Understanding the black box of communication in a common-pool resource field experiment

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ABSTRACT

It is well proven that communication enhances cooperation in public goods and common-pool resource experiments. It is less well understood why and how communication affects cooperative behavior and whether that impact is mediated by the sharing of a common context and the individuals' every day experiences. This paper aims to close this gap by means of a systematic content analysis of communication transcripts from field experiments. The paper analyzes communication statements shared by participants in a series of common-pool resource experiments conducted in rural Colombia. We first classified each statement under two categories: topic and function. Then, we tested hypotheses about the impact of those statements on cooperation depending on (1) their reference to the "field context" and other topic categories; and (2) the "informational", "disapproval", or "group solidarity" function of the statements. According to our results, statements that contain references to the context affect cooperation depending on the function of those statements. When the statements fulfill an information role, the effect is negative, but when statements have the function of enhancing group solidarity, the effect is positive. The statements that have the strongest positive impact on cooperation are those fulfilling a disapproval function, particularly when the topic of the messages are the payoffs obtained by the group.

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1. Introduction

Social dilemmas are situations where individual selfishness is at odds with group interests. In the environmental field, social dilemmas have been traditionally associated to the extraction of common pool resources like water, forests and fisheries, and the provision of public goods such as infrastructure, soil conservation or water quality (Ostrom et al., 1994). Empirical studies have shown that local communities all over the world are able to communicate as a way of better managing shared resources and provide public goods without external enforcers (Agrawal, 2014, 2001; Andersson, 2004; Baland and Platteau, 1996; Ostrom, 1990; Ostrom et al., 1992, 1994; Tucker, 2010; Wade, 1988). The role of communication in non-cooperative social dilemma experiments has been tested in numerous laboratory experiments in a variety of disciplines (for meta-analyses see Balliet, 2010 and Sally, 1995; for an overview of initial findings see Ostrom et al., 1994). Communication has shown to increase cooperation in social dilemmas experiments as it increase the ability of individuals in a group to coordinate their actions to restrain their appropriation and maintain group extraction levels relatively low. This is not trivial, given the benefits that defect (i.e., free ride on) offers (Ostrom, 2006).

Despite the importance attributed to communication in social dilemma games, few studies have systematically analyzed the content of communication interactions (Bornstein, 1992; Ostrom and Walker, 1991; Ostrom et al., 1992; Pavitt, 2011; Schwartz-Shea and Simmons, 1991) and tested hypotheses about the role of communication in non-cooperative games (Orbell et al., 1988; Pavitt, 2011; Pavitt et al., 2005; Simon and Gorgura, 2003). A few studies have used content analysis systematically; however, none has done it with data from experiments done in the field with real users of natural resources. Some of the most cited hypotheses about why communication works refer to the provision and sharing of information, the role of social norms, and the emergence

of group identity and solidarity (Bornstein, 1992; Shankar and Pavitt, 2002). Experimental studies have tested the validity of each of the hypotheses separately, with mixed results. Despite the efforts, there is still no evidence supporting either the dominance of one hypothesis over others, nor the compatibility between several of them (Cardenas and Ostrom, 2004).

As in experiments in the laboratory, in field experiments there is evidence of the effectiveness of communication in promoting cooperation, but the levels of cooperation vary greatly across groups. Studies have shown how the effects of communication can vary depending on group dynamics and socioeconomic characteristics of participants (Cardenas, 2003). Other studies have also demonstrated that when communication is allowed there is a positive impact on equity, measured with game earnings (Ghate et al., 2013). Overall, it is assumed that doing experiments in the field increases the external validity of the findings, because experiments are conducted with samples that are more representative of society and real-world context (List and Metcalfe, 2014; Poteete et al., 2010). Scholars have shown that context is crucial to comprehend why institutions that manage natural resources may function in one scenario but fail in another one (Dietz and Henry, 2008; Ostrom, 2007; Ostrom et al., 2007; Poteete et al., 2010). In this paper we aim to explore the impact of context as embedded in the communication interactions within the field experiment as a mean to explain users' behavior during the experiment.

To our knowledge there are not studies investigating how the communication process of experiments conducted in the field are influenced by the participants' context. To fill this gap, we content-analyze communication transcripts from framed field experiments conducted in rural Colombia. The research questions are "To what extent are hypotheses explaining the role of communication in laboratory experiments applicable to the field? Are any of those hypotheses more robust than the others in the field setting? And, to what extent does the context permeate the communication interactions?"

The paper is organized as follows. In Section 2, we present the theory and hypotheses driving the paper; Section 3 addresses the methodology, including a description of the field experiments and an explanation of the content analysis and coding procedures; in Section 4, we present the results of the study; Section 5 compromises the discussion of the results presented in Section 4; and in Section 6, we conclude and suggest areas for further research.

2. Theory and hypotheses

Since the 1950s, more than 100 studies have found significant evidence to conclude that communication significantly increases cooperation in non-cooperative games. Two quantitative meta-analyses have synthesized the literature about the different conditions that mediate the impact of communication on cooperation in social dilemmas (Sally, 1995 and Balliet, 2010). Sally (1995) found that communication had an effect on cooperation after controlling for 23 different experimental conditions. According to the author, the frequency of discussion periods and the ability of participants to make promises significantly increased cooperation. In a similar meta-analysis, Balliet (2010) found that face-to-face discussion enhanced cooperation more than written messages. In addition, the author found that repeated communication during iterated dilemmas did not have a statistically larger impact than one-shot, pre-play communication.

Cardenas and Ostrom's (2004) "information layers" framework explains that in many social dilemma games, players search for information to create an internalized vision of the game, which may involve a set of payoffs that go beyond the formal/external

game created and described by the experimenter. The internal-game values are then affected by three layers of information, to wit: the information players gather about the game conditions and dynamics ("material payoffs layer"), the information collected about other players' characteristics and the context in which the experiment is conducted ("group-context layer"), and their own values ("identity layer") (see Fig. 1). Information and understanding about the material payoffs and dynamics of the game can emerge through trial and error, along a repeated interactions game, through verbal and visual communications, or through a combination of them. Similarly, understandings of other players' characteristics and sharing the context may also require some form of communication. Finally, mobilizing one's beliefs does not require communicating with anyone.

As illustrated in Fig. 1 and further explained in the paragraphs that follow, the provision and information sharing, social norms, group identity and solidarity and the importance of the context hypotheses tested in this study can be framed within the "material payoffs" and "group-context" information layers of Cardenas and Ostrom's (2004) framework.

According to the group identity and solidarity hypothesis, communication contributes to the emergence and/or reinforcement of sympathy and shared interests among individuals in a group, which in turn facilitates cooperative behavior (Sally, 2001). This hypothesis is based on our capacity to recognize, anticipate, and sympathize with each other's characteristics, feelings and thoughts, depending on how similar those characteristics are to ours. Such sympathy or social identity can increase with the proportion of shared attitudes and/or experiences and can modify our willingness to act strategically (Sally, 2001). We depersonalize others and see them as typical members of a group (Turner et al., 1987). To the extent that others are categorized as members of our group, a motivational shift would occur, and group welfare would matter more than individual welfare (Bicchieri, 2002).

Orbell et al.'s (1988) well-known findings about the within-group cooperation bias have been interpreted as evidence supporting the "group identity" hypothesis. Similarly, in a game where two groups were competing for the provision of a public good, Bornstein and Rapoport (1988) and Bornstein et al. (1989) found that within-group communication fostered more intragroup cooperation than between-group communication. Pavitt (2011) argues that group identity plays an important role in the first stages of the communicative act because it allows for a reason to cooperate in the first place, allowing the emergence of trust among decision makers. In the same line, Simon and Gorgura (2003) found that solidarity words within the group had a statistically positive effect on cooperation.

According to the above explanations, the group identity and solidarity explanation would be fulfilled though statements enhancing the feeling of belonging to a group among the individuals (Bornstein and Rapoport, 1988; Bornstein et al.,
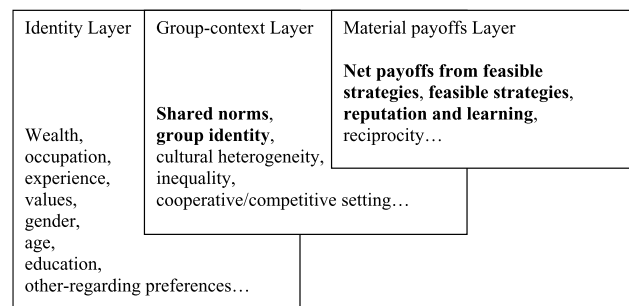
Identity Layer	Group-context Layer	Material payoffs Layer
		Net payoffs from feasible strategies, feasible strategies, reputation and learning, reciprocity…
Wealth, occupation, experience, values, gender, age, education, other-regarding preferences…	**Shared norms, group identity,** cultural heterogeneity, inequality, cooperative/competitive setting…	

Fig. 1. Information levels framework.
Source: Cardenas and Ostrom (2004).