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Analysis

Preferences for government enforcement of a common pool harvest quota: Theory and experimental evidence from fishing communities in Colombia

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ABSTRACT

We examine individual harvesters' preferences for government enforcement of a quota imposed on the exploitation of a common pool resource. We develop a model of Nash behavior by identical risk neutral harvesters to explain individual equilibrium preferences for enforcement of an efficient harvest quota. If the quota is not enforced well, we demonstrate that individual harvesters will always prefer increased enforcement—either increased monitoring or increased penalties—of the quota. We conduct a test of this theoretical result with data from framed common pool resource experiments conducted in artisanal fishing communities in three regions of Colombia. Subjects were given the opportunity to express their preferences for enforcement by voting on two levels of enforcement of a harvest quota, with and without communication. The two enforcement strategies involved the same probability that the government would audit individual harvesters, but differed in the level of the penalty for noncompliance. Contrary to theory, individuals voted for the lower inefficient penalty about 80% of the time and groups implemented this weaker enforcement strategy over 90% of the time. Giving subjects the opportunity to vote on the enforcement strategy did not lead to more efficient harvests, nor did allowing subjects to communicate before voting.

1. Introduction

The standard externality resulting from the exploitation of common pool fisheries (and other common pool resources) is that individual harvests increase the costs of other harvesters. Consequently, noncooperative and unregulated exploitation of a fishery is generally inefficient. In many cases, therefore, government regulation of common pool resources is justified. Of course, all regulations must be enforced. Thus, the efficient design of a common pool regulation must include efficient enforcement strategies to counteract harvesters' incentives to violate a regulation and to account for the costs of enforcement. However, many fisheries' regulations are poorly enforced (Dolsak and Ostrom, 2003), especially in the developing world. Potential reasons include the unwillingness of authorities to allocate adequate resources to enforcement and the lack of institutional capacity.

In this paper we analyze, both theoretically and with experimental evidence, one aspect of weak enforcement of common pool fisheries: namely, do individual harvesters prefer stricter enforcement of fishery regulations? This is an important issue because individual harvesters may have opportunities to influence and participate in the design and implementation of regulations, and hence, to express their preferences for weaker or stronger enforcement. Stronger enforcement of a regulation involves a fundamental tradeoff for the individual harvester—stronger enforcement increases the expected costs of noncompliance for an individual, but encourages lower aggregate harvests so that the cost externality associated with harvesting from a common pool is reduced. Which effect dominates will determine whether individual harvesters prefer stronger or weaker enforcement.

Our motivation for studying this aspect of weak enforcement of fisheries' regulations comes from our interest in the efficacy of government regulations of artisanal fisheries in the developing world. Enforcement of such regulations is typically quite weak. Thus, our primary interest is whether small-scale harvesters in a regulated fishery prefer that the government exert more enforcement pressure on these fisheries or if weak enforcement is consistent with their desires.

We begin by developing a theoretical model of identical risk neutral harvesters of a common pool resource to explain individual preferences for enforcement of an efficient harvest quota. We derive an optimal harvest regulation that consists of a harvest quota and a costly monitoring strategy to enforce the quota, given a fixed unit penalty for noncompliance. We then suppose that the quota is imperfectly enforced in the sense that monitoring is not sufficient to induce

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full compliance with the quota, and determine whether individual harvesters prefer increased enforcement. We demonstrate that individual harvesters will always prefer increased enforcement—either increased monitoring or increased penalties—of the quota. The reason is that stricter enforcement leads to lower aggregate harvests, which benefits an individual harvester more than the increase in his or her expected costs of noncompliance.

We test this theoretical result with data from framed common pool resource experiments conducted in three geographically-distinct artisanal fishing communities in Colombia with subjects whose livelihoods depend upon successful management of a shared resource. Subjects in some sessions were given the opportunity to express their preferences for enforcement by voting on two levels of the marginal penalty for violating a harvest quota, one low and the other significantly higher. The harvest quota and the probability that the government would audit individual harvesters were constant for all the treatments. Our theoretical model predicts that the subjects would always vote for the higher penalty, make more conservative harvest choices, and be better off than if the regulation were enforced with the lower penalty.

Contrary to this prediction, subjects and groups were rarely willing to implement the more efficient penalty. In the absence of communication, individuals voted for the higher penalty only about 20% of the time, and as a result, groups implemented this stricter enforcement strategy through majority rule less than 10% of the time. This finding is robust across the three regions. Moreover, giving subjects this opportunity to participate in part of the design of a regulation by voting on the quota violation penalty did not improve the efficiency of harvest choices.[1]

The experimental literature on participation in the design of policies to promote more efficient choices in social dilemmas is mixed. While some researchers have found that voting on certain elements of policies can increase cooperation in these settings,[2] this is rarely the case for subject participation in the design of enforcement. In a common pool resource experiment, Vyrastekova and van Soest (2003) asked subjects to vote on whether to allow an enforcer (an experiment participant) to keep the fines when taking violators to court. An affirmative vote was the efficient choice; however, they found that harvesters infrequently voted to allow the enforcer to keep these penalties, leading to inefficient outcomes. Bischoff (2007) also found that allowing subjects to vote on rules did not lead to improved outcomes. Bischoff's main conclusion is that although subjects often voted for efficient quotas, they were reluctant to support increased monitoring intensity. Consequently, groups that could change inefficient regulations through majority rule voting actually performed worse than groups who were not given this opportunity.

In a public goods experiment, Tyran and Feld (2006) compare the effects of an exogenously-imposed regulation that required each person to contribute all of her endowment to the public good vis-à-vis allowing subjects to vote on the implementation of this regulation. In both scenarios, the regulation was backed by perfect monitoring and a penalty for all violations of this requirement. Their main conclusion is that compliance is significantly greater when the subjects voted to implement a regulation with a sanction that was too low to induce full compliance. Our experiments, as well as those of Vyrastekova and van Soest (2003) and Bischoff (2007), are fundamentally different from Tyran and Feld's because their subjects voted on whether to impose a regulation. In our work, subjects voted on the severity of sanctions, given that a regulation would be imposed. Thus, Tyran and Feld do not address the question of individual desires for increased enforcement that is the goal of our study. Moreover, the penalty in Tyran and Feld's work is imposed with certainty in cases of noncompliance, whereas our penalties are imposed randomly because monitoring to detect noncompliance is imperfect.[3] These authors took a similar approach in a separate experimental study of tax compliance and found similar results; specifically they found that compliance was higher when subjects voted to accept a certain fine for noncompliance than when the fine was exogenously imposed (Feld and Tyran, 2002).

The study that is closest to ours is by Alm et al. (1999) who studied voting on the enforcement parameters of an income tax policy (tax rate, audit rate and fine). They also found that subjects were unwilling to vote for stricter enforcement. When subjects could not communicate, they always voted against stricter enforcement, both increases in audit probabilities and increases in the fine for evaded taxes, even in treatments in which it was efficient to do so. The subjects sometimes voted for increased enforcement when they could communicate with one another. Moreover, when the subjects voted for weaker enforcement, compliance rates decreased significantly. Alm et al. (1999) suggest that voting against stronger enforcement sends a signal of social acceptability of tax evasion.

In summary, while other researchers have found that subject participation in the decision about whether to enforce an external regulation may lead to more efficient choices (Tyran and Feld, 2006), it is clear that participation in the decision about the *level* of enforcement does not (Alm et al., 1999). We come to the same conclusion, but our work is the first to examine this issue in a field setting. The subjects in our experiments are mainly fishermen who operate under poorly enforced regulations or are intimately connected to a local fishery in other ways. Thus, the overexploitation of common pool resources and the (in)effectiveness of government regulations designed to promote efficient harvests are critically important to the subjects in our experiments. Moreover, we exploit the heterogeneity of the field by conducting our experiments in three regions of Colombia in communities that are dependent on a local fishery, but that vary in other ways. In each area we find the same general result: subjects are unwilling to vote for stricter regulatory enforcement, even when it would be in their best interests (both individually and collectively) to do so. Thus, we demonstrate that results obtained in laboratory experiments about the inefficiency of allowing subjects to vote on enforcement extend to artisanal fishing communities in Colombia.

2. Individual Preferences for Enforcing a Common Pool Harvest Quota

Our experimental design is based on a model of behavior by risk neutral harvesters who face a harvest quota that they may violate. The model is a static one that is similar to the model developed by Cornes and Sandler (1983), and used in experimental work by Ostrom et al. (1994), among others. A fixed group of n identical risk neutral individuals harvest a common pool resource. Individual i harvests x_i units, which sell at a constant price p. The individual's harvest costs are $c\sum_{i=1}^{n} x_i + dx_i\sum_{i=1}^{n} x_i$, where c and d are positive constants. By defining $x_{-i} = \sum_{j\neq i} x_j$, we can write i's harvest costs more compactly as $c(x_i + x_{-i}) + dx_i(x_i + x_{-i})$. These components of the cost function capture the social dilemma of the model: $dx_i(x_i + x_{-i})$ captures

[1] In many common pool field experiments like ours, subjects tend to be more conservative than predicted by models of purely self-interested harvesters (e.g., Cardenas et al., 2000; Velez et al., 2009). We find this result in our study as well.

[2] For example, both Walker et al. (2000) and Margreiter et al. (2005) find that voting on the allocation rules for a common pool resource substantially increased efficiency relative to a baseline with no opportunity for collective choice. Similarly, voting on the possibility of rewarding or punishing other group members tends to increase cooperation (Ostrom et al., 1992; Sutter et al., 2010).

[3] Cardenas' (2005) experiments are similar to Tyran and Feld's (2006), although he focused on a common pool resource environment and his main objective was to examine possible differences in the decisions made by university students in Bogotá, Colombia and field subjects in rural areas of Colombia. He finds that, in the majority of the cases, participants in rural areas opposed external regulation but students in urban areas normally voted in favor of regulation.