Journal of Economic Behavior & Organization 147 (2018) 76–94

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

Finding cooperators: Sorting through repeated interaction[☆]

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ARTICLE INFO

Article history:
Received 9 August 2016
Received in revised form
28 September 2017
Accepted 23 November 2017
Available online 13 February 2018

Keywords:
Repeated games
Relational contracts
Sorting
Market interaction
experiment

ABSTRACT

We present evidence from an indefinitely repeated gift-exchange game where market structures affect proposers' ability to punish uncooperative partners and their ability to sort between cooperative and uncooperative partners. Treatments vary by whether subjects can replace their partners, and if not, whether they can reduce their gift from one round to the next. Comparing treatments without contract restrictions, our replacement treatment is no different initially but has higher cooperation in the long run. Comparing treatments without replacement, our treatment with contract restrictions has lower cooperation initially but is no different in the long run. Neither of these findings are predicted by theories of repeated games based on the ability to punish, however, both findings are consistent with a simple sorting model.

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1. Introduction

Many studies in the experimental literature have found that repeated interactions generate higher levels of cooperation. A standard theoretical explanation for this result centers on the incentives created by the threat of punishment. An agent chooses to cooperate because she anticipates that a partner will punish her if she does not (e.g. by reducing her own cooperation in the future). Hence, according to the theory, differences in the ability to exercise repeated-game punishments entail differences in the potential for cooperation: cooperative opportunities increase with agents' ability to punish.

We conducted an experiment using a repeated gift-exchange game to study the importance of dynamic punishment strategies in establishing cooperation. The gift-exchange game is often used to model worker-firm relationships. A *proposer* (firm) makes a *transfer* gift (wage) to a *responder* (worker) and requests a *return* gift (effort); the responder then chooses the size of her return. The proposer's benefit from an increased return is larger than its cost to the responder, making mutual gift-exchange efficient. Given the game's asymmetry, we identify cooperation levels with the size of return gifts.

At first glance, the existing experimental literature on repeated gift-exchange games would appear to support the theoretical prediction that repeated-game punishments increase cooperation. Brown et al. (2004) (BFF) show that when a proposer can make gifts to one of many possible responders, the ability to identify partners from previous rounds increases

☆ This research was supported by: National Science Foundation Grant No. 1058380, and the Center for Experimental Social Science (CESS) at New York University. An earlier version was circulated under the title *The benefits of firing (and replacement): an experimental study*. We would like to thank Andrew Schotter, Magnus Johannesson, Ernst Fehr, David Cesarini, Mark Dean, Pedro Dal Bó, experimental group at NYU, participants in seminars and conferences at NYU, the Stockholm School of Economics, Brown, Oxford, FSU, BI Oslo, the University of Vienna, Maastricht University, CREED, EconCon 2011 and ESA 2011 for helpful discussions. We are especially grateful to Guillaume Fréchette for his patience and advice.

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https://doi.org/10.1016/j.jebo.2017.11.016
0167-2681/© 2017 Published by Elsevier B.V.

cooperation. The authors explain this finding by highlighting that identification is necessary for effective punishment. With identification, proposers can punish the responder for non-cooperative behavior by terminating a relationship that otherwise offers future rents. Without identification, relationships (are very likely to) terminate regardless of behavior. Falk et al. (2008) (FHM) show that dismissal barriers, which prevent a proposer from terminating a relationship or reducing her transfer, lower cooperation.[1] Again, the authors explain this result by highlighting how dismissal barriers restrict the ability to punish.

On closer inspection, however, it is not clear whether the above results can be attributed entirely to differences in punishment threats. Both BFF and FHM simultaneously vary a proposer's ability to punish an uncooperative responder *and* her ability to find and develop a relationship with a cooperative partner. Without identification in BFF, it is impossible for proposers to continue relationships only with cooperative responders (regardless of why responders cooperate). This may lower aggregate cooperation even under the extreme assumption that all responders are behavioral types, unresponsive to punishment threats, who either cooperate (provide the requested return) or do not. Similarly, dismissal barriers in FHM prevent a proposer from replacing an uncooperative responder type with a possibly more cooperative one.

We refer to a proposer's ability to distinguish between cooperative and uncooperative responders and make transfers only to the former, as sorting. Our experiment attempts to distinguish between a proposer's ability to sort and ability to punish, and see the extent to which each factor predicts cooperation. Our treatments independently varied proposers' ability to punish uncooperative responders, and their ability to replace them (the simplest form of sorting). A Baseline (B) treatment allows replacement options and flexible contracts; this resembles the baseline treatments of BFF and FHM. A Fixed Partner (FP) treatment retains flexible contracts but restricts proposers to making offers to a single responder. Finally, a Contract Restrictions (CR) treatment imposes a fixed partner and additionally proposers cannot reduce their transfers[2]; this resembles the dismissal barriers of FHM. In all treatments, after each round of gift giving, play continued for another round with a constant probability. We refer to each repeated interaction (of indeterminately many rounds) as a supergame.

The theory of repeated games which focusses on the ability to punish (we shall henceforth refer to this as *repeated game punishment theory*) does not predict any difference in cooperation between the Baseline and Fixed Partner treatments. The same maximal cooperation level can be obtained in both settings from the start of a supergame by threatening responders with a zero continuation payoff punishment if they do not cooperate. Indeed the set of possible equilibrium payoffs for a proposer–responder pair is *identical* in the two treatments. On the other hand, the theory does predict a clear difference in cooperation between these flexible contract treatments and the Contract Restrictions treatment. Contract Restrictions constrain punishments, destroying the incentive to cooperate; the unique sequential equilibrium involves no gift-exchange.

Alternatively, if the ability to sort between cooperative and uncooperative responders is instrumental in generating cooperation, we would expect different results between the Baseline and Fixed Partner treatments. In the Baseline treatment, uncooperative partners can be recursively replaced with possibly cooperative ones, allowing for a larger population of cooperative matches to emerge over time. By contrast, in both the Fixed Partner and Contract Restrictions treatments a proposer can only hope to interact with a single responder, limiting the potential for sorting. For example, under the extreme assumption that all responders are cooperative or uncooperative behavioral types, we might expect similar cooperation levels in these two treatments.

Our results can be summarized as follows: in the Baseline and Fixed Partner treatments, the average return is not significantly different in the early rounds of a supergame, but it is higher in the Baseline treatment in later rounds. By contrast, the average return in the Fixed Partner treatment is larger than in the Contract Restrictions treatment in early rounds of a supergame but is not significantly different in later rounds.

The comparison between the Baseline and Fixed Partner treatments, both in terms of initial and eventual cooperation levels, points directly to the importance of sorting. The finding that cooperation rates do not differ under the Fixed Partner and Contract Restrictions treatment in later rounds is more remarkable; it suggests that the threat of repeated game punishments may have played little role in determining long-run cooperation levels.[3]

To fully understand the roles of sorting and punishment threats, however, requires examining the dynamics of the differences in cooperation between the Fixed Partner and Contract Restrictions treatments. Why is cooperation under Contract Restrictions initially lower, but ultimately similar? Mechanically, this occurs because cooperation in the Fixed Partner treatment remains approximately constant, while it increases over the supergame under Contract Restrictions. Such increased cooperation under Contract Restrictions is explained by the predominance of "starting small" strategies. Proposers initially made small transfers and requested modest return gifts. When this return was provided, proposers subsequently increased the size of both their own transfer and their requested return.

Starting small can be explained as a form of sorting. It allows a proposer to distinguish between cooperative and uncooperative responders at low stakes, and increase the stakes only with the former. Starting small would seem particularly

[1] FHM's dismissal barriers apply only if a proposer interacts with a responder for two consecutive rounds, mirroring employment protection legislation in a labor market context.

[2] In all treatments, transfers and returns are chosen from a range, as shown in Section 2.

[3] Experimental public-goods games have traditionally implemented punishment by allowing a subject to choose to sacrifice money to lower the payoff of other parties. Our repeated game offers less explicit punishments, in that proposers can withhold future transfers that were otherwise expected (this distinction can also be seen in Charness and Rabin (2002) model).

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