



Enforcing cooperation in public goods games: Is one punisher enough?



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ABSTRACT

We experimentally investigate a finitely repeated public goods game setting where, in each round, access to sanctioning power is exclusively awarded to one single player per group. We show that our central ‘Top Contributors as Punishers’ institution – a mechanism by which a player needs to be the highest contributor in her group in order to earn the right to sanction others – is extremely effective in raising cooperation and welfare due to turnover in the top contributor role and to top contributors’ willingness to substantially sanction others. Our findings yield implications for the design of mechanisms intended to foster cooperation in social dilemma environments.

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1. Introduction

Explaining the emergence and sustainability of human cooperation in social dilemma environments, where a strong temptation to free ride on others exists, has long been a core problem for social scientists. In the last years, an increasing number of economic experiments have been contributing to shed light on the issue by investigating the role that *institutions* can play in enhancing cooperation (see e.g. Yamagishi, 1986; Casari & Plott, 2003). Since in social dilemmas the maximization of social welfare conflicts with individual payoff maximization, the role of sanctioning institutions aimed at penalizing deviant behavior has been extensively explored (Ostrom, Walker, & Gardner, 1992). On the whole, so far, laboratory studies

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have concentrated on two broad classes of punitive mechanisms, tackling the problem from two different angles: *decentralized* and *centralized* punishment.

Under voluntary, decentralized punishment, players are usually free to sanction each other arbitrarily and this institutional arrangement turned out to be extremely successful in stabilizing cooperation rates over time, due to many participants' willingness to engage in (costly) punishment of opportunistic behavior (see Fehr and Gächter's (2000, 2002) pathbreaking studies). However, the experimental literature has recently identified a 'dark side' of unrestricted peer punishment, shedding light on some serious drawbacks of this peer-based sanctioning mechanism. First, there are inefficiencies due to lack of coordination among potential punishers (O'Gorman, Henrich, & Van Vugt, 2009). Second, in many cases this institutional arrangement may undermine the scope for self-governance, as sanctioning may take the form of misdirected, 'antisocial' punishment – that is, low contributors inefficiently meting out sanctions on high contributors (Gächter & Herrmann, 2011; Hauser, Nowak, & Rand, 2014; Herrmann, Thoeni, & Gächter, 2008).¹ As a consequence of the waste in punishment points due to both miscoordination and antisocial punishment, recent work documents that the success of 'vigilante justice' in enforcing cooperation comes at a substantial cost: unless we consider a significantly longer time horizon (Gächter, Renner, & Sefton, 2008), *average earnings* turn out to be *lower* than in the absence of sanctioning options (Denant-Boemont et al., 2007; Dreber, Rand, Fudenberg, & Nowak, 2008). This is a major shortcoming of unrestricted punishment, as it risks turning into a wasteful, inefficient activity for those communities or organizations that adopt it (Nosenzo & Sefton, 2014).

Thus, it would be natural to think that an alternative, viable solution could be to delegate the sanctioning power to a *single, external enforcer*. With a Hobbesian 'Leviathan' entitled to monitor individuals' behavior and wield a 'sword' against free riders, no coordination problems in meting out sanctions would arise. However, even a purely centralized solution appears to be largely unsatisfactory under some important respects. A first reason has to do with the *informational* dimension (see on this also Baldassarri & Grossman, 2011). In many jobs, due to lack of physical proximity, employers cannot observe the exact contribution provided by each worker to the production of total output (Mas & Moretti, 2009). The underlying argument is that in many socio-economic contexts the relevant knowledge is dispersed and a decentralized system is better able to detect it and fulfill its potential, compared to a centralized one. Next, even apart from informational problems, monitoring individuals can be extremely *costly*. In this regard, recent studies also highlight the importance of potentially significant 'hidden costs of control': experimental evidence indicates that many agents reduce their performance as a response to the principal's controlling decision, likely due to agents perceiving the latter being as a signal of distrust and a limitation of their choice autonomy (Falk & Kosfeld, 2006).

In light of such serious drawbacks characterizing 'extreme' (i.e. purely decentralized and purely centralized) punishment-based incentive schemes, in this paper we study the power of an intermediate solution in which the sanctioning power is concentrated in the hands of a *single player* (like in classic centralized mechanisms), but this sole punisher, far from being externally appointed, is a *member of the group* (like in decentralized mechanisms). The reason why we conjectured that this hybrid *peer-to-peer centralized* mechanism could work is that in principle it combines the key advantages of centralized and decentralized sanctioning institutions.

On the whole, our experimental analysis is aimed at studying the effects on cooperation of the introduction of peer-based centralized punishment mechanisms (instead of purely decentralized ones) that differ from one another depending on the criteria used to identify the sole punisher in the groups.

This goal has been pursued by designing an experiment consisting of five treatments. In our baseline, punishment is potentially *widespread*, in the sense that more than one player in each group may sanction others in each period (see Fehr & Gächter, 2000, 2002), while in the other four mechanisms sanctioning power is *concentrated* in the hands of one player only in each group. These four single punisher treatments are characterized by (1) one punisher who is randomly selected in each period (O'Gorman et al., 2009) and is also immune from punishment, (2) one punisher who is selected in each period on the basis of her contribution behavior (i.e., (one of) the top contributor(s)) and is also immune from punishment, (3) one punisher who is selected every four periods on the basis of her contribution behavior (i.e., (one of) the top contributor(s)) and is also immune from punishment and (4) one randomly selected punisher who cannot punish the top contributor, who, therefore, is immune from sanctioning (though not entitled to sanction).

The reason why we opted for this experimental design is twofold. First, we aimed at comparing the performances of alternative peer-based centralized mechanisms based on single punishers. Second, we sought to shed light on single punishers' motivations towards cooperation and sanctioning. To achieve these goals, we first compared our decentralized punishment baseline with two single punisher treatments: one where single punishers are randomly selected (1) and one where only (one of) the top contributor(s) can punish and is immune from punishment (2). This comparison aimed at understanding whether it is passing from decentralized punishment to centralized sanctioning based on single punishers *per se* that makes the difference or whether the *specific criterion* through which single punishers are selected (i.e. random vs. contribution-based) also matters. Then, by comparing (2) and (3), i.e., a treatment in which only (one of) the top contributor(s) can punish but, unlike in (2), punishment and immunity last for four periods, we tried to distinguish between two broad classes of explanations: are players actually motivated to significantly contribute to the (first-order) public good and punish low contributors or are they driven by the desire to become immune from punishment and/or enjoy punishment *per se* (i.e., regard-

¹ A further problem with discretionary sanctioning is that when multiple stages of punishment are allowed, so that immunity of sanctioners from reprisals is removed, counterpunishment and feuds are likely to be triggered, limiting, once again, successful self-governance and leading, eventually, to a demise of cooperation (Denant-Boemont, Masclat, & Noussair, 2007; Nikiforakis, 2008; Nikiforakis & Engelmann, 2011).

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