



# Voluntary contributions with redistribution: The effect of costly sanctions when one person's punishment is another's reward<sup>☆</sup>



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## ARTICLE INFO

### Article history:

Received 7 September 2010

Received in revised form 9 August 2013

Accepted 12 August 2013

Available online 8 September 2013

### JEL classification:

C91

H41

D30

### Keywords:

Public goods

Collective action

Experiment

Punishment

## ABSTRACT

We introduce new treatments of a voluntary contribution mechanism with opportunities to punish in order to see how contributions, punishments and earnings change when punishment is in the form of fines the punisher distributes to other members of her group. The linked punishment-reward set up is of theoretical interest and could represent simultaneous shifts of social disapproval and approval. Conjectures that punishment will be better targeted, and that it will be more substantial for given deviation from others' contributions, receive support. Making punishment redistributive increases contributions and efficiency, even after netting out the design's free resource element.

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## 1. Introduction: voluntary contributions and punishment

One of the most active areas of experimental economics research in recent years has been the exploration of subjects' propensities to engage in costly punishment and the impact of punishment on a variety of interactions, including public goods and common pool resource dilemmas.<sup>1</sup> Punishment is of interest both for the practical reason that it may play a pivotal role in solving these and other dilemma problems by creating self-interested incentives to take socially efficient actions (Fehr and Gächter, 2000; Güreker et al., 2006; Gächter et al., 2008), and because evidence of its presence is suggestive of a preference or predisposition that may have even broader implications for both theory and policy. Indeed, some argue

<sup>☆</sup> We are grateful to the Department of Economics at Brown University for funding most of the experiments reported here; our earlier-conducted treatments used funds provided by the MacArthur Foundation network on norms and preferences and National Science Foundation Grant SES-0001769. We are grateful to Omar Ahmed for modifying the programs used to conduct the experiments. Garcia's work was partially funded by the Chase Manhattan research assistantship in economics at Brown University.

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<sup>1</sup> Examples of punishment in other types of experiments are found in the ultimatum game (Camerer and Thaler, 1995), the gift exchange game (Fehr and Gächter, 1998), and the trust game (Houser et al., 2008). Surveys of the literature on voluntary contributions with punishment opportunities are provided by Gächter and Herrmann (2008) and Chaudhuri (2011).

that human cooperation in matters as varied as the exertion of effort in workplaces and partnerships and the functioning of states would be impossible but for the widespread presence of the impulse to punish free riders (Field, 2001; Fehr and Schmidt, 2003; Gintis et al., 2005).

Although willingness to pay for punishment and its often pronounced effect on voluntary contributions are remarkable, authors including Cinyabuguma et al. (2004), Cinyabuguma et al. (2006), Botelho et al. (2005), Gächter and Herrmann (2005), and Herrmann et al. (2008) have pointed out that allowing punishment in public goods experiments can have a far less salutary effect on earnings, hence efficiency. Since earnings rise with contributions but fall with expenditures on and earnings lost to punishment, a central question about the efficiency impact of an option to punish is whether there is a high enough ratio of contributions induced by the threat of punishment to costs associated with punishment actually carried out. Theoretically, if only low contributors are threatened with punishment and if the threat is well anticipated, little or no actual punishment would be needed in order for the existence of a punishment opportunity to raise both contributions and earnings.<sup>2</sup> There is evidence that subjects do increase contributions when punishment is available, even before observing it. However, in the numerous experiments in the literature, substantial punishment costs are incurred by punishers and those targeted by them, depressing aggregate earnings. As Gächter and Herrmann (2008) put it in their comprehensive review of the voluntary contributions literature: “In most experiments in which punishment has material pay-off consequences, punishment turned out to be an inefficient tool to enforce cooperation because resources are destroyed.”

In addition to the amount of punishment that is required to get the job done, mis-targeting of punishment can also lower efficiency. Cinyabuguma et al. (2006), Gächter et al. (2005), Herrmann et al. (2008) and Ertan et al. (2009) provide evidence that a major reason for the sometimes inefficient impact of decentralized punishment is that a substantial fraction of it is misdirected at high contributors—a phenomenon that we call “perverse punishment” and that overlaps with what Herrmann et al. call “anti-social punishment.”<sup>3</sup> In 13 of 16 subject pools around the world in which those authors conducted voluntary contribution experiments both with and without punishment, earnings were lower in the punishment condition. In their experiments, the difference between earnings in the no punishment and in the punishment conditions was highly correlated, at the subject pool level, with the proportion of punishment classified as “anti-social.” A desire to investigate ways to reduce or offset perverse punishment is an important motivation of the present research.

Sefton et al. (2007), and Sutter et al. (2010) studied settings in which subjects could reward rather than punish group members in a voluntary contributions game and compared the effectiveness of rewards to that of punishment. Both studies found rewards to be less effective than punishment when the rewarding technology is revenue neutral (it costs the bestower one unit to give one additional unit of earnings to the beneficiary).<sup>4</sup> When Andreoni et al. (2003) studied rewards and punishment separately in one-shot proposer-responder games, they similarly found that “rewards are much less effective in moving the proposers away from the minimum possible offer (p. 894).” Andreoni et al. also studied the combination of rewards and punishment and found it to be more effective than either device by itself. To our knowledge, costly rewards and punishment have not been combined in the voluntary contributions game, although cost-free redistribution is studied by Sausgruber and Tyran (2007), who find that it elicits significantly higher contributions and hence efficiency.

The purpose of the present paper is to study the impact of costly punishment when resources lost to the punished party must be transferred by the punisher to some other member or members of the group. *Ceteris paribus*, this way of combining rewards with punishments is more efficient than treatments in which penalties “vanish” or “are burned,” since no additional resources are lost other than the costs to punishers.<sup>5</sup> Its incentive impact is also likely to be greater than that of punishment alone, since the punisher can reward cooperators at no additional cost at the same time as she punishes free riders. But that outcome is assured only if punishment is targeted properly, which brings us back to our concern with the perverse targeting of punishment. The subset of punishers observed to punish high contributors in other public goods experiments

<sup>2</sup> This might be achieved if subjects could issue credible threats to punish at zero or low cost, obviating the need to follow up with actual costly punishment. Bochet et al. (2006) find that pre-play numerical announcements of possible punishment alone failed to raise efficiency, but Masclet et al. (2010) find that permitting subjects to issue cost-free threats before actual punishment does lead to improved efficiency (see also Bochet and Putterman, 2009). More broadly, Gächter et al. (2008) find that when play of a contribution and punishment game resembling Fehr and Gächter (2000) is extended for forty rather than ten periods, the benefits of the punishment threat outweigh the costs of punishment. Sanctions that are cost free to both punisher and recipient, that is the simple conveying of disapproval, can also increase efficiency as demonstrated by Masclet et al. (2003).

<sup>3</sup> We call punishment of high contributors—usually identified for convenience as those who contribute more than the group’s average in the period—“perverse” because the expectation of it tends to discourage contributions, thus reducing social efficiency. Herrmann et al. use the term “anti-social punishment” for any case in which a subject  $i$  punishes a subject  $j$  who has contributed more than  $i$  has. While the sets of “perverse” and of “anti-social” punishment largely overlap in practice, we find our definition more useful when focusing on the effect the punishment has on the person receiving it, because subjects in the experiments in question (including our own) do not know who in particular punished them. Thus unless they are their group’s unique highest or lowest contributor, they don’t know whether their punisher contributed more or less than themselves. Note that both sets of authors find desire to avenge received punishment to be a potential explanation of a large proportion of perverse or anti-social punishment events. This implies a link between the problem of perverse punishment and that of counter-punishment, discussed by Cinyabuguma et al. (2006) and Nikiporakis (2008) among others.

<sup>4</sup> Walker and Halloran (2004) also compare rewards and punishments in a voluntary contribution experiment, finding both to be relatively ineffective in a one-shot setting. Vyrostekova and van Soest (2008) compare budget-neutral rewards to rewards that benefit the recipient more than they cost the bestower in common pool resource experiments. Similar to the voluntary contribution experiments, budget-neutral rewards are ineffective at sustaining cooperation.

<sup>5</sup> Another experiment in which the losses of punished subjects are preserved, avoiding the inefficiency associated with vanishing resources, is Casari and Plott (2003), which studies a design in which the losses of punished subjects are transferred to those punishing them.

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