

Sanctions that signal: An experiment[☆]Roberto Galbiati^{a,*}, Karl H. Schlag^b, Joël J. van der Weele^c^a OSC-CNRS and Sciences-Po, Paris, France^b University of Vienna, Austria^c J.W. Goethe University, Grüneburgplatz 1, RuW Gebäude 4, Stock, 60323 Frankfurt am Main, Germany

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ABSTRACT

The introduction of sanctions provides incentives for more pro-social behavior, but may also be a signal that non-cooperation is prevalent. In an experimental minimum-effort coordination game we investigate the effects of the information contained in the choice to sanction. We compare the effect of sanctions that are introduced exogenously by the experimenter to that of sanctions which have been actively chosen by a subject who has superior information about the previous effort of the other players. We find that cooperative subjects perceive actively chosen sanctions as a negative signal which significantly reduces the effect of sanctions.

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1. Introduction

Authorities commonly take measures in order to promote cooperation between people, including laws, sanctions, and monitoring devices. These interventions provide incentives for good behavior, but the very fact that they are introduced can also change people's perception of the organization or society they are a part of. For example, increasing punishment for a particular crime can inform the public that this crime is prevalent and hard to control. Introducing time management systems in a workplace may signal that shirking is the social norm. Increasing monitoring on immigrant groups may lead people to believe that these groups have bad intentions and have a stigmatizing effect. International financial intervention in a country can inform investors that its mismanagement has been worse than previously thought.

In all these examples, the introduction of the intervention sends a signal that others are not cooperating, which may dampen or even reverse the desired impact of the measure. Recently, a number of theorists have modeled such a signaling effect, based on particular assumptions on how beliefs are formed (Sliwka, 2007; Friebe and Schmedler, 2011; Bénabou and

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Tirole, 2011; Van der Weele, 2012). Our objective is to understand how people actually make inferences in this context, and to this end we run a laboratory experiment. More specifically, we study behavior in an experimental coordination game, designed to answer the following questions.

- 1 Can the introduction of incentives associated with small, non-deterrent¹ sanctions induce efficient behavior and raise expectations of cooperative actions by other players?
- 2 In situations of imperfect information about the past behavior of other group members, can the introduction of sanctions make agents more *pessimistic* about the actions of others by implicitly signaling that other players have not been cooperating? If so, does this reduce the effectiveness of sanctions?

Our experimental setup is a two person minimum-effort game: a coordination game with many Pareto ranked equilibria, based on the setup in Goeree and Holt (2001, 2005). Each player chooses a level of costly effort, and is rewarded according to the minimum of the efforts of all players in the group. The more efficient equilibria result only if all players play individually risky strategies. Doubt about the other player's willingness to play such a strategy may result in inefficient outcomes.

In all experimental treatments agents were matched in groups of three, where the third player was a 'principal' who benefitted proportionally to the minimum-effort chosen by the other two in the group. The subjects played the minimum-effort game twice, but the principal was the only one to be informed of the outcome of the first round before the second round was played. This information structure was common knowledge. Apart from effort choices, we also elicited the subjects' beliefs about the effort of the other player.

To answer Question 1, we compare a control treatment without sanctions with a sanction treatment. In a control treatment no sanctions were introduced between rounds, and consequently the second round was the same as the first. In the treatment, a mild sanction F was introduced for both players in the group, that lowered the earnings of a subject if she selected low effort (and also carried a small fixed cost for the principal), but did not change the set of Nash equilibria. Because the sanction was introduced by the experimenter unconditional on past effort choices by the subjects, we call this the 'exogenous sanction treatment'.

Our hypotheses for the effect of such sanctions are based on a simple formal model, explained in Section 4. The experimental game has many Nash equilibria, so in order to make predictions we use a model similar to level- k reasoning (Nagel, 1995; Costa-Gomes and Crawford, 2006). We assume that people think of their partner as either a pessimistic type, who believes the partner will choose low effort, or an optimistic type, who believes their partner will choose high effort. This model predicts that the change in payoffs associated with sanctions should increase effort through (a) an 'incentive effect', and (b) a 'belief effect', i.e. a change in expectations about the action of the other player. The first result of the paper is that we do indeed find both effects in the data, and so our answer to Question 1 is affirmative.

Question 2 addresses a potential signaling effect of sanctions. To answer it, we introduced an additional treatment. Before the second round of the minimum-effort game was played, the principal could decide whether or not to introduce the same sanction F as above, at a small cost to his own earnings. Because the principal had observed first round behavior and could condition the sanction on this behavior, we call this the 'endogenous sanction treatment'.

Our model predicts that in this treatment there exists an equilibrium in which the principal will sanction if and only if there is at least one player who plays relatively low effort. Therefore, a player who played relatively high effort in the first round, but nevertheless observes a sanction, will learn that his partner is a pessimistic type who is likely to continue to choose low effort: sanctions are 'bad news'. This means that for these players the incentive effect of the sanction will be counteracted by a negative belief effect. By contrast, people who initially chose low effort will not get any information from a sanction, because in equilibrium it would have been introduced independently of their partner's behavior. Thus, our hypothesis is that endogenous sanctions are less effective than exogenous sanctions, especially for those who behaved cooperatively.

Our second result is that we can confirm these hypotheses. There is no evidence that subjects with low first-round effort react differently when facing an endogenous sanction. On the other hand, the signaling effect of the endogenous sanction for those with high first-round effort is so strong that it eliminates the incentive effect, so the net effect is indistinguishable from the case where there is no sanction. As a result, exogenous sanctions are on aggregate significantly more effective than endogenous sanctions.

To our knowledge, we are the first to investigate experimentally whether the introduction of sanctions signals uncooperative behavior by other group members. The main message of our paper is that the effectiveness of sanctions depends on the context in which they are introduced. On the one hand, people recognize the incentive effects that sanctions will have on others, which increases their effectiveness. On the other hand, when information about the behavior of others is limited, as is the case in modern large-scale societies or firms, the introduction of sanctions may cause pessimism by drawing attention to past misbehaviors. This is especially true for those that are optimistic and behave cooperatively.

¹ By 'small', 'non-deterrent' or 'mild', we mean that sanctions do not make playing the socially efficient action a dominant strategy.

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