RELATIVES AND OR SOMEONE FROM THE SAME HOUSEHOLD

FRIENDS (BUT NOT RELATIVES)

ACQUAINTANCES
(Mugeni)

UNKNOWN

Group Relations

HOW MANY OF THE OTHER THREE PLAYERS IN YOUR GROUP ARE RELATIVES OR SOMEONE FROM THE SAME HOUSEHOLD

FRIENDS (BUT NOT RELATIVES)

Post-experimental individual survey after PG game

General Information

IS FARMING YOUR MAIN PROFESSION?
 Yes
 No

HOW MANY BAGS OF CROP YIELDS DO YOU NORMALLY PRODUCE PER YEAR? (1 BAG = 50KG)
number of bags (or add unit if interviewee wants to answer in NAD or other unit instead)

HOW MANY BAGS OF YOUR PRODUCTION DO YOU SELL? (1 BAG = 50KG)
number of bags (or add unit if interviewee wants to answer in NAD or other unit instead)

AND THAT IS HOW MUCH INCOME PER YEAR FROM SELLING FARMING YIELDS?
income from the WHOLE year or season in NAD

DOES YOUR HOUSEHOLD RECEIVE ANY REMITTANCES FROM PEOPLE WORKING ELSEWHERE? (E.G. IN RUNDU)
 Yes
 No

IS YOUR HOUSEHOLD OR SOMEONE IN YOUR HOUSEHOLD RECEIVING ANY PENSIONS (E.G. OLD OR HANDICAPPED)
 Yes
 No

TOTAL INCOME INCLUDING EVERYTHING YEARLY? IN NAD
income from: farming, remittances, pensions and other income

WHICH OF THE FOLLOWING ASSETS DOES YOUR HOUSEHOLD OWN?
 electricity from powerline
 generator for electricity
 radio
 television
 refrigerator
 motorized vehicle
 bicycle
 phone

5/13

Post-experimental individual survey after PG game

WHAT MATERIAL IS YOUR HOUSE MADE OF?
 tent
 reed house (nsugo sonombu)
 timber and termite mud
 corrugated iron
 stone
 bricks

Agriculture

IN THE LAST 10 YEARS, DO YOU REMEMBER IN WHICH YEARS THERE WERE GOOD HARVEST YIELDS?
 2007
 2008
 2009
 2010
 2011
 2012
 2013
 2014
 2015
 2016
 2017
 none
 don't know

6/13

Post-experimental individual survey after PG game

DO YOU HAVE ANY PLANS TO CHANGE LANDS OR EXPAND YOUR CULTIVATION AREA IN THE NEXT FIVE YEARS? *

Yes
 No

WOULD YOU SAY THERE IS SUFFICIENT LAND FOR EVERYONE? *

Yes
 No

DO YOU REMEMBER IN WHICH YEARS YOU CLEARED FOREST FOR A NEW FIELD? *

none
 2000
 2001
 2002
 2003
 2004
 2005
 2006
 2007
 2008
 2009
 2010
 2011
 2012
 2013
 2014
 2015
 2016
 2017
 never
 don't know

HOW MUCH ON AVERAGE WHEN YOU DID SO PER YEAR? (surface in hectare or meters, add unit), put 0 if you they did not clear.

DO YOU NEED PERMISSION FOR CLEARING? *

no
 yes, from headman
 Other

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Post-experimental individual survey after PG game

IN THE LAST 10 YEARS, DO YOU REMEMBER IN WHICH YEARS THERE WERE BAD HARVEST YIELDS? *

2007
 2008
 2009
 2010
 2011
 2012
 2013
 2014
 2015
 2016
 2017
 none
 don't know

HOW MANY CATTLE DOES YOUR HOUSEHOLD OWN? *

DO YOU USE FERTILIZERS FOR CULTIVATION? *

Yes
 No

Land tenure

HOW MANY HECTARES OF FIELD DO YOU CULTIVATE
one hectare = 100 x 100 meters = one large football field *

AND THAT IS HOW MANY FIELDS? *

DID YOU LEAVE ANY FIELDS FALLOW IN THE LAST 5 YEARS? *

Yes
 No

DO YOU PLAN TO USE THEM AGAIN ONE DAY? *

Yes
 No

FOR HOW LONG HAVE YOU BEEN USING THE LAND YOU CULTIVATE NOW? IN YEARS

7/13

SPECIFY OTHER.

HAVE YOU BEEN DENIED PERMISSION TO CLEAR IN THE LAST YEARS? *

- Yes
- No

DO YOU FEEL THERE IS SOME TYPE OF RIVALRY OR CONFLICTS IN ACQUISITION OF NEW LAND? *

- Yes
- No

DO YOU FEEL SAFE AND SECURE ABOUT YOUR OWN LAND (TENURE)? *

- very safe
- pretty safe
- somewhat safe
- worried
- unsafe

DO YOU THINK YOU WILL STILL USE THE LAND YOU USE NOW IN 10 YEARS? *

- Yes
- No

Environment

HAS THERE BEEN ANY CHANGE IN THE WEATHER OVER THE LAST YEARS? *

- more rain
- less rain
- hotter
- colder
- no change
- don't know

IN THE LAST 10 YEARS, DO YOU REMEMBER IN WHICH YEARS THERE WAS PARTICULARLY MUCH RAIN? *

- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- none
- don't know

IN THE LAST 10 YEARS, DO YOU REMEMBER IN WHICH YEARS THERE WAS PARTICULARLY LITTLE RAIN? *

- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- none
- don't know

DO YOU THINK THE FOREST WILL STILL BE THERE AND ROUGHLY THE SAME SIZE IN 10 YEARS? *

- Yes
- No

Post-experimental individual survey after PG game

Extra

ARE YOU BORN IN THIS VILLAGE?

Yes

No

FOR HOW LONG HAVE YOU LIVED IN THIS VILLAGE?

more than 20

more than 10

more than five

less than five

WHERE DID YOU LIVE BEFORE? (OPTIONAL)

neighbour village

far away village in Kavango

Rundu

other part in Namibia

Angola

other country

WHY DID YOU COME HERE? (OPTIONAL)

expectation of better farming conditions

marriage

relatives

better education for the kids

job

Other

SPECIFY OTHER.

DO YOU SOMETIMES THINK ABOUT MIGRATING TO ANOTHER PLACE?

Yes

No

WHERE WOULD YOU CONSIDER MOVING TO?

another village

Rundu

another part of Namibia

Post-experimental individual survey after PG game

WHAT ARE THE REASONS FOR MIGRATING?

expectation of better farming conditions

marriage

relatives

better education for the kids

job

Other

SPECIFY OTHER.

DO YOU PLAN TO OR HAVE YOU ALREADY TALKED TO OTHER PLAYERS ABOUT THE DECISIONS YOU MADE IN THE GAME?

Yes

No

IF YOU HAD TO DECIDE BETWEEN THE FOLLOWING TWO OPTIONS WHICH WOULD YOU PREFER? RECEIVING 1000 NAD FOR YOURSELF OR EVERY HOUSEHOLD IN THE VILLAGE RECEIVING 100NAD INCLUDING YOURSELF?

1000 NAD for yourself

100 NAD for everyone

IMAGINE A LADDER WITH 10 RUNGS. THE RICHEST PERSON IN THIS VILLAGE STANDS ON THE HIGHEST RUNG AND THE POOREST AND THE LOWEST. WHERE ON THAT LADDER DO YOU SEE YOURSELF?

one is the poorest ten is the richest

10

9

8

7

6

5

4

3

2

1

DO YOU THINK, GENERALLY SPEAKING, MOST PEOPLE CAN BE TRUSTED OR THAT YOU NEED TO BE VERY CAREFUL IN DEALING WITH PEOPLE?

Most people can be trusted

Need to be very careful

Post-experimental individual survey after PIG game

<p style="text-align: right;">*</p> <p>DO YOU TRUST PEOPLE IN YOUR VILLAGE COMPLETELY, SOMEWHAT, NOT VERY MUCH OR NOT AT ALL?</p> <p> <input type="radio"/> completely <input type="radio"/> somewhat <input type="radio"/> not very much <input type="radio"/> not at all </p>	<p style="text-align: right;">*</p> <p>DO YOU TRUST THE OTHER PLAYERS IN THE WORKSHOP OF TODAY COMPLETELY, SOMEWHAT, NOT VERY MUCH OR NOT AT ALL?</p> <p> <input type="radio"/> completely <input type="radio"/> somewhat <input type="radio"/> not very much <input type="radio"/> not at all </p>	<p style="text-align: right;">*</p> <p>DO YOU TRUST THE OTHER THREE PLAYERS IN YOUR GROUP COMPLETELY, SOMEWHAT, NOT VERY MUCH OR NOT AT ALL?</p> <p> <input type="radio"/> completely <input type="radio"/> somewhat <input type="radio"/> not very much <input type="radio"/> not at all </p>
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Supplement D: Information for data and analysis script request

Dataset and script for the data preparation and analysis (“do-file”) can be made available upon request to the corresponding author. Game protocol and instruction are also available in the local languages spoken in Kavango, Namibia.