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An individualistic approach to institution formation in public good games

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ABSTRACT

In a repeated public goods setting, we explore whether individuals, acting unilaterally, will provide an effective sanctioning institution. Subjects first choose independently whether they will participate in a sanctioning stage that follows a contribution stage. Only those who gave themselves the "right" to sanction can do so. We find that the effectiveness of the institution may not require provision of the institution at the level of the group. Individuals acting unilaterally are able to provide sanctioning institutions that effectively raise cooperation. The effectiveness of the institution, however, depends on whether the "right" to sanction entails a monetary cost or not.

1. Introduction

A common feature of most studies of public good games is that the institution proposed to increase contributions is provided exogenously and the emphasis is placed on the conditions which effectively help to alleviate the free rider problem (see Chaudhuri, 2011 for a recent survey). Of late, there is growing interest in how the institution comes into being. This issue is important because the formation of the institution is subject to a second-order free rider problem. Others may profit from the institution but they prefer someone else to provide it (see Oliver, 1980).[1] The literature on the endogenous formation of institutions provides an answer assuming that the institutional choice mechanism is voting: there is ample experimental

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[1] Other early works on this issue are Yamagishi (1986), where subjects were offered the possibility to voluntarily fund a sanctioning institution in a public goods game and Ostrom et al. (1992), where in a common pool resource game, subjects had the opportunity to communicate to decide whether to use

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evidence showing that in many cases, the outcome of voting is a sanctioning institution.[2] This approach however assumes that the group has the capacity to organize the voting mechanism and to enforce the resulting outcome.

Individuals in many societies can and do act on their own – such as deciding on contributions to the public good – without the need for the group to aggregate individual preferences. In addition, in many settings, individuals discontented with the contribution levels of their peers, can choose to unilaterally provide and enforce sanctioning institutions.[3] It is, therefore, perhaps more natural to take individual actions as the starting point in analysing the ability of groups to endogenously provide and enforce potentially efficiency-enhancing institutions such as sanctioning.

In this paper, we experimentally examine the provision and effectiveness of the sanctioning institution in a public goods game when its provision depends on *individuals* acting independently. Will individuals unilaterally choose a punishment role? If so, what is the effect on group outcomes in comparison to when the sanctioning institution is exogenously and universally provided? Finally, how is the effectiveness of the institution changed if individuals must unilaterally bear the cost of providing it?

In our experiment, before making decisions on contributions, individuals unilaterally decide whether or not they want to be able to use punishment. The number of such individuals is then announced before the contribution stage takes place. Finally, contribution levels are made public and only those individuals who gave themselves the "right" to make use of sanctioning can assign punishment to *any* group member.[4] This is akin to the behaviour of vigilantes who take it upon themselves to provide mechanisms to enforce a norm and punish others who violate it or some voluntary neighbourhood watch groups that provide both monitoring and sanctioning. An obvious behavioural question is whether group members will respond differently to a sanctioning mechanism that has been exogenously provided to all group members in comparison to one in which individuals act unilaterally to choose to provide the mechanism.

We consider two variants of the sanctioning institution where individuals choose-to-participate (CTP)—whether the choice to participate is available at no monetary cost (CTP0) or whether there is a positive cost (CTP1).[5] In addition, we replicate the most common settings in public goods experiments—the Voluntary Contributions Mechanism (VCM) and the VCM with an exogenously provided opportunity to punish (StdPun). In the VCM setting, subjects could only contribute to the public good and there was no enforcement mechanism available. In StdPun, all group members automatically had the right to assign punishment to others in the group.

Based on the standard assumption of own income maximization, individuals would not be expected to provide the sanctioning institution or to use it to discipline free-riders. However, previous work has found that individuals do make use of exogenously provided sanctioning institutions and are able to enforce high cooperation levels in groups. Fehr and Schmidt (1999), hereafter FS, rationalise such behaviour using a model of inequity aversion. Extending their model to our setting, we find that, as in FS, any symmetric contribution profile can be supported as a subgame perfect Nash equilibrium. However, this requires everyone in the group – selfish and inequity averse players – to provide the sanctioning institution. In addition, there exist sub game perfect equilibria with less than complete provision where only a subset of inequity averse players provide the institution. However, to account for the pecuniary inequity that arises from the different participation decisions, contribution profiles in such equilibria are asymmetric.

One may think of the CTP settings as allowing for *extreme* cases that correspond to the provision cost of the sanctioning institution. When the provision cost approaches infinity, no player will choose to sanction and the institution will resemble the VCM. When the provision cost approaches zero as in CTP0, then all players may choose to give themselves the right to sanction and the institution will resemble StdPun. In the intermediate range however, the FS model predicts a multiplicity of equilibrium outcomes with a wide range of contribution levels and participation in the punishment stage. It is such situations that our experiment allows us to investigate.

Our experimental data show several monotonic results. When the provision of the sanctioning institution is costly, fewer subjects choose to participate in the punishment stage than when it is costless. In terms of the effects on cooperation, while both CTP treatments start at the same level, cooperation levels in the two CTP treatments soon diverge. In CTP0, groups are as successful in raising cooperation as with automatic universal participation in punishment (StdPun). In CTP1, despite the

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sanctions. Traulsen et al. (2012) and Zhang et al. (2014) find that many players choose pool punishment when second order punishment of non-punishers is possible.

[2] Gürerk et al. (2006), Ertan et al. (2009) and Sutter et al. (2010) are examples where the choice is between no sanctions vs. informal sanctions. In Kosfeld et al. (2009) and Kube et al. (2015), the choice is between no sanctions and formal sanctions imposed by a central authority. Markussen et al. (2014) and Kamei et al. (2015) are recent studies where the choice is between formal and informal sanction schemes.

[3] There are alternative institutions other than sanctioning that can be implemented. Some examples are rewards for high contributors (Sefton et al., 2007), ostracism of low contributors (Cinyabuguma et al., 2005), excludability (Croson et al., 2014), leadership within groups (van der Heijden et al., 2009) and formation of coalitions (Dannenberg et al., 2010; McEvoy et al., 2011). Kube et al. (2015) study the endogenous provision of institutions that include both minimum contribution levels and centralised sanctioning.

[4] A related paper is Masclet et al. (2013), where subjects can make non-binding threats before the contribution stage. Players issue costless detailed threats to other group members as a function of hypothetical contribution levels and these threats are made public before making contribution decisions. They find an increase in contributions relative to a standard VCM.

[5] Using standard economic terminology, the punishment technology may entail a *fixed* per round provision cost associated with acquiring and having the technology ready to use, and a *variable* cost associated with making use of it. The standard approach in the literature is linear variable cost with no provision cost (as in Herrmann et al., 2008). Some papers, though, consider a positive provision cost but the decision to provide the sanctioning institution is taken at the group level (see for example Kosfeld et al., 2009).