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Institution formation and cooperation with heterogeneous agents

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ABSTRACT

Driven by an ever-growing number of studies that explore the effectiveness of institutional mechanisms meant to mitigate cooperation problems, recent years have seen an increasing interest in the endogenous implementation of these institutions. In this paper, we test within a unified framework how the process of institution formation is affected by three key aspects of natural environments: (i) heterogeneity among players in the benefits of cooperation, (ii) (a)symmetry in players' institutional obligations, and (iii) potential trade-offs between efficiency and equality in payoff allocations. We observe social preferences to be limiting the scope for institution formation. Inequality-averse players frequently object to institutions that fail to address differences in players' benefits from cooperation – even if rejecting the institution causes monetary losses to all players. Relating our findings to previous studies on institution formation, we discuss potential advantages and drawbacks of stipulating unanimous support for implementing institutions that foster cooperation.

1. Introduction

> "[…] a set of rules used in one physical environment may have vastly different consequences if used in a different physical environment" (Ostrom, 1990, p. 22).

Cooperation problems are ubiquitous in many areas in economics, ranging from teamwork or hold-up problems in managerial economics, over community governance or property rights security in development economics, natural resource management or climate protection in environmental economics, trade obstacles or treaty formation in international economics, to tax compliance and the provision of public goods in public economics. Each example certainly has its own distinctive issues, but when it comes to mitigating the underlying cooperation problems, there is usually a common approach: the modification of individuals' incentive-compatibility constraints, such that "free-riding" is no longer the dominant strategy (e.g., Shavell and Polinsky, 2000). These modifications (implicitly or explicitly) impose restrictions on individuals' choice sets, which raises the question whether they will be implemented in the first place (e.g., Gürerk et al., 2006; Tyran and Feld, 2006; Kosfeld et al., 2009; Bierbrauer and Hellwig, 2011; Markussen et al., 2014). In the present paper,

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we will shed light on this central question – asking in particular to which extent (i) the heterogeneity of the involved players and (ii) the (a)symmetry of the restrictions affects their implementation.

Consider the following example that we use throughout the paper, namely the provision of a public good. If members of a society are perfectly identical and all benefit equally from overcoming this social dilemma, one might expect them to mutually agree on establishing an institution that eliminates the social dilemma.[1] However, controversies might arise when members are heterogeneous and have different stakes in overcoming the social dilemma. In particular when equality considerations are taken into account, the exact content of the institution is key to successful implementation. Symmetric institutions, in which all members have the same obligations, might be rejected in favor of asymmetric institutions with member-specific obligations – even if this implies monetary losses for all members.

To causally identify how institution formation is affected by selected aspects of natural environments, we conducted a series of laboratory experiments. The basic underlying game, a public-good game, is a prominent workhorse for studying cooperation problems. Each player receives an endowment and has to decide on its allocation between private consumption and contributions to a public good. Provision of the public good creates benefits for all group members and is socially efficient in terms of the sum of monetary payoffs.[2] However, the individual marginal return from the public good is below the marginal return from private consumption, such that free-riding incentives exist which jeopardize public good provision. To offer players the opportunity to endogenously mitigate the cooperation problem, we add an additional stage that is played prior to the public good game. At this first stage, players decide on implementing an institution using unanimity voting. If all players in the group vote in favor of the institution, they are committed to certain efficiency-enhancing contribution levels in the subsequent public good game.[3] If at least one player votes against the implementation of the institution, the regular public good game is played and each player can freely decide how much to contribute in the second stage.

Players in our setup thus start in the absence of institutions and subsequently decide on the implementation of a joint institution to foster cooperation. In such an initial, lawless state of nature that is characterized by sovereign players facing a social dilemma, it seems natural to use unanimity voting for deciding on the implementation of institutions.[4] In fact, unanimous decision-making is the easiest possible, if not the only, voting procedure that players do not have to explicitly agree upon prior to voting. It does not require players to give up sovereignty, since each player can veto any decision. This is different for non-unanimous voting rules, such as majority voting, where players need to forfeit part of their sovereignty and which therefore typically only emerges after a joint history of cooperation.[5]

Since our focus is on how institution formation is affected (i) by heterogeneity in players' benefits from cooperation, and (ii) by the (a)symmetry of obligations, we vary these factors in a controlled manner while fixing the decision rule to unanimity voting in all treatments. First, in some treatment conditions (*Homogeneous types*), all players are of the same type and, thus, receive the same benefits from the public good, while in other conditions (*Heterogeneous*), there are two types that differ in their marginal benefits. Second, we vary the content of the institution. All players are either obliged to contribute their entire endowment to the public good (*Symmetric institution*), or obligations differ between the two player types (*Asymmetric*). While the symmetric institution implies efficient public good provision, but inequality in payoffs for heterogeneous players, obligations in the asymmetric case are chosen such that final payoffs are equalized. This setup allows us to clearly identify the roles of inequality aversion and efficiency concerns in the process of institution formation.

We find that inequality considerations can hamper the formation of efficient institutions meant to foster cooperation. With heterogeneous player types, those with low marginal benefits frequently object to the symmetric institution (about 40% reject it). The same is observed for homogeneous player types with asymmetric institutions (about 45% reject it). On the other hand, support is high when the institution implements equal payoff allocations: the asymmetric institution seems perfectly acceptable for heterogeneous player types, as does the symmetric institution for homogeneous types. In both cases, more than 90% of all votes are in favor of the implementation.

With respect to the sum of monetary payoffs, we observe that efficiency is always lower when institution formation failed than when the institution was implemented. The symmetric institution for homogeneous player types performs best (average efficiency is above 90% of the maximally obtainable sum of payoffs). Compared to this, under heterogeneity both the symmetric and the asymmetric institution lead to lower rates of efficiency, albeit for different reasons. In the former case, average efficiency is lower because the symmetric institution is frequently rejected. In the latter case, heterogeneous

[1] Of course, expected benefits must exceed the costs of implementing the institution. Throughout the paper, we take this for granted by assuming the institution to be costless – notwithstanding that the case of positive costs would be interesting to study (e.g., Kamei et al., 2015).

[2] Throughout the paper, efficiency refers to monetary payoffs.

[3] One could also think of the institution as consisting of two elements: (i) It states a certain obligation for each player, i.e., the exact amount that he is required to contribute in the second stage, and (ii) it installs a deterrent sanctioning technology, i.e., players' contributions are monitored and a player receives harsh punishment when deviating from the required contribution. For reasons of simplicity, the second component is not an explicit part of the experiment. Instead, it is implicitly modeled by restricting a player's choice set in the second stage to the required contribution (see Kosfeld et al., 2009 or Gerber et al., 2013 for similar approaches).

[4] The idea of an initial state of nature that is characterized by sovereign agents in a lawless environment goes back to Rousseau (1762) and Hobbes (1651).

[5] Cooperation in past periods may foster trust and reciprocal behavior among players, which may make them willing to forfeit part of their sovereignty. To give just one example, international organizations, most notably the League of Nations as the precursor of what is now the United Nations, used to apply the unanimity voting rule for voting on matters of substance before World War II. It was only during the post-war growth in international coordination through permanent organizations that non-unanimous voting rules were increasingly applied.