



IEL PAPER IN COMPARATIVE ANALYSIS OF
INSTITUTIONS, ECONOMICS AND LAW NO. 21

The Perils of Government Enforcement

**Rustam Romaniuc, Katherine Farrow,
Lisette Ibanez, Alain Marciano**

February 2016

This paper can be downloaded without charge at the IEL Programme - Institutions Economics and Law Working Paper Series <http://www.iel.carloalberto.org/Research-and-Publication/Working-papers.aspx> or <http://polis.unipmn.it/index.php?cosa=ricerca,iel>

THE PERILS OF GOVERNMENT ENFORCEMENT*

Rustam Romaniuc[†], Katherine Farrow[‡], Lisette Ibanez[¶], Alain Marciano^{||}

forthcoming in *Public Choice*

Abstract

An important part of the debate about self vs state-governance involves a discussion about enforcement mechanisms. While some scholars argue that private enforcement mechanisms work sufficiently well in supporting cooperation, others cite the downfalls of private mechanisms so as to legitimize government enforcement. This paper focuses on the interplay between government and private enforcement mechanisms. Using an experimental approach, we demonstrate two results. First, we show that government enforcement, in the form of a centralized monetary punishment in our experiment, can be useful if aligned with and implemented after a private form of enforcement, namely peer disapproval. However, our second result suggests that the removal of government enforcement leads to a substantial decrease in overall cooperation levels – cooperation levels are higher under private enforcement when subjects had never experienced government enforcement compared to when they had been exposed to government enforcement. Specifically, the removal of government enforcement undermines the power of the remaining private enforcement mechanism to affect the behavior of free-riders.

Keywords: Self-governance, private enforcement, peer control, government enforcement, public goods

JEL codes: C92, D70, H41, K42

*We thank Christoph Engel, Yuval Feldman, Remi Gaultier, Sven Hoeppe, David Masclot, David Rand and Jeroen van de Ven for their helpful comments at various stages of this work. This paper also benefited from comments by the participants at the ETH Workshop on Social Norms and Institutions, the Montpellier Experimental Economics Workshop, the 2015 French Association for Experimental Economics meeting (PSE), and the MetaLawEcon Workshop at the Amsterdam Center for Law and Economics. We thank Dimitri Dubois for programming the experiment. We are grateful to the French Agency for the Energy and Environmental Management (ADEME) for its financial support.

[†]Corresponding author. *E-mail address:* rustam.romaniuc@gmail.com

[‡]University of Montpellier – LAMETA and University of Turin – IEL

[§]University of Montpellier, LAMETA

[¶]INRA, LAMETA

^{||}University of Montpellier, LAMETA

1 Introduction

A discussion of the merits and limits of self-governance necessarily takes place along two dimensions. First, it must bear on the possible emergence of cooperation norms. The question is whether norms can emerge spontaneously from repeated interactions between individuals or if norms must be created explicitly by the state.¹ Second, one must also consider which type of enforcement – private or governmental² – is required for individuals to comply with rules of conduct. Here, the specific question is whether private parties are able to devise mechanisms and institutions to ensure compliance with rules without the need of “the backing of state authority” (Benson 1991).

With regard to these two sets of questions, there is a vast literature³ showing that self-governance works, and that it has been pervasive throughout human history. Admittedly, rules of conduct did not emerge only from private interactions but compelling evidence suggests that they were also implemented successfully through private enforcement mechanisms. Examples range from primitive societies (Benson 1989, 1991a, 1991b), ancient Greece (Karayiannis and Hatzis 2012), medieval Ireland (Peden 1977) and Iceland (Friedman 1979; Solvasson 1993), and across diverse groups such as Maghribi traders (Greif 1989, 1993), the American West in the 19th century (Anderson and Hill 1979), pirates (Leeson 2007a, 2009a, 2009b, 2014a), and prison gangs⁴ (Sobel and Osoba 2009; Leeson and Skarbek 2010). Contemporary societies have also

¹It has been shown that conventions, customs or social norms do emerge spontaneously from the repetition of interactions between individuals (Sugden 1986; Josselin and Marciano 1995, 1997). Critics of the spontaneous emergence of norms argue that there is no reason to assume that individuals will engage in interactions with others if the environment is not peaceful. In other words, norms are a public good and self-interested individuals have no incentives to contribute to their creation, which implies that norms must be created by the state (see, e.g., Sened 1997; Aviram 2004).

²Private enforcement mechanisms may be decentralized (such as shaming) or centralized (such as private judicial institutions). What these enforcement mechanisms have in common is that they are private – i.e., non-governmental. One should not necessarily equate private with decentralized (also referred to as informal) enforcement. The literature on self-governance refers to both private centralized/formal and private decentralized/informal enforcement mechanisms (see Leeson 2007a, 2009c, 2013). Other examples of private enforcement institutions in the literature on self-governance have less clear categories (see, e.g., Leeson 2014c, 2007b). In this paper, a private enforcement mechanism is characterized when the individuals affected by an offender’s behavior take it upon themselves to enforce a rule of conduct through the expression of disapproval. Government enforcement is characterized when punishment is top-down/centralized. However, one should not necessarily equate centralized or top-down punishment with governmental mechanisms. We thank one referee and the associate editor of the journal for having raised this important distinction.

³Recent works along these lines are Leeson (2014b), Stringham (2005, 2015), and Stringham and Powel (2009).

⁴Even more remarkable is the case of outlaw societies, such as pirates or prison gangs. Indeed, rule compliance in

been included in this literature (Benson 1990; Ellickson 1991; Bernstein 1992; Leeson 2013). Private enforcement mechanisms in these instances often take the form of expressive punishment, such as social disapproval and gossip, among those with whom the individual interacts (Guala 2012).

If private enforcement thus appears to work sufficiently well, one may wonder: what is the usefulness of government enforcement? This is precisely the question that we address in this paper. Given evidence that private enforcement mechanisms are widespread, we seek to understand the benefits and costs of a government enforcement mechanism in the presence of private enforcement that is already in place. Specifically, we study the effects of adding and removing a government-like enforcement mechanism – in the form of centralized monetary punishment – on individual compliance with a cooperation norm that is created and enforced via peer disapproval.⁵ Our analysis begins by establishing a private enforcement mechanism, namely peer control *via* peer disapproval, and proceeds by examining how the addition and removal of government enforcement impact cooperation levels and the effectiveness of private enforcement.

To do this, we build on a firmly established paradigm from experimental economics, the public good game that we present in Section 2. Our two main results are presented in Section 4. First, we confirm that implementing government enforcement that is aligned with a pre-existing cooperation norm stabilizes contributions to the public good over time. Our second finding, however, is less favorable regarding the impact of a government enforcement mechanism on the effectiveness of pre-existing privately enforced norms. We show that there exists a crowding-out effect or a sort of double “stickiness” regarding the post-intervention effects of government enforcement.⁶ Our results suggest that once individuals have been exposed to government enforcement, this enforcement cannot be removed without reducing cooperation levels and damaging the effectiveness of the private enforcement mechanism in the process.

The existing literature, presented in Section 3, struggles to explain how the removal of government enforcement may negatively impact contributions to a public good. We complement these groups can only be ensured privately, precisely because these groups are outside of the law. As a related point, Fleury and Marciano (2014) provide an analysis of private-governance among the undead.

⁵Indeed, we do not envisage the replacement of a private enforcement mechanism with a government enforcement mechanism, but rather analyze the effects of adding government enforcement to complement the private enforcement mechanism.

⁶Stringham (2015, pp. 195-200) also emphasizes the risk that government might crowd-out private governance. In our experiment, the crowding-out is the consequence of removing government enforcement mechanisms.

the existing literature by showing that removing government enforcement, in the form of a centralized monetary punishment, makes low contributors unresponsive to the private enforcement mechanism of peer disapproval that remains in place.

2 Experimental design

2.1 Experimental game

We use a public good game that represents a stylized model of a community in which each person's well-being depends on own and other persons' contributions. Individually, each member is best off if he or she contributes nothing and relies on others' efforts to create social benefits by behaving cooperatively. Thus, the public good game provides the closest scenario to real-life settings when some kind of coercion by the state may, a priori, increase social welfare.

The basic structure of our experimental game follows the well-established design of a repeated linear public good game employing standard parameters. Ledyard (1995) and more recently Chaudhuri (2011) provide elaborate descriptions of how public good games are implemented. In our experiment, groups are composed of $n = 4$ subjects. Each subject is endowed with $E_i = 20$ tokens at the beginning of each period, which must be allocated to either a public account (g_i) or left on subject's private account (c_i). Each participant i must make a contribution decision g_i ($0 \leq g_i \leq 20$). Contributions are made in whole tokens, simultaneously and without any communication. In the Baseline, each token left on the private account generates a benefit equal to 1 Ecu. In addition to the tokens kept on the private account, each participant receives a fixed benefit, $\alpha = 0.4$ Ecus, from the *total* group contribution to the public account, where $0 < \alpha < 1 < n\alpha$. Thus, the individual payoff function (π_i) is the following:

$$\pi_i = 20 - g_i + 0.4 \sum_{j=1}^4 g_j$$

The value provided to individuals by the public good is a linear function of how much of the public good is provided. From $1 < n\alpha$ it follows that the Utilitarian optimum and the efficient symmetric outcome is for all group members to contribute their entire endowments to the public account. This would, in effect, maximize the gains at the group level (which correspond to $n\alpha$). However, at the individual level (assuming pure self-interest), each subject is better off from contributing zero to the public account.

In our experiment, each session is composed of three segments of ten periods each. In the first segment of each session (periods 1-10), which corresponds to our Baseline, we implement these standard parameters. In the second and third segments, our experiment differs, however, from standard public good games along two main dimensions.

The first dimension we manipulate is the strategic environment within which subjects make decisions. In our Government enforcement treatment (hereinafter GE), subjects are informed that 0.3 Ecus will be subtracted from the private account for every token not allocated to the public account. The payoff function in the GE treatment is given by

$$\pi_i = E_i - g_i + \alpha \sum_{j=1}^n g_j - s_i(E_i - g_i)$$

This setup implies that while in the Baseline the return from each token left on the private account was 1 Ecu, this return is reduced to 0.7 Ecus in the GE treatment. The intensity, framing, and implementation of the subtraction rule were chosen so as to replicate three specific characteristics of punishments meted out by state authorities. First, the monetary punishment of offenders is typically mild (Engel 2014). Also Ostrom et al. (1992) note that many successful communities had frequently recourse to mild monetary punishment. In order to implement a mild punishment, we set the subtraction rule so as to ensure that donating zero remains the dominant strategy of money-maximizing individuals, which preserves the nature of the decision as a social dilemma – i.e., one that pits an individual’s interest against the interest of the group. To see why this is the case, consider the individual payoff with our subtraction rule, which yields the following individual payoff function: $\pi_i = 0.7*(E_i - g_i) + 0.4*\sum_{j=1}^n g_j$. While full contributions from every subject in the group yields $\pi_i = 32$ Ecus, contributing zero and paying $s_i = 0.3$ for every token kept on the private account, yields $\pi_i = 38$ Ecus for the free-rider. Thus, a money maximizing individual does not contribute to the public account so long as $s_i < 1 - \alpha$.

Second, the punitive nature of the punishments meted out by state authorities is typically clear in real-world settings. Cooter (1984, p.1523) argues that costly governmental punishment is a payment “imposed for doing what is *forbidden*” (emphasis added) rather than “the price of doing what is permitted”. To emphasize the punitive nature of our subtraction rule in the GE treatment, we highlight the fact that Ecus are subtracted when individuals deviate from the action that benefits the group, i.e., when they keep tokens on their private account and therefore do not place them in the public account. Specifically, the instructions read that 0.3 Ecus

are subtracted from tokens not allocated to the public account.⁷ In public good experiments, it is generally assumed that group members share the understanding that the desirable action of each individual is one that favors the interest of the group and that deviations from this action are undesirable (see, e.g., Andreoni and Gee 2012). Our GE treatment makes salient this contribution norm by emphasizing that keeping tokens on the private account constitutes deviations from the group desirable outcome and that these deviations have monetary consequences. We avoid using words such as tax, punishment, or sanction in order to minimize experimenter demand effects (Zizzo 2010) and avoid the possibly varied connotations that participants may attach to this vocabulary.

Third, to mimic centralized government enforcement, we make it clear to participants that the subtraction rule is applied by the central computer. Because the legitimacy of enforcement figures has been shown to play an important role in public goods experiments with punishment opportunities (Baldassarri and Grossman 2011), we wish to minimize the possibility that the punisher is seen as illegitimate. Thus, while some recent experiments (e.g., Engel 2014) used a randomly selected subject to act as the punishing authority, we elect to deliver punishment in this treatment through the central computer as the experimenter is most likely to be seen as a legitimate authority (Milgram 1963; Karakostas and Zizzo 2015).

Our second treatment, the Peer enforcement treatment (hereinafter PE), was implemented in the following manner. This treatment adds a second stage to the standard linear public good game. In this stage, we introduce the option for group members to send disapproval points to each other. Following Masclet et al. (2003), each participant is given the opportunity to assign between zero and ten disapproval points to any other member in the same group if he or she is dissatisfied with the other's contribution in a given period. Thus, the number of points sent represents the level of disapproval of a subject's contribution. As such, they are not costly, in monetary terms, to send or receive – similarly to gossip or to facial expressions that indicate disapproval of someone's conduct. An assignment of zero points indicates the absence of disapproval, while ten points indicate the highest level of disapproval. The functioning of the sending of disapproval points was explained to subjects by the following message:

In this stage you have the opportunity to register your approval or disapproval of each other group member's decision by distributing points. **You can award a large number of points to any member of your group if you disapprove of his or**

⁷Romaniuc (2016) found that this way of presenting a punishment expresses cooperation norms.

her decision: 10 points for the strongest disapproval, 0 points for the absence of disapproval. You may distribute any whole number of points between 0 and 10.

Finally, we combine the two dimensions – i.e., GE and PE treatments – in a third treatment, which we conceptualize as the Combined enforcement treatment (hereinafter CE).

2.2 Procedures

The experiment consists of eight sessions conducted at the Laboratoire Montpellierain d'Economie Theorique et Appliquee (LAMETA) in Montpellier, France, between March and September 2015. Twenty subjects participated in each session (with 16 in one session), for a total of 156 participants (54.49% were females), invited via the ORSEE software (Grenier 2004). Seventy-nine percent of the subjects were students at one of the universities in Montpellier and 22.3% of them were studying economics. Nine out of ten subjects participated previously in a laboratory experiment. We ensured, however, that none had participated previously in an experiment with similar parameters. Terminals were separated by lateral partitions to ensure complete anonymity. Payments were made privately at the end of the session. The exchange rate was 15 Ecus = 1 euro. Subjects earned an average of 22 euros. Sessions lasted between 1.5 and 2 hours, including initial instruction and payment of subjects.

At the outset of each session, subjects were informed that the central server would allocate them randomly to groups of four people. We employ partner-matching, so group assignments remain the same for the entire session. Each session consists of 30 periods, divided into three segments of ten periods. The total number of segments in the session was common knowledge, as was the fact that at the end of the experiment only one segment out of the three was to be chosen at random for payment. This procedure has been used by others in public good games, e.g., Andreoni and Miller (2002) and Goeree et al. (2002). Goeree et al. (2002) argue that paying for all decisions may provide stronger incentives, but paying only for some decisions may induce subjects to think more clearly about the payoff consequences of each decision rather than focus on the relative earnings aggregated over all decisions. This design allows us to avoid the problem of whether subjects are influenced by their cumulative earnings and thus care less about the consequences of their decisions in the last periods of the game.

In each session, subjects first played ten periods of a standard public good game, which corresponds to our Baseline. The same subjects then played another ten periods in either the GE, the PE, or the CE treatment. All subjects played the first ten periods under Baseline conditions

in order to provide groups the opportunity to become accustomed to significant degrees of free-riding. This creates a challenging environment for each of our treatments employed in the second segment of the session.

The addition of a third segment allows us to examine the sequential effect of adding the GE treatment to groups that previously had been accustomed to peer disapproval under the PE treatment and vice versa. Also, the third segment allows us to compare two scenarios: one in which PE is the only mechanism that subjects experienced, both in the second and third segments versus a scenario in which PE had been supported by GE in the second segment but the latter was dropped in the third segment, leaving PE as the only way of sustaining cooperation norms.

Table 1 provides detailed information about the described treatments, the number of sessions for each treatment, and the segment in which each treatment was implemented.

Table 1: Experimental treatments

| Sessions | Subjects | Groups | Segment 1 | Segment 2 | Segment 3 |
|--------------|----------|--------|-----------|-----------|-----------|
| Sessions 1-2 | 40 | 10 | Baseline | GE | CE |
| Sessions 3-4 | 40 | 10 | Baseline | PE | CE |
| Sessions 5-6 | 36 | 9 | Baseline | PE | PE |
| Sessions 7-8 | 40 | 10 | Baseline | CE | PE |

3 Theoretical background and predictions

3.1 Standard predictions

The traditional game theoretic model tested in most laboratory experiments assumes away the impact that social or internalized norms may have on behavior.⁸ Also, monetary punishments are considered to change behavior only when these are optimal – that is, when option X is made more attractive relative to option Y in monetary terms. Thus, this model predicts that in our PE,

⁸It is important to keep in mind that game theory, in general, is mute about the content of agents' utility. The experimental literature testing game theoretic predictions chose to use self-regarding preferences in formulating the standard Nash equilibrium (see Cox 2004). It is, however, possible to include a preference for others' income in agents' utility functions and then apply Nash or subgame perfection to the resulting game.

GE, and CE treatments, none of the subjects will contribute to the public good.

Why is this? In our Baseline, it can easily be seen that the dominant strategy Nash equilibrium is for all subjects to keep all 20 Ecus in their private account and contribute nothing to the public account. In equilibrium, this yields a gain of 80 Ecus at the group level. Alternatively, if all group members contributed their entire endowments to the public account, the individual gain would be 32 Ecus and total group earnings 128 Ecus. This corresponds to the Pareto optimal outcome – the outcome that maximizes total group earnings. However, as is well-known, a rational money-maximizing agent would benefit from deviating from this strategy in favor of complete free-riding, hoping for a private gain of 44 Ecus. Since the game is symmetric, this is the strategy adopted by everyone and each subject ends up with 20 Ecus – their initial endowment.

In our PE, GE, and CE treatments, the subgame perfect equilibrium is the same as in the Baseline treatment. This is because peer disapproval is payoff-irrelevant and the monetary punishment is non-deterrent in terms of the benefit-cost ratio. Contributions should not be affected by the introduction of either of these treatments. This is also what we should expect under the combination of the two.

In contrast to these predictions, however, repeated public good experiments employing parameters similar to our Baseline have shown that subjects contribute about 40% of their endowment in the first period and then reduce their contributions to reach virtually the game theoretic prediction in the last periods of the game (see Gaechter 2014). We should therefore expect subjects in our Baseline to behave differently than the game theoretic predictions presented above. Further, any impact of our key treatments – PE and CE – relative to the Baseline must be attributed to behavioral factors such as the desire to avoid peer disapproval, and its reinforcement or reduction by a government-like enforcement mechanism.

3.2 Peer disapproval as a private norm-enforcement strategy

Private enforcement can take many forms. In this paper, we study a decentralized mechanism based on the use of peer disapproval.

A great deal of evidence exists regarding how peers enforce cooperation norms in field settings. Field evidence, however, is often difficult to interpret, and limited control over experimental interventions in field settings means that measuring the interplay between peer enforcement and other types of enforcement can be problematic. It is for this reason, for example,

that the crowding-out of social disapproval in Gneezy and Rustichini's (2000) seminal paper is proposed as only one among other possible explanations for their results. For instance, the willingness to express disapproval in real-life settings may be influenced by factors such as the belief that those receiving disapprobation could retaliate (Nikiforakis 2008).

Laboratory experiments are therefore needed to control the expression of peer disapproval so as to establish its causal impact on those receiving disapprobation. Laboratory experiments have indeed helped to clarify the extent to which peers voluntarily enforce cooperation norms in groups. One robust experimental finding is that individuals are willing to enforce norms that support cooperation even when doing so is costly (for a survey of the literature, see Gaechter and Herrmann 2009). In most field settings, however, peer enforcement manifests in low or zero-cost behaviors such as ridicule, social disapproval, and gossip⁹ (Boehm 1999; Feinberg et al. 2012). Ostrom et al. (1992) made the first attempts to design a laboratory experiment to study norm enforcement by peers. In the context of a common-pool-resource game, they show that people use "shaming" as a strategy to try to induce others to comply with what they consider to be appropriate conduct. The shaming strategy led to substantial improvement in cooperation levels. Gaechter and Fehr (1999) sought support for this outcome in the context of a public good game. They found, however, no impact of social approval and disapproval. Their design, nonetheless, neglects an important feature of real life human interactions – in their experiment, approval or disapproval was not communicated directly from peer to peer. An experiment that allowed subjects to communicate directly their disapproval is Masclet et al. (2003). The authors found that simply giving to subjects this opportunity increases compliance with cooperation norms. They explain this result by the fact that social disapproval instills shame and increases the psychological cost of selfishness. Subhasish (2013) and Nelissen and Mulder (2013) followed and confirmed the seminal result from Masclet, Noussair, Tucker, and Villeval. Since our PE treatment is based on Masclet et al. (2003), we expect to find similar results. Thus,

Hypothesis 1. *Providing subjects the opportunity to express disapproval of others' decisions is an effective strategy for creating and enforcing cooperation norms.*

⁹Dunbar (2004) estimates that gossip constitutes 65% of all spoken communication. On gossip, see also Giardini (2012), and Giardini and Conte (2011).

3.3 The interplay of private enforcement and government enforcement

Once cooperation norms have emerged and are privately enforced, government enforcement mechanisms may improve, reduce or leave unaffected cooperation levels. To formulate our hypotheses about how these two forms of enforcement might interact in our experimental setting, we refer to the existing literature on the complementarity or substitutability of added government enforcement, as well as the lasting effects associated with the government enforcement once it is removed.

Adding government enforcement Analyses concerning the interplay between government and private enforcement address the efficacy of government enforcement with and without the private support of members of the society. Spontaneous order theorists urge public authorities to be cautious when implementing new rules (Boettke et al. 2008; Williamson 2009). As Boettke et al. (2008) emphasize, a sort of institutional stickiness exists whereby the effectiveness of government-enforced rules is improved if rule-makers take into account the importance of the temporal context in which these rules are implemented – specifically, the importance of privately enforced norms as precedents for government enforcement. For instance, the French Civil Code, the Code Napoleon, worked because it was based on and wrote down the customs that preceded it (Josselin and Marciano 2002). The role of private enforcement is also emphasized by the law-and-economics of norms literature (McAdams 1997; Feldman 2009), which argues that punishment meted out by government authorities may strengthen the private enforcement of cooperation norms because government enforcement mechanisms indicate and legitimize these norms (Sunstein 1996; Cooter 1998). Enacting a law prohibiting littering, for instance, may induce people to expect to have to pay for non-compliance. In addition, it could induce people to expect to be a target of ostracism from others in their community to a greater extent than before if they are caught littering. In the absence of any legal statement about littering, however, the expectation of ostracism may be reduced, suggesting that government enforcement legitimizes private enforcement, serving as a signal that peer punishment of non-compliance is “backed” by the government.

The experimental literature on the effectiveness of government-like enforcement mechanisms, however, does not provide clear results. While some studies find evidence that punishment meted out by central government-like authorities can “reinforce” peer control, others find that the former crowds-out the latter, or has no effect. The reinforcement hypothesis is supported, for instance, by Andreoni and Gee (2012) and Xiao and Houser (2010), who found

that government-like enforcement reinforced cooperation norms, especially when the punishment was applied publicly. This finding is supported by Baldassari and Grossman (2011) who analyze how centralized punishment affects cooperation in the context of a public good game. They conducted a lab-in-the-field experiment with small groups of farmers in order to study the effectiveness of a monetary punishment when the punishing authority is seen as legitimate. In field settings such as this, it is reasonable to assume that behavior is inherently driven by social norms (see Ellickson's 1992 study of norms governing farmers and ranchers in Shasta County, California). In contrast, Gneezy and Rustichini (2000), in their famous field work, found imposing a fine on parents who are late to pick up their children from day care may in turn reduce parents' expectations of receiving non-monetary punishment, such as disapproval, from day-care center employees. The situation studied by Gneezy and Rustichini (2000) more closely parallels a principal-agent relationship rather than a social dilemma, however, which leads us to base our Hypothesis 2 on results found by Baldassari and Grossman (2011), who used a public good experiment, as we do in this paper.

***Hypothesis 2.** Since the experimenter is most likely seen as a legitimate authority, the introduction of punishment delivered through the experimenter should enhance the legitimacy of peer disapproval and result in increased cooperation.*

Removing government enforcement The lasting impacts associated with removing government enforcement have received only limited attention within economics. Nelissen and Mulder (2013) performed an experiment that is of particular interest to our work. They compare contributions after the removal of monetary sanctions to the situation when peer disapproval is abandoned and find that levels of cooperation decline more after the removal of monetary sanctions than after the removal of peer disapproval. Notwithstanding the interesting implications from their work – in particular that monetary sanctions improve cooperation when they are in place but have a rather negative impact once removed – their experiment, however, does not tell us how removing monetary sanctions may impact the effectiveness of a peer system of disapproval that may remain in place.¹⁰ Stagnaro et al.'s (2016) experimental study may provide new insights into this question. They find that a centralized punishment institution

¹⁰Another major difference with our study is that Nelissen and Mulder (2013) use peer-monetary punishment whereas in our experiment the punishment is centralized.

positively affects cooperation even when it is removed, but does not affect subjects' willingness to enforce a cooperation norm privately. Conversely, Peysakhovich and Rand (2015) find that post-centralized punishment positively affects private enforcement levels. It is worth noting that both Stagnaro et al. (2016) and Peysakhovich and Rand (2015) investigate subjects' willingness to enforce norms of cooperation, which is different from studying the reaction of those who are punished by one's group fellows. Although our experiment sheds light on the two dimensions, we focus more on the latter aspect.

The hypothesis that removing government-enforced sanctions might cause a significant change in people's behavior has been also tested empirically by Funk (2007). Using observational data from a natural experiment, Funk demonstrated that the removal of the legal obligation to vote that had been enforced by symbolic (less than \$1) fines had a significant negative impact on voter turnout in some Swiss Cantons. However, Funk (2007) does not investigate the link between the removal of government-enforced sanctions and the working of private enforcement.

Our experiment allows us to test whether the removal of government-enforced sanctions negatively impacts the effectiveness of the private enforcement that remains – namely, social disapproval. Hence, our Hypothesis 3 is as follows.

***Hypothesis 3.** We hypothesize that the removal of a government-like mechanism of punishment should signal that those who express high levels of disapproval are no longer backed by the authority that previously implemented the punishment. The reduced effectiveness of private enforcement, in turn, should negatively impact cooperation levels.*

4 Results

The presentation of the results is divided into three parts. First, we answer the question whether peer disapproval – our PE treatment – is an effective mechanism for creating and enforcing private cooperation norms. Second, we investigate whether adding government-like enforcement in the form of a monetary punishment – our GE treatment – to a pre-existing system of peer disapproval improves cooperation. Third, we address whether removing government enforcement undermines the power of peer disapproval to change the behavior of low contributors – which corresponds to the transition from our CE treatment to our PE treatment.

4.1 Does peer disapproval create and maintain cooperation norms?

Table 2 provides detailed information about average group contributions by treatment and by segment.

Table 2: Average contributions to the public good by treatment and by segment

| Segment 1 periods 1-10 | Segment 2 periods 11-20 | Segment 3 periods 21-30 |
|----------------------------------|-----------------------------------|-----------------------------------|
| Baseline | GE | CE |
| 6.40 (2.31) | 10.59 (3.48) | 11.87 (3.65) |
| Baseline | PE | CE |
| 4.81 (2.13) | 8.31 (6.22) | 11.56 (6.61) |
| Baseline | PE | PE |
| 5.98 (1.79) | 8.59 (2.78) | 9.31 (5.18) |
| Baseline | CE | PE |
| 4.10 (3.04) | 12.49 (3.49) | 3.81 (3.65) |

Note: Average contributions are reported at the group level, with standard deviations in parentheses.

The first question we investigate is whether, in the absence of any explicit change in the benefit-cost ratio, higher contribution rates can be sustained by the expression of peer disapproval alone. To do this, we examine how subjects behave under the PE treatment compared to the Baseline. It is important to note that the same subjects transit from a state in which there is no punishment – i.e., our Baseline in segment 1 – to a state in which each group member has the possibility of sending disapproval points to any other group member if he or she is dissatisfied with the other’s contribution decision. Such a design makes it more difficult to obtain a significant impact of peer disapproval than in the original study by Masclet et al. (2003) because we do not compare treatments in the same periods or segments. In other words, the Baseline always precedes the PE treatment.¹¹

¹¹As we know from the existing literature in experimental economics, average contributions decline significantly

Table 2 indicates that average contributions are substantially lower in periods 1-10 under the Baseline than in periods 11-20 under the PE treatment. If we pool the data from the sessions in which the Baseline is in the first ten periods and the PE treatment is in effect in periods 11-20 (this is the case in four sessions), then we obtain an average contribution of 5.36 in the Baseline and of 8.45 under the PE treatment¹². A Wilcoxon signed-rank test shows that this difference is significant at conventional levels¹³ ($z = 2.156, p < 0.05$). Thus,

***Result 1.** The expression of peer disapproval has a positive and significant effect on average contribution levels. Peer disapproval is therefore an effective strategy to privately create and enforce norms of cooperation even when retaliation between agents is impossible.¹⁴*

4.2 How does the addition of government enforcement affect cooperation?

The evolution in average contributions when the GE treatment was introduced after peer disapproval is shown in Figure 1.

[Insert here Figure 1]

To answer the question whether the addition of GE to PE in the third segment improves cooperation, it was necessary to design a treatment in which PE is the only mechanism in place across both segments two and three in order to compare it to a scenario in which GE is added in segment three. It is evident that the combination of PE with GE – referred to as the CE treatment in Figure 1 – results in higher average contributions than when peer disapproval remains the only enforcement mechanism in the third segment. This outcome is shown in Table 1. When over time (see Keser and van Winden 2000). Consequently, we might reasonably expect lower contribution levels in our second segment compared to the first, *ceteris paribus*. However, if with this design, we can show that peer disapproval creates and sustains cooperative behavior, then this is the strongest kind of support one could obtain for the existence of norm-driven behavior backed by peer control. In doing so, we identify the lower bound of the PE treatment.

¹²The reason we can pool the data from these four sessions for segment 1 and 2 is that we always have the Baseline in the first 10 periods and the PE in periods 11-20 and the Mann-Whitney ranksum test indicates that we cannot reject the null hypothesis that the means are drawn from the same distribution.

¹³The null hypothesis is that the means are drawn from the same distribution. We treat average contributions of each four-person group as a single independent observation.

¹⁴In effect, we constantly varied the order according to which each subject's decision was presented to the other group members, thus rendering even non-costly retaliation impossible (see the experimental instructions in the online supplementary materials – B).

the PE treatment is the only enforcement mechanism in periods 21-30, subjects contribute on average 9.31 tokens over these periods, compared to 11.56 tokens when GE is added to PE over the same periods. However, a Mann-Whitney ranksum test indicates that this difference is not significant ($z = 0.817$, $p = 0.41$).

Since from a statistical point of view we cannot reject the hypothesis that similar levels of cooperation are achieved with and without GE, does this imply that government enforcement is not worthwhile? To fully address this question, we explore the impact of government enforcement beyond its impact on aggregate contribution levels. In real-world enforcement scenarios, the stability of cooperation rates over time is of considerable importance.¹⁵ For instance, Figure 1 suggests that our PE treatment in segment three fails to maintain high contribution rates over time. However, we do not find any evidence of a similar decay in segment three of the treatment in which GE is added to PE. We explore this outcome statistically by comparing average contributions in the first five periods of segment three to average contributions in the last five periods of the same segment when GE is added to PE.¹⁶ We find no evidence of a significant decay in cooperation in segment 3 when GE is added to PE. A Wilcoxon signed-rank test indicates no significant difference in average contributions between periods 21-25 and 26-30 ($z = 0.408$, $p = 0.68$).

This naturally prompts the question whether the combination of private and government enforcement stabilizes contribution rates regardless of the environment in which this combination is employed. In other words, would we still observe such a stable evolution in contributions if the combination of the two enforcement mechanisms was preceded by some other treatment than PE in periods 11-20? To answer this question, we implemented again the CE treatment in periods 21-30 but, this time, preceded by the GE treatment in periods 11-20. It turns out that the environment within which the CE treatment is implemented does matter. In effect, when the combination of PE and GE is used after subjects had been accustomed to GE alone, average contributions are significantly higher in periods 21-25 than in periods 26-30 ($z = 2.701$, $p < 0.01$). Thus,

Result 2. *We find that adding government enforcement to private enforcement prevents contribution rates from decaying over time. However, our results do not support the hypothesis that the combination*

¹⁵Although some types of interventions can result in higher average contributions, many generally fail to maintain those high contribution rates over time (Fehr and Gaechter 2000).

¹⁶In most repeated public good experiments, it is common to detect a clear difference between the first and the last periods of the game (see Keser and van Winden 2000).

of the two types of enforcement increases average cooperation rates.

4.3 Do post-government enforcement effects exist?

We now come to the core question that this experiment raises: does the removal of government enforcement impact the functioning of the private enforcement that remains in place? We hypothesized (see hypothesis 3 above) that the removal of our GE treatment will not simply restore the power of peer disapproval to its initial level, but rather will undermine its ability to change the behavior of those who receive points of disapproval. To test this hypothesis, we compare cooperation rates under the PE treatment in segment three to cooperation rates under the same mechanism and in the same segment, with the only difference between the two being that one was preceded by PE in segment two, whereas the other was preceded by the combination of PE and GE in segment two. In this latter case, the government enforcement introduced at period 11 was removed after period 20, leaving only PE from period 21 to 30. Consequently, the only difference between the two is that in one case subjects had been exposed to government-like enforcement in periods 11-20, but not in the other case.

Figure 1 (see above) shows that removing GE after period 20 results in a reduction in contributions in periods 21-30. Table 2 shows that subjects contribute an average of 3.81 tokens in periods 21-30 under the PE treatment once government enforcement was removed. We compare this to the 9.31 tokens contributed on average by subjects under the same private enforcement in the same segment three, but who previously had not been exposed to government enforcement. The Mann-Whitney ranksum test indicates that the difference between the two is significant at conventional levels ($z = 2.287$, $p < 0.05$).

One explanation for this finding could be that subjects simply stop expressing disapproval once the government enforcement is removed. However, we are able to reject this hypothesis and provide support for our hypothesis 3, i.e., that disapproval points in fact lose their power to change people's behavior. Figure 2 below presents the evolution of disapproval points sent in the PE treatment in segment three that was preceded also by PE in segment two to the PE treatment in segment 3 when it was preceded by the combination of PE and GE in segment two. It is evident that, if anything, subjects express more disapproval in periods 21-30 after having been exposed to GE than when GE had never been introduced. The Mann-Whitney ranksum test indicates that the difference between the average number of disapproval points sent in segment three between these two treatments is statistically significant ($z = 1.993$, $p < 0.05$).

[Insert here Figure 2]

This outcome seems to lend support to our Hypothesis 3 – that previous exposure to government enforcement undermines the power of peer disapproval to change the behavior of those who receive points of disapproval. In order to go further in the testing of this hypothesis, we distinguish between two types of contributors, low and high contributors, as disapproval points may have different effects on those who contribute less or more than the average contribution in their group. Accordingly, we define a low contributor as someone who had contributed less than the mean contribution level of their group in period t .¹⁷ High contributors are those who had contributed more than the mean contribution level of his group in period t . Figure 3 shows that previous exposure to government enforcement does indeed affect in different ways the behavioral response of low and high contributors to receiving disapproval points.

[Insert here Figure 3a and 3b]

Figure 3(a) shows the effect of receiving disapproval points on the change in low and high types' contributions from period t to $t+1$ when subjects **had not** experienced any government-like enforcement. It clearly indicates that high contributors do not change their contribution from one period to the next as a result of disapproval received from their peers. However, low contributors, under the no-exposure to government enforcement, do increase their contribution from one period to the next as the result of disapproval points received. Figure 3(b), on the other hand, shows the effect of disapproval points on the change in low and high types' contributions when subjects previously **had been** exposed to government-like enforcement. It indicates that, when previously exposed to our GE treatment, low contributors are not responsive to disapproval from their peers. However, the effect for high contributors is more nuanced. They contribute substantially lower amounts in $t+1$ when they realize that they contributed more than the group average in period t . Yet, receiving more disapproval points reduces the extent to which they lower their own contributions.

The estimates from the following OLS, shown in Table 3 (Panel A and Panel B), confirm that

¹⁷Someone who contributes less than the average contribution in his or her group reasonably may be considered as breaking a norm since the norm is generally described as the average behavior in one's group, community or society (for a thorough analysis of various accounts of norms, see Bicchieri (2006))

a previous exposure to government enforcement undermines the effectiveness of disapproval points for low contributors:

$$c_i^{t+1} - c_i^t = \beta_0 + \beta_1(\sum D^t) + \epsilon_i$$

The coefficient β_1 measures the effect of receiving disapproval points on subject i 's change in contribution from one period to the next. The model is estimated separately for subjects who contributed less (Low contributors) and more (High contributors) than the mean group contribution in period t .

Table 3: Determinants of changes in contribution

| | Contributions in $t + 1$ under PE without previous exposure to GE | Contributions in $t + 1$ under PE with previous exposure to GE |
|-----------------------------------|---|--|
| PANEL A: LOW CONTRIBUTORS | | |
| Constant | -1.207 (1.365) | -0.456 (2.275) |
| Lagged disapproval points | 0.203*** (0.058) | 0.134 (0.079) |
| R ² | 0.129 | 0.025 |
| Observations | 155 | 171 |
| PANEL B: HIGH CONTRIBUTORS | | |
| Constant | -2.132*** (0.503) | -6.595*** (0.743) |
| Lagged disapproval points | 0.000 (0.055) | 0.275*** (0.040) |
| R ² | 0.020 | 0.188 |
| Observations | 205 | 229 |

Note: Standard errors are in parentheses. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

The β_1 estimates from the Panel A in Table 3 suggest that disapproval points raise contributions for individuals who contributed less than the average only when they had not been exposed to government enforcement; while Panel B suggests that, when previously exposed to government enforcement, receiving more disapproval points reduces the extent to which high contributors lower their own contributions. Thus, the effect from the exposure to government

enforcement is twofold: it undermines the effectiveness of disapproval points for low contributors and it reduces the extent to which high contributors negatively react to the information that they contributed more than the average contribution level in their group.¹⁸

***Result 3.** The removal of government enforcement results in a significant lessening of cooperation rates under private enforcement. This effect is not explained by a reduction in subjects' willingness to express disapproval vis-a-vis the other group members. On the contrary, the number of disapproval points sent is significantly higher with a previous exposure to government enforcement than without this exposure. We find that low contributors are responsive to the receipt of punishment points when previously they had not been exposed to government enforcement, but that once they experienced it, the receipt of disapproval does not change their behavior anymore. For low contributors, a previous exposure to government enforcement crowds-out the effectiveness of peer disapproval to enforce cooperation norms.*

5 Discussion

As we observed in our study, there are benefits but also possible costs from using government enforcement. On the one hand, government enforcement may improve cooperation norms when private enforcement already is in place. On the other hand, removing government enforcement makes low contributors unresponsive to private enforcement. What might explain these two effects?

The most plausible interpretation of our findings is based on a specific approach within the expressive theory of government enforcement. Cooter (2000) distinguishes between the expressive, deterrent, and internalization effects of government enforcement. The expressive effect occurs when government enforcement causes people to adjust their expectations about

¹⁸Another effect from the exposure and then removal of government enforcement concerns the threshold above which subjects raise their contributions from one period to the next. As in Masclét et al. (2003), we find that without previous exposure to government enforcement, subjects raise their contributions when they receive an amount greater or equal to about 15 disapproval points. Recall that the maximum number of disapproval points that one can send is ten. Consequently, receiving ten disapproval points clearly does not count for *social* disapproval – it may indeed indicate that only one, out of three, peers are highly dissatisfied with the contribution of the one who receives points of disapproval. However, receiving 50% of the maximum possible points of disapproval (the maximum being 30) may suggest general agreement that one's contribution was not appropriate. When a government-like enforcement had been in place previously, we find that subjects do not increase the amount they contribute in $t + 1$ even when they receive amounts of disapprobation up to and slightly exceeding 20 points – that is, an amount of disapproval close the maximum possible. This is shown in Figure 4(a) and 4(b) in the online supplementary materials – A.

what constitutes appropriate behavior in a given group, community, or society at large. When this occurs, people interpret governmental measures as an expression of what constitutes one's duty. For instance, Feldman and Tyler (2011) find that employees' adherence to workplace rules is stronger when those procedures are mandated by the government. This argument is also suggested by Benabou and Tirole (2011), who show that government enforcement may affect what people believe they should do in a particular context, and suggest that governmental rules may thus have a normative function.

The literature on the expressive theory of government enforcement further rejects the argument that the removal of government-enforced sanctions will not cause any change in people's behavior when sanctions are mild. Funk's (2007) study, for instance, suggests that as adding a government-enforced sanction reinforces cooperation norms, in a similar way, its removal alters people's perceptions of the significance of contributing to a public good.

In the context of our own experiment, we showed that the addition of government enforcement to private enforcement caused subjects to contribute on average more compared to when private enforcement was the only mechanism in place.¹⁹ However, contributions went down to levels reaching nearly complete free-riding when government enforcement was removed, leaving only private enforcement. This reduction in contributions is unlikely to be caused by the removal of the monetary sanction because our subtraction rule was purely symbolic, i.e., the sanction preserved the nature of the decision as a social dilemma. Rather, we conjecture that the abolition of government enforcement altered people's perceptions of the significance of contributing. It may be the case, as the expressive theories of government enforcement suggest, that before the government enforcement mechanism was removed, contributing was considered the appropriate behavior to be followed, whereas once it was removed, this association was removed along with it.²⁰

Why could this make low contributors unresponsive to the receipt of disapproval points? We hypothesize that the removal of the normative significance attached to contributing may have been interpreted by low contributors as a signal that those who express high levels of disapproval are no longer "backed" by the government – in our case, the automatic mechanism

¹⁹However, as we explained in the previous section, this increase is not significant, perhaps owing to the small sample size, although it is obvious by eyeballing the evolution in contributions in Figure 1 that contributions are higher under the combination of government and private enforcement than when private enforcement is used in isolation in periods 21-30.

²⁰Khadjavi (2015) develops a similar argument and shows experimentally that government-like punishment may deactivate pro-social emotions.

that metes out the sanction. Consequently, low contributors may no longer have felt compelled to react positively to high levels of disapproval. This is also how Gneezy and Rustichini (2000) interpret some of their results. Specifically, they contend that parents who were late to pick up their children from the day-care center may not have felt shame or guilt once exposed to a symbolic monetary fine for being late. However, there is an important difference between their findings and ours. They observe such perverse effects even when the fine is in place. From this perspective, our results rather support the argument developed by Funk (2007) – namely that government enforcement may change people’s perceptions of the significance of contributing, making this the right thing to do, when government enforcement is in place. However, once it is removed, this association is also removed along with it, making low contributors unresponsive to social disapproval.

6 Conclusion

Private enforcement of cooperation norms using mechanisms such as shaming, ostracism, and gossip, not only precede the rules enforced by governmental authorities, but presumably also remain in place even after government enforcement measures are lifted. This might be the case when, for example, government enforcement becomes too costly to implement, or proves only marginally to enhance compliance with desired behaviors, causing policymakers to remove such measures in order to rely instead on the previous, emergent mechanisms to maintain cooperation.

As our results suggest, the addition of government enforcement can be effective in stabilizing contributions to a public good. To ensure this outcome, spontaneous order theories emphasize that government enforcement should align with pre-existing norms and be implemented once a private enforcement is in place. Our results support the hypothesis that government enforcement stabilizes cooperation when implemented after pre-existing privately enforced norms. It seems, then, that government enforcement may complement private enforcement, or, as Posner and Rasmusen (1999, p. 369) put it, “the two kinds [of enforcement] reinforce each other”. Our second finding is, however, less favorable regarding the impact of government enforcement on cooperation and the effectiveness of private enforcement. We find evidence of a crowding-out effect resulting from the post-intervention impact of government enforcement. Once individuals have been exposed to government enforcement, its removal leads low contributors to become unresponsive to private mechanisms of enforcement such as peer disapproval.

As the French economist Frederic Bastiat argued, policy-makers must be careful, because there is that which is seen and that which is not seen. We have demonstrated that that which is not seen, i.e., peer disapproval in the field, matters a great deal for the effectiveness of government enforcement mechanisms.

References

- [1] Andreoni, J. & Miller, J. H. (2002). Giving according to GARP: An experimental test of the consistency of preferences for altruism. *Econometrica*, 70(2), 737-753.
- [2] Andreoni, J. & Gee, L. K. (2012). Gun for hire: Delegated enforcement and peer punishment in public goods provision. *Journal of Public Economics*, 96(11-12), 1036-1046.
- [3] Anderson, T. & Hill, P. J. (1977). An American experiment in anarcho-capitalism: the not so wild, wild West. *Journal of Libertarian Studies*, 3, 9-29.
- [4] Aviram, A. (2004). A paradox of spontaneous formation: The evolution of private legal systems. *Yale Law & Policy Review*, 22, 1-68.
- [5] Baldassarri, D. & Grossman, G. (2011). Centralized sanctioning and legitimate authority promote cooperation in humans. *Proceedings of the National Academy of Sciences*, 108(27), 11023-27.
- [6] Benabou, R. & Tirole, J. (2011). Laws and norms. *NBER Working Paper No. 17579*.
- [7] Benson, B. L. (1989). Enforcement of private property rights in primitive societies: Law without government. *Journal of Libertarian Studies*, 9(1), 1-26.
- [8] Benson, B. L. (1990). Customary Law With Private Means of Resolving Disputes and Dispensing Justice: A Description of a Modern System of Law and Order Without State Coercion. *Journal of Libertarian Studies*, 9(2), 25-42.
- [9] Benson, B. L. (1991a). An evolutionary contractarian view of primitive law: The institutions and incentives arising under customary American Indian law. *Review of Austrian Economics*, 5(1), 41-65.
- [10] Benson, B. L. (1991b). Reciprocal exchange as the basis for recognition of law: Examples from American history. *Journal of Libertarian Studies*, 10(1), 53-82.

- [11] Bernstein, L. (1992). Opting out of the legal system: Extralegal contractual relations in the diamond industry. *Journal of Legal Studies*, 21(1), 115-157.
- [12] Bicchieri, C. (2006). *The grammar of society: The nature and dynamics of social norms*. Cambridge: Cambridge University Press.
- [13] Boehm, C. (1999). *Hierarchy in the forest: The evolution of egalitarian behavior*. Harvard University Press.
- [14] Boettke, P., Coyne, C. & Leeson P. T. (2008). Institutional stickiness and the new development economics. *American Journal of Economics and Sociology*, 67(2), 331-358.
- [15] Bomley, D. W. (1992). *Making the commons work: Theory, practice, and policy*. Institute for Contemporary Studies.
- [16] Chaudhuri, A. (2011). Sustaining cooperation in laboratory public goods experiments: a selective survey of the literature. *Experimental Economics*, 14, 47-83.
- [17] Cooter, R. D. (1984). Prices and sanctions. *Columbia Law Review*, 84, 1523-1560.
- [18] Cooter, R. D. (1998). Expressive Law and Economics. *Journal of Legal Studies*, 27(2), 585-608.
- [19] Cox, J. C. (2004). How to identify trust and reciprocity. *Games and Economic Behavior*, 46(February), 260-281.
- [20] Dunbar, R. I. M. (2004). Gossip in evolutionary perspective. *Review of General Psychology*, 8, 100-110.
- [21] Ellickson, R. (1991). *Order without law: How neighbors settle disputes*. Cambridge: Harvard University Press.
- [22] Elster, J. (1989). Social norms and economic theory. *Journal of Economic Perspectives*, 3(4), 99-117.
- [23] Engel, C. (2014). Social preferences can make imperfect sanctions work: Evidence from a public good experiment. *Journal of Economic Behavior and Organization*, 108, 343-353.
- [24] Fehr, E. & Gaechter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Review*, 90(4), 980-994.

- [25] Feinberg, M., Cheng J. T. & Willer, R. (2012). Gossip as an effective and low-cost form of punishment. *Behavioral and Brain Sciences*, 35(1), 25.
- [26] Feldman, Y. (2009). The expressive function of trade secret law: Legality, cost, intrinsic motivation, and consensus. *Journal of Empirical Legal Studies*, 6(1), 177-212.
- [27] Feldman, Y. & Taylor T. R. (2011). Mandated justice: The political promise and possible pitfalls of mandating procedural justice in the workplace. *Regulation & Governance*, 6(1), 46-65.
- [28] Fischbacher, U., Gaechter, S. & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters*, 71, 397-404.
- [29] Fleury, J.-B. & Marciano, A. (2014). Order, coordination, and collective action among the undead. In: Whitman, G. & Dow, J. P. (eds.), *Economics of the undead: Blood, brains and ben-jamins*. Rowman & Littlefield.
- [30] Francis, H. (1985). The law, oral tradition and the mining community. *Journal of Law and Society*, 12, 267-271.
- [31] Friedman, D. (1979). Private creation and enforcement of law – A historical case. *Journal of Legal Studies*, 8(2), 399-415.
- [32] Funk, P. (2007). Is there an expressive function of law? An empirical analysis of voting law with symbolic fines. *American Law and Economics Review*, 9(1), 135-159.
- [33] Gaechter, S. (2014). Human pro-social motivation and the maintenance of social order. In: Zamir, E. and Teichman, D. (eds.), *Handbook on Behavioral Economics and the Law*. Oxford University Press.
- [34] Gaechter, S. & Fehr, E. (1999). Collective action as a social exchange. *Journal of Economic Behavior and Organization*, 39(4), 341-369.
- [35] Gaechter, S. & Herrmann, D. (2009). Reciprocity, culture and human cooperation: Previous insights and a new cross-cultural experiment. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1518), 791-806.
- [36] Giardini, F. (2012). Deterrence and transmission as mechanisms ensuring reliability of gossip. *Cognitive Processing*, 13(2), 465-475.

- [37] Giardini, F. & Conte, R. (2011). Gossip for social control in natural and artificial societies. *Simulation*, 88(1), 18-32.
- [38] Gneezy, U. & Rustichini, A. (2000). A fine is a price. *Journal of Legal Studies*, 29, 1-17.
- [39] Goeree, J. K., Holt, C. H. & Laury S. K. (2002). Private costs and public benefits: Unraveling the effects of altruism and noisy behavior. *Journal of Public Economics*, 83, 255-276.
- [40] Grenier, B. (2004). An online recruitment system for economic experiments. In: Kremer, K. and Macho, V. (eds.), *Forshung und wissenschaftliches Rechnen*, GWDG Bericht 63, 79-93.
- [41] Josselin, J.-M. & Marciano, A. (1995). Constitutionalism and common knowledge: Assessment and application to a future European constitution. *Public Choice*, 85(1-2), 173-188.
- [42] Josselin, J.-M. & Marciano, A. (1997). The paradox of Leviathan: How to develop and contain the future European state? *European Journal of Law and Economics*, 4(1), 5-21.
- [43] Josselin, J.-M. & Marciano, A. (2002). The making of the French Civil Code: An economic interpretation. *European Journal of Law and Economics*, 14, 193-203.
- [44] Karakatos, A. & Zizzo, D. J. 2015. Compliance and the power of authority. *Journal of Economic Behavior and Organization*, doi:10.1016/j.jebo.2015.09.016.
- [45] Karayiannis, A. D. & Hatzis, A. N. (2012). Morality, social norms and the rule of law as transaction cost-saving devices: the case of ancient Athens. *European Journal of Law and Economics*, 33(3), 621-643.
- [46] Keser, C. & van Winden, F. (2000). Conditional cooperation and voluntary contributions to public goods. *Scandinavian Journal of Economics*, 102(1), 23-39.
- [47] Khadjavi, M. (2015). On the interaction of deterrence and emotions. *Journal of Law, Economics, and Organization*, doi: 10.1093/jleo/ewu012.
- [48] Ledyard, O. (1995). Public goods: some experimental results. In: Kagel, J. and Roth, A. (eds.), *Handbook of experimental economics*. Princeton University Press (Chap. 2).
- [49] Leeson, P. T. (2007 a). Ann-arrgh-chy: The law and economics of pirate organization. *Journal of Law & Economics*, 115(6), 1049-1094.
- [50] Leeson, P. T. (2007 b). Trading with bandits. *Journal of Law & Economics*, 50, 303-321.

- [51] Leeson, P. T. (2009 a). The calculus of piratical consent: The myth of the myth of social contract. *Public Choice*, 139(3-4), 443-459.
- [52] Leeson, P. T. (2009 b). *The invisible hook: The hidden economics of pirates*. Princeton: Princeton University Press.
- [53] Leeson, P. T. (2009 c). The laws of lawlessness. *Journal of Legal Studies*, 38(2), 471-503.
- [54] Leeson, P. T. (2013). Gypsy law. *Public Choice*, 155: 273-292.
- [55] Leeson, P. T. (2014 a). Pirates, prisoners, and preliterates: Anarchic context and the private enforcement of law. *European Journal of Law and Economics*, 37(3), 365-379
- [56] Leeson, P. T. (2014 b). *Anarchy unbound: Why self-governance works better than you think*. Cambridge: Cambridge University Press.
- [57] Leeson, P. T. (2014 c). God damn: The law and economics of monastic malediction. *Journal of Law, Economics, and Organization*, 30(1), 193-216.
- [58] Leeson, P. & Skarbek, D. (2010). Criminal constitutions. *Global Crime*, 11(3), 279-298.
- [59] Masclet, D., Noussair, C., Tucker, S. & Villeval, M-C. (2003). Monetary and nonmonetary punishment in the voluntary contributions mechanism. *American Economic Review*, 93(1), 366-380.
- [60] McAdams, R. H. (1997). The origin, development, and regulation of norms. *Michigan Law Review*, 96, 338-433.
- [61] Milgram, S. (1963). Behavioral study of obedience. *Journal of Abnormal Social Psychology*, 67, 371-378.
- [62] Nelissen, R. M. A. & Mulder, L. B. (2013). What makes a sanction "stick"? The effects of financial and social sanctions on norm compliance. *Social Influence*, 8(1), 70-80.
- [63] Nikiforakis, N. (2008). Punishment and counter-punishment in public good games: Can we really govern ourselves? *Journal of Public Economics*, 92, 91-112.
- [64] Ostrom, E., Walker, J. & Gardner, R. (1992). Covenants with and without a sword: self-governance is possible. *American Political Science Review*, 86(2), 404-417.

- [65] Peysakhovich, A. & Rand, D. G. (2015). Habits of virtue: Creating norms of cooperation and defection in the laboratory. *Management Science*, <http://dx.doi.org/10.1287/mnsc.2015.2168>.
- [66] Posner, R. A. & Rasmusen, E. B. (1999). Creating and enforcing norms, with special reference to sanctions. *International Review of Law and Economics*, 19, 369-382.
- [67] Romaniuc, R. (2016). What makes law to change behavior? An experimental study. *Review of Law and Economics*, forthcoming.
- [68] Sened, I. (1997). *The political institution of private property*. Cambridge: Cambridge University Press.
- [69] Sobel, R. S. & Osoba, B. J. (2009). Youth gangs as pseudo-governments: Implications for violent crime. *Southern Economic Journal*, 75(4), 996-1018.
- [70] Solvasson, B. (1993). Institutional evolution in the Icelandic Commonwealth. *Constitutional Political Economy*, 4, 97-125.
- [71] Stagnaro, M. N., Arechar, A. A. & Rand, D. G. (2016). From good intentions to good norms: Top-down incentives to cooperate foster prosociality but not norm enforcement. *Mimeo*.
- [72] Stringham, E. P. (ed.). (2005). *Anarchy, state, and public choice*. Cheltenham: Edward Elgar.
- [73] Stringham, E. P. (2015). *Private governance: Creating order in economic and social life*. Oxford: Oxford University Press.
- [74] Stringham, E. P. & Powel, B. (2009). Public choice and the economic analysis of anarchy: A survey. *Public Choice*, 140, 503-538.
- [75] Subhasish, D. (2013). Non-monetary incentives and opportunistic behavior: Evidence from a laboratory public good game. *Economic Inquiry*, 51(2), 1374-1388.
- [76] Sugden, R. (1986). *The economics of rights, cooperation, and welfare*. Oxford: Basil Blackwell.
- [77] Sunstein, C. (1996). On the expressive function of law. *University of Pennsylvania Law Review*, 144, 2021-2053.
- [78] Zizzo, D. J. (2010). Experimenter demand effects in economic experiments. *Experimental Economics*, 13(1), 75-98.

Figure 1: Evolution of average contributions by group and by period

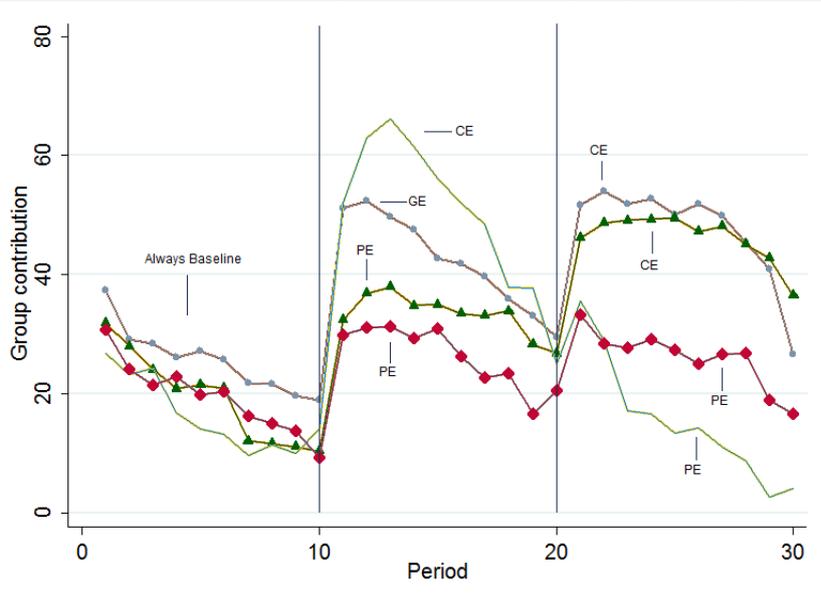


Figure 2: Evolution of disapproval points sent by treatment and by segment

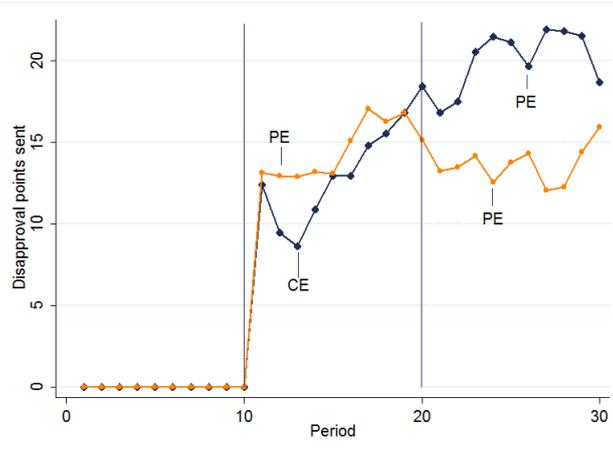


Figure 3: The relationship between disapproval received in period t and the change in contribution from t to $t + 1$

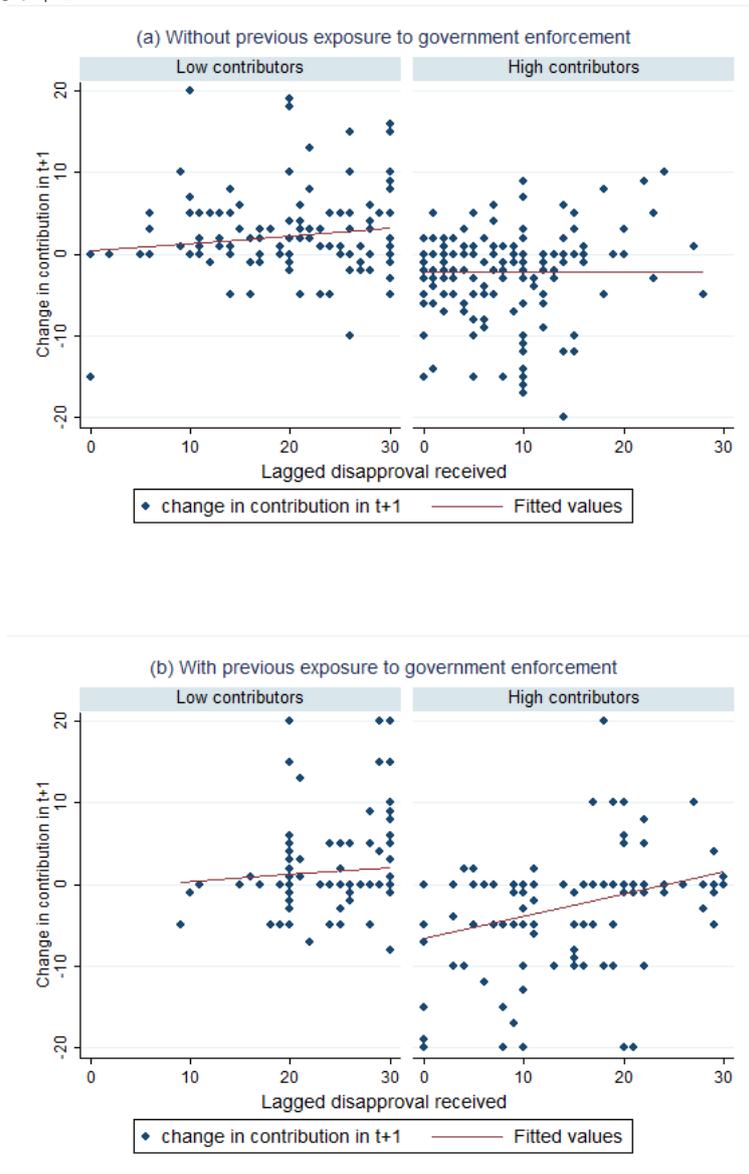
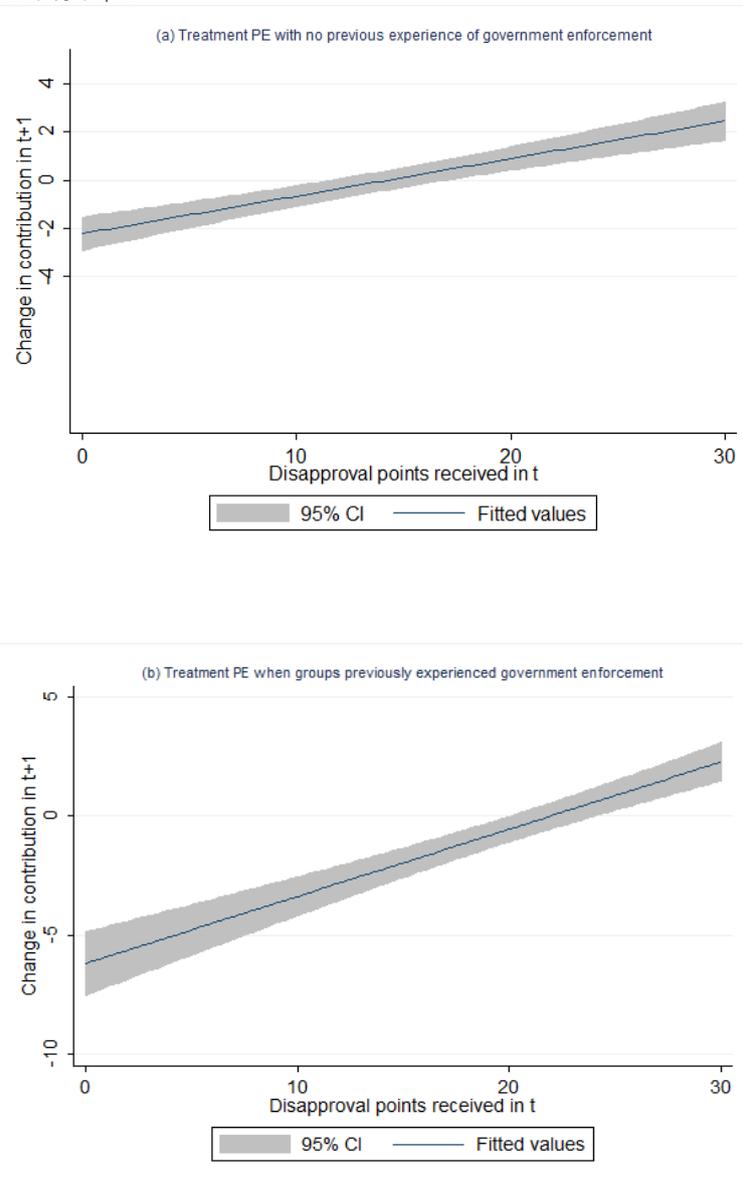


Figure 4: The relationship between disapproval points received in period t and the change in contribution from t to $t + 1$



Instructions (originally written in French)

GENERAL RULES

The experiment in which you are going to participate is part of a study on decision-making. Please read the instructions carefully. These instructions are meant to help you understand the experiment. Once all of the participants have read the instructions, the experimenter will then reread the instructions aloud.

Your gains will depend on your decisions as well as the decisions of other participants. All of your responses will be anonymous and will be gathered via a software program. You will indicate your choices on the computer in front of which you are seated, and this computer will calculate the gains you have realized in the course of the experiment. The sum total of money gained during the experiment will be paid to you in cash at the end of the experiment. From this moment on, we ask you to refrain from speaking. If you have a question, please raise your hand and an experimenter will help you in private.

The experiment is composed of three parts. Each part is made up of several periods. The instructions for Part 2 will be distributed to you once Part 1 has been finished, and the instructions for Part 3 will be distributed once Part 2 has been finished. One of the three parts will be drawn at random for payment. Your gain for the experiment will be equal to the gain you obtained during this Part. In the three parts, the gains are expressed in ecus. The conversion rate of emus into euros is 15 ecus = 1 euro.

At the beginning of Part 1, the central computer will create groups of four at random. The composition of the groups will remain unchanged for the duration of the experiment. You will not be able to identify the other members of your group and they will not be able to identify you.

PART 1

This part is composed of ten periods. At the beginning of each period, you as well as the other three members of your group will have an amount of 20 tokens that you must allocate between two accounts: your individual account and a collective account belonging to all of the

members of your group (you included). Specifically, you must decide on the number of tokens that you put in the collective account. The remaining tokens are automatically placed in your individual account. You are free to put any whole number of tokens between 0 and 20 into the account.

Individual Account

Each token placed in your individual account earns you 1 ecu. And so, if for example, you put 6 tokens in your individual account, this will earn you 6 ecus. Your individual account only earns ecus for you alone.

The collective account

The collective account is shared by all members of your group. Each token placed in the collective account earns 0.4 ecus to each member of the group. Thus, if for example, you put 6 tokens in the collective account, this will earn 2.4 ecus for each member of the group (you included), amounting to a gain of 9.6 ecus for the entire group.

Gain

Your gain for the period is equal to the sum of the gains of your individual account and the collective account.

Example 1

You put 16 tokens in the collective account and thus 4 tokens in your individual account (put there automatically). Let us suppose that the three other members of your group put a total of 48 tokens in the collective account. In total, the collective account now comprises $48 + 16 = 64$ tokens. Your gain is then equal to 4 ecus (individual account) $+ 64 * 0.4$ (collective account) = 29.6 ecus.

Example 2

You put 3 tokens in the collective account and thus 17 tokens in your individual account. Let us suppose that the three other members of your group put a total of 40 tokens in the collective account. In total, the collective account now comprises $40 + 3 = 43$ tokens. Your gain is then equal to 17 ecus (individual account) $+ 43 * 0.4$ (collective account) = 34.2 ecus.

Final Details

All of the members of your group (you included) will make their decisions simultaneously. When all of the members of the group have made their decision, a "summary" screen will appear. The screen will remind you of the number of tokens that you have placed in each of the two accounts and inform you of the number of tokens placed in the collective account by your group, and of your gain in ecus for the period.

At any time you can access the history of previous periods by clicking on the "history" button. The history will appear for each past period, the number of tokens that you put in each of the two accounts, the total number of tokens put in the collective account by your group, your gain in ecus for the period, and your cumulative gain since the first period of that Part.

PART 2

This part is also composed of 10 periods. The composition of the groups is unchanged. Your group is therefore composed of the same members as in Part 1. As in the preceding part, at the beginning of each period, you will have an amount of 20 tokens that you must allocate between your individual account and the collective account.

Additional instructions

From now on, the tokens that you do not put in the collective account, and that remain therefore in your individual account, are subject to a 30% deduction. Thus, 0.3 ecus are deducted for every token that remains in your individual account. This deduction is applied in each period. If for example, you put 12 tokens in your individual account, your gain from this account is $12 - 12 \times 0.3$ (deduction) = 8.4 ecus.

The functioning of the collective account is the same as in Part 1 of the experiment: each token placed in the collective account therefore earns 0.4 ecus for each member of the group (you included).

Your gain for the period is still equal to the sum of the gains of your individual account and the collective account.

Example

You put 6 tokens in the collective account and therefore 14 tokens in your individual account. Let us suppose that the three other members of your group put a total of 26 tokens in the collective account. In total, the collective account now comprises $26 + 6 = 32$ tokens. Your gain is thus equal to 14 (individual account) $- 14 \times 0.3$ (deduction) $+ 32 \times 0.4$ (collective account) $= 22.6$ ecus.

PART 3

This part is also composed of 10 periods. The composition of the groups is unchanged. Henceforth, each period takes place in two steps:

First step

The first step is identical to Part 2. In the same way, at the beginning of each period, you have 20 tokens that you must allocate between your individual account and the collective account. The functioning of these two accounts is the same as in Part 2. The tokens that you do not put in the collective account, and which remain in your individual account are thus subject to a deduction of 30%. This deduction is applied in each period.

Second step

In this stage, an "Individual decisions of other members of your group" screen will appear. This screen will indicate the number of tokens that each member of your group put in the collective account. Each of you has now the opportunity to register your approval or disapproval of each other group member's decision by distributing points. **You can award a large number of points to any member of your group if you disapprove of his or her decision: 10 points for the strongest disapproval, 0 points for the absence of disapproval.** You may distribute any whole number of points between 0 and 10.

In the same way, the other members of your group can send you disapproval points.

To summarize, during the second step:

- You are first informed of the number of tokens that each of the 3 other members of your group has put in the collective account. Note: the order in which the decisions of the 3 other members of your group are indicated to you is randomly modified after each period (in other words, for example, the number that will appear first on your screen will not always correspond to the decision of the same member of the group).
- Next, you must decide on the number of points that you wish to distribute to each of the 3 other members of your group. You must enter a value between 0 and 10 points for each member of the group. If you do not wish to express disapproval concerning another member of the group, you must enter the value 0.
- Once all of the members of the group have made their decisions, your screen will show the total number of disapproval points that the other members of your group have attributed to you.

If you have questions concerning what you have just read, please raise your hand and an experimenter will help you in private.

The **IEL International Programme** is an educational and research pole in law and economics promoted by a number renowned institutions.

Details are available at: iel@carloalberto.org or <http://iel.carloalberto.org/>

IEL papers in Comparative Analysis of Institutions, Economics and Law are published by the Department POLIS, Università del Piemonte Orientale, partner of IEL programme and are available at <http://www.iel.carloalberto.org/Research-and-Publication/Working-papers.aspx> or <http://polis.unipmn.it/index.php?cosa=ricerca,iel>

Recent working papers

- 2016 No.21 Rustam Romaniuc, Katherine Farrow, Lisette Ibanez, Alain Marciano: *The Perils of Government Enforcement*
- 2015 No.20 Rustam Romaniuc: *What makes Law to change Behavior? An experimental study*
- 2015 No.19 Alessandro Melcarne and Giovanni B. Ramello: *Judicial Independence, Judges' Incentives and Efficiency*
- 2014 No.18 Matteo Migheli and Giovanni B. Ramello: *Open Access Journals & Academics' Behaviour*
- 2014 No.17 Carla Marchese: *Tax Amnesties*
- 2013 No.16 Enrico Colombatto: *A free-market view on accidents and torts*
- 2013 No.15 Theodore Eisenberg, Sital Kalantry and Nick Robinson: *Litigation as a Measure of Well-being*
- 2013 No.14 Manfred J. Holler and Barbara Klose-Ullmann: *One Flew Over the Cuckoo's Nest: Violence, Uncertainty, and Safety*
- 2013 No.13 Matteo Migheli and Giovanni B. Ramello: *Open Access, Social Norms & Publication Choice*
- 2013 No.12 Theodore Eisenberg and Martin T. Wells: *Ranking Law Journals and the Limits of Journal Citation Reports*
- 2012 No.11 Jinshan Zhu: *The Correlated Factors of the Uneven Performances of the CDM Countries*
- 2012 No.10 Manfred J. Holler: *The Two-dimensional Model of Jury Decision Making*
- 2012 No.9 Alain Marciano and Elias L. Khalil: *Optimization, Path Dependence and the Law: Can Judges Promote Efficiency?*
- 2012 No.8 Giovanni B. Ramello: *Aggregate Litigation and Regulatory Innovation: Another View of Judicial Efficiency*

- 2011 No.7 Roberto Ippoliti: *An Empirical Analysis on the European Market of Human Experimentation*
- 2011 No.6 Enrico Colombatto, Arie Melnik and Chiara Monticone: *Relationships and the Availability of Credit to New Small Firms*
- 2011 No.5 Nancy Gallini: *Private Agreements for Coordinating Patent Rights: The Case of Patent Tools*
- 2011 No.4 Robert K. Christensen and John Szmer: *Examining the Efficiency of the U.S. Courts of Appeals: Pathologies and Prescriptions*
- 2011 No.3 Alberto Cassone and Giovanni B. Ramello: *The Simple Economics of Class Action: Private Provision of Club and Public Goods*
- 2011 No.2 Theodore Eisenberg and Kuo-Chang Huang: *The Effect of Rules Shifting Supreme Court Jurisdiction from Mandatory to Discretionary - An Empirical Lesson from Taiwan*
- 2011 No.1 Guido Calabresi and Kevin S. Schwarts: *The Costs of Class Actions: Allocation and Collective Redress in the U.S. Experience*