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Strategies of cooperation and punishment among students and clerical workers

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ABSTRACT

We study the individual behavior of students and workers in an experiment where they repeatedly face the same cooperative task. The data show that clerical workers differ from college students in overall cooperation rates, strategy adoption and use of punishment opportunities. Students cooperate more than workers. Cooperation increases in both subject pools when a personal punishment option is available. Students are less likely than workers to adopt strategies of unconditional defection, and more likely to select strategies of conditional cooperation. Finally, students are more likely than workers to sanction uncooperative behavior by adopting decentralized punishment, and also personal punishment when available.

1. Introduction

Cooperation—acting for the joint benefit of a group—is a key issue in the social and behavioral sciences, and it has been studied extensively by experimental economists. Achieving cooperation is especially challenging when individuals cannot develop personal ties, thus interacting as "strangers." There are still two aspects of cooperation in groups of strangers, which are relatively unexplored in experiments. First, whether results that emerge from studies based on a typical population of undergraduate students can be generalized to *non-standard* subject pools, which are characterized by a wider array of life and work experiences. Second, if and how adding a personal punishment opportunity to a standard social dilemma affects the strategies adopted at the *individual* level. We address these substantive and methodological issues by carrying out a study of cooperation, in which the task is repeated indefinitely and subjects cannot rely on reputation. The patterns of behavior of college students are compared to those of white-collar workers, in treatments with and without a personal punishment opportunity. The benchmark subject pool in the experiment consisted of undergraduate students from various disciplines

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at Purdue University, a large U.S. university. The non-standard subject pool comprised clerical workers employed as staff throughout Purdue University. These workers were mostly long-time local residents who exhibited a wide variation in age and educational backgrounds and did not have prior experience with laboratory experiments.[3]

In the experiment, pairs of subjects played a prisoner's dilemma either with or without the opportunity to engage in personal punishment. They interacted as strangers for an indefinite number of periods: subjects could neither identify the person they were matched with, nor see their history of play. According to folk theorem-type results, this setting admits multiple equilibria, including one with 100% cooperation (Kandori, 1992; Ellison, 1994). Indefinite repetition helps to overcome the short-run temptation to cheat others. This is the case if players adopt a norm of behavior based on the threat of relentless decentralized punishment, i.e., they *permanently* cease to cooperate after seeing just one defection; this is called the "grim" strategy. Here, personal punishment is theoretically neither necessary nor sufficient to sustain cooperation with identical, rational, and self-regarding agents. Evidence from previous studies indicates that cooperation levels are low when subjects do not know each other and cannot build reputations (e.g., Ostrom, 2010), and cooperation increases substantially when there are personal punishment opportunities (e.g., Ostrom et al., 1992; Fehr and Gächter, 2000).

Our design closely reflects the decentralized trading environment in Kandori (1992) and Ellison (1994). This generates theoretical predictions that serve as a reference in the interpretation of the empirical findings. In the paper, we assess (i) the strategies adopted by individuals in each subject pool, (ii) how students and workers differ in their ability to achieve cooperation, when many cooperation rates are supported in equilibrium, and (iii) how the additional opportunity to inflict a personal punishment affects individual strategies.

The design is as follows. Each participant played a supergame of indefinite duration within a group of four subjects. In every period, the group was randomly partitioned into two pairs of subjects and every pair played a prisoner's dilemma (PD). In the literature, the PD is the standard platform for studies on cooperation. The interaction was anonymous and subjects could only observe actions and outcomes in their own pair. Hence, even though each group interacted repeatedly, this design made it impossible for a single participant to build an individually identifiable reputation. Because of the random matching process, all participants could do was to form a general assessment about what to expect from the average member of their group. We call this setting a "strangers" design. This setting excludes reputation-based strategies as an explanation for cooperation, and brings to the forefront strategies that do not discriminate individuals based on their identity. As an additional advantage, this stranger design facilitates the identification of strategies adopted by subjects, because it exposes participants to a variety of counterparts.

We also introduced in the experiment the possibility of adopting personal punishment. Each subject had the costly opportunity to immediately respond to a counterpart's action by lowering her payoff in the period. Cooperators and defectors alike could be punished. We are especially interested in studying if and how subjects use personal punishment to complement or to substitute for decentralized sanctioning schemes that rely on future defections.

In previous work (Camera et al., 2012), we questioned the empirical validity of the theoretical notion that play is homogeneous and that subjects implicitly coordinate on full cooperation when such an equilibrium is available. This previous study revealed that the behavior of only one out of four subjects was consistent with the use of the grim trigger strategy. It also revealed that, as subjects gained experience with the game, they kept experimenting with different strategies and managed neither to achieve full cooperation nor to coordinate on cooperative strategies.

This paper moves forward the study of equilibrium selection and individual strategy adoption in two directions. First, it explicitly compares aggregate and individual behavior of two diverse subject-pools. Second, it extends the analysis of strategies from a case where subjects can only resort to decentralized punishment, to a design in which they *also* have the opportunity to engage in personal punishment. We report substantial differences between subject pools; both in aggregate and individual behavior, and in the design with and without the personal punishment opportunity. Students exhibit higher levels of aggregate cooperation than workers. Students are also less likely than workers to adopt unconditional strategies, and more likely to select strategies of conditional cooperation. Finally, students are more inclined than workers to sanction defections through decentralized punishment and personal punishment, when available.

2. Related experimental literature

Our study is related to the experimental literature about differences in behavior and in strategies adopted by subjects with different socio-demographic characteristics. One methodological issue still open in this literature is whether results from a standard undergraduate population generalize to other populations, a question which is related to the external validity of experimental results (Harrison and List, 2004; Ball and Cech, 1996). There are only a few published studies on games of trust and cooperation, which compare students to non-student samples; the main message is that students are less cooperative and that age tends to be negatively correlated with cooperation.

The literature on public good games indicates that students contribute on average less than non-students. This result is supported by several studies involving non-student subjects (e.g., Carpenter and Seki, 2006; Egas and Riedl, 2008). See

[3] Some student participants had previous experience with laboratory experiments. One may conjecture that a common experience that cooperation in experimental tasks tends to yield higher earnings could have influenced behavior. We thank a referee for pointing this out. Overall, we did not have precise ex-ante expectations about how workers would be different from students.