



Cooperation and norm enforcement - The individual-level perspective[☆]



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ABSTRACT

We explore the relationship between individuals' disposition to cooperate and their inclination to engage in peer punishment as well as their relative importance for mitigating social dilemmas. Using a modified strategy-method approach we identify *individual* punishment patterns and link them with *individual* cooperation patterns. Classifying $N = 628$ subjects along these two dimensions documents that cooperation and punishment patterns are aligned for most individuals. However, the data also reveal a sizable share of free-riders that punish pro-socially and conditional cooperators that do not engage in punishment. Analyzing the interplay between types in an additional experiment, we show that pro-social punishers are important for achieving cooperation. Incorporating information on punishment types explains large amounts of the between- and within-group variation in cooperation.

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1. Introduction

An extensive body of research documents cooperation among humans (e.g., Andreoni, 1988; Ledyard, 1994; Fischbacher and Gächter, 2010; Balliet et al., 2011; Chaudhuri, 2011, to name only a few), pointing out that cooperation problems can be mitigated by appropriate institutional settings (e.g., Ostrom et al., 1992; Kosfeld et al., 2009). Among these, the ubiquitous mechanism of peer punishment plays a prominent role in the literature (e.g., Fehr and Gächter, 2000; Fehr and Gächter, 2002; Carpenter, 2007; Reuben and Riedl, 2013). Even though peer punishment makes successful cooperation much more likely to occur, there are still groups who fail to use decentralized punishment in an effective and pro-social manner. This

might be due to the fact that peer punishment constitutes a cooperation problem in itself (Yamagishi, 1986). A breakdown in cooperation that coincides with a failure of peer punishment could thus capture two sides of the same coin (see, e.g., Ones and Putterman, 2007; Peysakhovich et al., 2014). This conjecture raises two fundamental questions that we try to answer in this paper: Firstly, what is the relation between an *individual's* disposition to cooperate (Fischbacher and Gächter, 2010; Fischbacher et al., 2001) and her *individual* inclination to engage in peer punishment? Secondly, if these two dispositions do not coincide, which of the two is relatively more important in achieving cooperative outcomes under peer punishment?

We study these questions employing a classical workhorse in the literature on cooperation and punishment: a linear public-goods game (VCM) with decentralized punishment (Fehr and Gächter, 2002). Subjects first make a contribution decision and can then assign costly punishment points that reduce the other group members' payoffs. Within this prominent paradigm, we introduce a variant of the strategy-method at the punishment stage of the game that allows identifying heterogeneity in peer punishment at the *individual* level.

When making her punishment decisions, each subject is confronted with a random sequence of 'scenarios', i.e., combinations

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of others' contributions. One of these scenarios corresponds to the other group members' actual contribution decisions. All other scenarios are randomly drawn contributions that systematically cover relevant parts of the strategy space. Only the punishment decisions for the scenario with the actual contributions become payoff-relevant. As subjects do not know which scenario is the 'relevant' one, we have an incentive compatible strategy-method that induces *exogenous* variation in others' contributions to consistently estimate individual peer punishment patterns in a one-shot game (see Bardsley, 2000, for a related approach eliciting cooperation patterns).¹

Using this strategy-method to elicit punishment patterns reveals substantial heterogeneity between individuals. In our sample of $N = 628$ experimental participants two patterns dominate: Almost every second subject (47.1%) is classified as a *pro-social punisher*. Their individual punishment patterns are all significantly decreasing in the other's contributions, i.e., they target their punishment towards those contributing nothing or little to the public good. The second-largest group (40.3%) are *non-punishers* ('second-stage free-riders'), i.e., subjects that do not at all engage in peer punishment. Beyond these two dominant types, there is only a small fraction of subjects that displays either an unsystematic pattern or a pattern that is increasing in the other's contribution (in the spirit of 'anti-social punishment'; see, e.g., Herrmann et al., 2008). Moreover, we document that among pro-social punishment types, patterns are almost exclusively 'self-centered' around the own contribution level.

Linking individual punishment patterns to the corresponding individual dispositions to cooperate – which we obtain from a within-subject design using the measure of conditional cooperation introduced in Fischbacher et al. (2001) – yields a two-dimensional classification that reveals two behavioral archetypes. (i) For the majority of our subjects cooperation and punishment types are aligned: we find that 55% of conditional cooperators punish pro-socially and that 56% of free-riders are non-punishers. (ii) Consequently, this also implies that a significant share of subjects have individual punishment- and cooperation-patterns that are diverging: 35% of conditional cooperators are non-punishers and 32% of free-riders do engage in pro-social punishment.

The ability to identify these two behavioral archetypes – individuals whose cooperation and punishment patterns are either aligned or diverging – is a major benefit from combining our approach to classify punishment patterns at the individual level with the conditional cooperation-measure from Fischbacher et al. (2001). Moreover, as the individuals' inclinations to cooperate and to punish are far from being perfectly correlated, we can assess their respective importance for mitigating a social dilemma in the presence of punishment opportunities. To do so, we use these individual type-classifications from two one-shot games to explain group outcomes in a third game: a finitely repeated public-goods game with peer punishment – both among stable groups where players interact repeatedly (partner design) and among steadily alternating groups where a group's type composition changes over time (stranger design).

In both conditions, we observe that groups with more conditional cooperators achieve higher average contributions that are also more stable over time, than groups with fewer conditional cooperators.

While these observations mirror previous findings that highlight the important role of conditional cooperators (e.g., Gächter and Thöni, 2005), we also obtain a similar picture with respect to the group members' *punishment* types. In fact, variation in punishers' types seems to be crucial in this richer environment: keeping constant the fraction of conditional cooperators, average contributions are significantly higher in groups that contain more pro-social punishers. The presence of pro-social punishers induces higher contributions among, subjects classified as free-riders and among conditional cooperators.

These findings underline that (at least in the context of peer punishment) group outcomes crucially depend on the presence of pro-social punishment types. To the best of our knowledge, our paper is the first to present causal evidence on this link. The results complement recent studies that have hinted at the importance of individuals' inclination to punish. Ones and Putterman (2007) rank lab subjects according to a composite index, which is based on previous contribution and punishment decisions in a repeated VCM. Using the ranking to form homogenous groups of similar types, they find that subsequent cooperation is higher in groups with 'higher-ranked' subjects, i.e., among individuals that tend to be more cooperative and/or willing to engage in pro-social punishment.

Studying field data, Rustagi et al. (2010) find a positive correlation between natural groups' success in managing forest commons and the number of conditional cooperators in the respective groups. They attribute this to the difference between conditional cooperators and selfish persons in their self-reported statements about time spent on forest patrols.² In a similar vein, the correlational analyses by Kosfeld and Rustagi (2015) suggest that these natural groups are also better at managing forest commons if the corresponding leader's third-party punishment behavior, as measured in a lab experiment, promotes equality and efficiency rather than being arbitrary.

Rustagi et al. (2010) and Kosfeld and Rustagi (2015) focus either on cooperation or on punishment patterns, whereas Ones and Putterman (2007) combine both patterns into a single index. By contrast, Falk et al. (2005) study both individual punishment and cooperation behavior in isolation, but without exploring the relative impact of subjects' types on mitigating a social dilemma. They employ a strategy-method on the peer punishment-stage of a binary prisoner's dilemma-game between three persons and relate the punishment pattern to the subject's actual cooperation decision in the prisoner's dilemma. While the fraction of people who cooperate and punish is similar to what we find, it differs for those who defect and punish. To some extent, this is driven by the marked amount of anti-social punishment in their data. In parts, though, this might also be due to the fact that they use the actual decision (cooperate or defect) rather than eliciting cooperation types via a strategy-method. After all, a defector might either be a selfish individual or a conditional cooperator that expects the other person to defect. Our two-dimensional type classification suggests that this distinction makes a difference for pinning down the linkage between cooperation and punishment patterns.

The classification of individuals along two dimensions offers additional insights on how the interplay of different behavioral types drives group outcomes. Accounting for the heterogeneity in punishment types significantly improves our ability to explain the large and persistent differences in cooperation across groups. Moreover, the identification of systematically different punishment patterns

¹ An alternative approach, based on a conventional strategy-method together with a strongly restricted choice set, is implemented by Cheung (2014) and Kamei (2014), who offer interesting complementary findings on cooperation and punishment patterns, respectively. Beyond method and sample size, the present paper also differs from these studies in that we analyze the link between cooperation and punishment types as well as the role of the different types for achieving cooperative outcomes in a repeated game.

² The authors conclude that [...] "better forest management outcomes are not only a result of conditional cooperators being more likely to abide by the local rules of the group but also being more willing to enforce these rules at a personal cost" (p. 964). The systematic causal evidence provided in this paper confirms this line of reasoning.

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