To suggest is to commit? A common pool resource experiment with non-enforceable recommendations

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ABSTRACT

I report the results of an artefactual field experiment conducted with Colombian artisanal fishermen. I set up a common pool resource game in which subjects exchange recommendations prior to the extraction decision. The classical tension of this game between individual and collective incentives opens the door for strategic communication. However, I find that subjects are highly consistent with their transmitted message and, to some extent, responsive to the incoming recommendation. Recommendations are efficiency enhancing: extraction levels are lower when the outgoing and the incoming messages are closer to each other. This is particularly relevant in treatments with a high proportion of cooperative recommendations. I link experimental behavior with survey data and I find that lying behavior is negatively correlated with the ratio between the (reported) satisfactory and realized earnings from the fishermen.

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1. Introduction

Costless and non-enforceable communication preceding social interactions is labeled in economic theory as cheap-talk. It includes the revelation of private attributes, intentions and beliefs. Although cheap-talk is considered to be useful mostly in coordination problems (Crawford, 1998), the experimental evidence suggests that cheap talk is also effective in bargaining situations (Forsythe et al., 1991; Valley et al., 1998) and in trust games (Ellingsen and Johannesson, 2004).

In this work I explore the efficiency-enhancing capacity of a specific form of cheap talk: simultaneous non-enforceable recommendations. I conduct an artefactual field experiment with artisanal fishermen. The strategic setting emulates the extraction of a common pool resource (CPR). The open access extraction is characterized by its sub-

optimal Nash equilibrium: subjects do not fully internalize the social cost of their actions, leading to extraction levels above the socially desirable ones.

I added to this particular CPR game the possibility to exchange recommendations with a set of neighbors defined by an exogenous network. The inefficiency of the Nash equilibrium opens the door for strategic communication: self-regarding subjects may try to induce lower extraction levels on their neighbors to increase their own payoff. Besides, the simultaneous character of recommendations may create a tradeoff between consistency (the distance between the chosen extraction level and the previous sent recommendation) and responsiveness (the distance between the chosen extraction level and the received recommendation) when subjects do not communicate strategically.

I introduce exogenous variation in the network structure (*i.e.* which player is neighbor of whom) and in the type of recommendation transmitted by one of the five subjects in each network. The two network structures are a *star* and a *cycle*. In the *star* a central player is connected to all the other group members (who are disconnected among them) and messages are bilaterally exchanged. In the *cycle* every player acts simultaneously as a sender with one fellow group member and as a receiver with another one. The comparison of behavior between networks is useful to understand subjects' responsiveness to the received message when the recommendation is common knowledge, a particular feature of the message from the *star's* central node.

In some treatments a coin toss determined the type of message transmitted by one of the five group members. The message was the same every round. In treatments with a *good* message the selected participant recommended the socially optimal extraction level. In treatments with a *bad* message the selected participant recommended the individually rational extraction level. The usefulness of the different randomly determined messages is twofold. On the one hand, it provides a subset of participants for whom consistency between the sent message and the subsequent choice is not a potential source of disutility. On the other hand, *good* and *bad* centralized messages promote cooperative and competitive environments, respectively. It allows testing if the environment affects both the consistency with the players' own messages and the responsiveness to the incoming recommendations.

This work contributes to the understanding of the effectiveness of cheap-talk in social dilemmas in three different ways. First, it extends the efficiency-enhancing effect of non-binding messages from promises to recommendations. This result provides support to the lie-aversion hypothesis (Gneezy, 2005) with respect to the guilt-aversion mechanism (Battigalli and Dufwenberg, 2007) as competing explanations on the efficiency-enhancing effects of communication. Second, this study deals with a simultaneous exchange of recommendations. It brings into the analysis the potential tension between consistency and responsiveness. To the best of my knowledge, this tradeoff has not been explored before despite its relevance in social dilemmas with two-way communication. Third, the study links experimental behavior with survey data from the fishermen that took part of the study. It contributes to the ecological validity of the study by establishing a link between consistent behavior in the CPR game and the gap between realized and expected earnings from the fishing activity.

I find that subjects are highly consistent and do not engage in strategic communication very often. Lying behavior is less common when credible cooperative recommendations are frequent. The evidence of responsiveness to the incoming recommendations is mixed. Between networks, the effect of a common signal on the responsiveness is only observed for *good* recommendations. Within the *star* network, the difference in responsiveness between central *good* and *bad* messages is not statistically significant (although *bad* messages seem to trigger more responsiveness). I find that, in cooperative environments, extraction levels are negatively correlated with the distance between the incoming and the outgoing recommendation.

The remainder of this paper is organized as follows. A revision of the relevant literature is presented in Section 2. Then in Section 3 I present the CPR game, the experimental setting and the behavioral predictions. Experimental results are reported in Section 4, followed by a discussion of the findings in Section 5. Section 6 concludes.

2. Related literature

Farrell and Rabin (1996) claim that a message must be self-signaling and self-committing to make cheap talk relevant in the decision-making process. Suppose a game with a *Sender* and a *Receiver* with a symmetric set of strategies X and Y and symmetric payoffs. A message is self-signaling if the *Receiver* knows that the *Sender* does not have incentives to announce X and then do Y. The message is self-committing if the *Receiver* knows that if he believes on the announcement of X and the *Sender* is aware of that, the *Sender* does not have incentives to play Y.

The experimental evidence for coordination games, in which the self-signaling and self-committing conditions are satisfied, shows a positive impact of cheap talk in reaching more efficient outcomes (Crawford, 1998). In bargaining games the exchanged messages are less likely to be informative given the conflict between parties. Evidence on the impact of cheap talk is mixed for these games (Forsythe et al., 1991; Valley et al., 1998; Lundquist et al., 2009).

Communication also provides opportunities to set non-binding agreements in social dilemmas with inefficient Nash equilibria. It includes the Prisoner's Dilemma (Sally, 1995), public goods games (Dawes et al., 1977; Isaac and Walker, 1988) and CPR games (Ostrom et al., 1994). Cheap talk has also been explored using more structured forms of communication in extensive form games. Ellingsen and Johannesson (2004) propose a trust game with threats (messages from the trustee) and promises (messages from the truster), finding that the latter are more credible than the former. A central argument to support this finding is that lie-aversion is not orthogonal to fair-mindedness.

The alternative explanation to lie-aversion for promise keeping is guilt-aversion (Battigalli and Dufwenberg, 2007). According to the guilt-aversion hypothesis the disutility of being inconsistent does not come from the act of lying *per se*, but instead from the psychological cost of not fulfilling the counterpart's expectations. Experimental evidence in favor of this argument is reported in Charness and Dufwenberg (2006); Charness and Dufwenberg (2010)). Vanberg (2008) proposes a modified dictator game that disentangles the effects of guilt-aversion and lie-aversion. Dictators made a promise to their counterpart and then some of them are randomly reshuffled. The low proportion of self-advantageous decisions provides support for the lie-aversion hypothesis.

Ellingsen et al. (2010) argues that the effect of lie-aversion may be confounded with the "false consensus effect." It is a psychological bias according to which people usually overestimate the likelihood that other's perceptions and thoughts match their own (Ross et al., 1977). Ellingsen et al. show a reduction in the bias caused by the "false consensus effect" after revealing the second movers' expectations in a trust game. Bacharach, Guerra and Zizzo (2007) show an equivalent result, although they call it the "self-fulfilling property of trust." It means that a player is more likely to trust his counterpart if he believes that the other trusts him.

Recommendations, although less studied than promises, have also been explored in social dilemmas with one-way communication. In Levy et al. (2011) a leader is selected to send a recommendation to the rest of group members in a public goods game. Whether the leader is elected or randomly chosen, his message influences the contributions of the remaining group. Koukoumelis, Levati and Weisser (2012) corroborate the influence of a leader's recommendation in one-shot public good games in which individual contributions are public information.

3. Experimental design

3.1. The common pool resource game

The theoretical set up is based on Cárdenas (2004). There are n players sharing a common resource under an open access scheme. Players face a set of ordered actions $x_i \in \{1, \ldots, x_{max}\}$ representing their extraction level. The direct benefits from extraction are given by ax_i. The direct costs are assumed to be quadratic and are denoted by $bx_i^2/2$. The positive externality from the preservation of the resource is given by $\gamma(nx_{max} - X)$. This externality decreases linearly with the aggregate extraction $X = \sum_{i=1}^{n} x_i$. The material benefits from extraction are given by:

$$\pi_i(x_i, x_{-i}) = \left(ax_i - \frac{bx_i^2}{2} \right) + \gamma \left(nx_{max} - \sum_{i=1}^{n} x_i \right) \tag{1}$$

The first order condition is obtained by maximizing Eq. (1) with respect to the extraction level x_i:

$$\frac{d\pi_i}{dx_i} = a - bx_i - \gamma = 0 \tag{2}$$

According to Eq. (2) the player will extract up to the point in which the marginal benefit is equal to the direct marginal cost bx_i