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WHY PEOPLE OBEY THE LAW: EXPERIMENTAL EVIDENCE FROM THE PROVISION OF PUBLIC GOODS

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Abstract

According to economists, severe legal sanctions deter violations of the law. According to legal scholars, people may obey law backed by mild sanctions because of norm-activation. We experimentally investigate the effects of mild and severe legal sanctions in the provision of public goods. The results show that severe sanctions almost perfectly deter free-riding. However, people also obey law backed by mild sanctions if it is accepted in a referendum. We show that voting for mild law induces expectations of cooperation, and that people tend to obey the law if they expect many others to do so.

JEL Classification: H41, D72, K42, H26, C92.

Keywords: deterrent effect of legal sanctions, expressive law, social norms, public goods, voting.

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1 Introduction

The economic analysis of law traditionally emphasizes the deterrent effects of legal sanctions to explain why people obey the law. According to this view, people rationally calculate the costs and benefits of breaking the law. People are predicted to abide by the law if sanctions are sufficiently severe, whereas they tend to break the law if sanctions for doing so are too mild (Becker 1968, see Polinsky and Shavell 2000 for a survey). While this approach has its merits, it fails to explain why most people obey laws backed by only mild sanctions (e.g., Robinson and Darley 1997).

Recent legal thought has rediscovered the importance of social norms in studying the effects of law (Ellickson 1991, Tyler 1990).[1] In addition to the direct deterrent effects of legal sanctions emphasized by the economic analysis of law, legal scholars have suggested various indirect ways how lawmaking may affect behavior (Cooter 1998, 2000, McAdams 2000, Posner 1998, 2000a, 2000b, Posner and Rasmusen 1999, Sunstein 1996, 1999). However, the relevance of norm-mediated effects of lawmaking ("expressive law") is contested (Adler 2000, Anderson and Pildes 2000, Scott 2000). This disagreement among legal scholars is at least in part due to a lack of conclusive empirical evidence on whether and why a law backed by mild sanctions (henceforth mild law) induces people to obey the law.

This paper uses the methods of experimental economics to analyze the effects of lawmaking. The law we investigate makes the contribution to a public good an obligation and sanctions free-riding. We use experimental methods because they provide the means to measure the efficiency-increasing effects of lawmaking under controlled conditions. For example, the severity of a sanction is controlled by the experimenter and known by all participants in the experiment. In contrast, people may comply with objectively mild laws in the field because they overestimate the severity of formal legal sanctions or because they anticipate severe complementary informal sanctions (Waldfogel 1994, Lott 1992). To test for the effects of mild law, we compare it to an otherwise identical condition with severe law, and a condition without law. To investigate under which circumstances the enactment of mild law induces expectations of law-abiding behavior, we compare exogenously imposed law and

[1] See also the special issue on Social Norms, Social Meaning, and the Economic Analysis of Law in *Journal of Legal Studies* 27 (June 1998), or Symposium on Social Norms and the Law, 144 *University of Pennsylvania Law Review* (1996), University of Virginia Conference on Legal Construction of Social Norms, February 2000.

endogenously chosen law. If law is endogenously chosen, people *vote in a referendum* on whether or not to enact law. If law is exogenously imposed, it is enacted by the experimenter.

The results show that law backed by severe sanctions almost perfectly deters free-riding. That is, severe law massively improves efficiency in the provision of public goods. A law backed by mild sanctions does not significantly improve efficiency if exogenously enacted. In this case, mild law does not appear to have norm-activating effects. However, if mild law is accepted in a referendum, the public good is much more (about three times more) efficiently provided than without law. We investigate why endogenous mild law is (from an economic perspective) so surprisingly successful. The explanation we suggest has two elements: commitment and conditional cooperation. We show that if mild law is accepted in a referendum, subjects expect others to be committed not to free-ride. That is, voting for mild law is interpreted as a signal for cooperation, and induces expectations of cooperation. These expectations, in turn, are shown to increase cooperation. As a consequence, subjects tend to obey the law if they expect most others to do so.

We proceed as follows: Section 2 provides a discussion of lawmaking and cooperation norms. Section 3 describes the experimental design, and section 4 presents the results. Section 5 interprets these results and provides some conclusions. In particular, we believe that this study is a contribution to answer the "... core question [of] how potential cooperators signal one another and design institutions that reinforce rather than destroy conditional cooperation." (Ostrom 2000: 138). Our results suggest that referenda may be an institution that allows citizens to signal one another their willingness to cooperate and to increase efficiency in the provision of public goods.

2 Lawmaking and the efficient provision of public goods

According to standard economics, public goods are under-provided because of free-rider incentives (Samuelson 1954). The resulting inefficiency is seen as one of the major justifications for government activity and lawmaking (e.g., Hardin 1997). Efficiency gains can in principle be reaped by lawmaking if a law makes the provision of the public good an obligation and metes out severe sanctions to free-riders.[2] However, positive prescriptions are rarely found in laws. Usually, (criminal) law forbids certain acts and sanctions committing the act. From a theory perspective, the provision of a public good is equivalent to the prevention of a public bad. Therefore, obeying the law can in many instances be interpreted as a contribution to a public good.

In the following, we distinguish between "mild law" and "severe law" drawing on economic logic. Mild law prevails if law is backed by a mild sanction, i.e. a sanction which is too low to deter a rational and egoistic agent from free-riding. Similarly, the expression "severe law" is used to indicate a law backed by a sanction which is sufficiently severe to deter a rational and egoistic agent from free-riding. Note that according to economic logic mild law does not induce efficiency gains in the provision of public goods because of its insufficient deterrent effects.

This paper investigates whether mild law increases efficiency in the provision of public goods through a process of norm-activation. The following sections discuss how lawmaking can activate cooperation norms.

A) Activation of cooperation norms

Social psychologists argue that social norms must be *activated* to affect behavior. For example, Smith and Mackie (2000: 377) note: "Norms must be brought to mind before they can guide behavior. They can be activated by deliberate reminders or by subtle cues, such as observations of other people's behavior." Therefore, lawmaking may activate cooperation norms in a direct and an indirect way. First, the enactment of mild law may directly activate cooperation norms and induce law-abiding behavior if the law is perceived as a public

[2] We use the term "law" in the sense the term is defined in the imperative theory of law (see Raz 1980). This theory defines a law as an obligation backed by a sanction.

expression (a “deliberate reminder”) of what one ought to do. In this case, a mild legal sanction may not just be interpreted as a (low) price to pay for some kind of neutral behavior. Instead, imposing a sanction for free-riding may express that this behavior is unacceptable even for one willing to incur the sanction (Cooter 1984, Kahan 1998). Second, lawmaking can improve cooperation in an indirect way by activating the norm of *conditional cooperation*. This norm prescribes that one ought to cooperate if others also cooperate. It has been that argued that conditional cooperation is the most important cooperation norm (Ostrom 2000), and it has been found to be a robust behavioral regularity in economic experiments (Fischbacher et al. 2001, Keser and van Winden 2000). The two forms of norm-activation through lawmaking therefore interact: Some people may be induced to obey mild law by the “deliberate reminder”-effect, and others may follow their example because of activation of conditional cooperation. As a consequence of this “multiplier” effect, people may obey mild law if they observe that many others do.

To illustrate, consider the example of littering. Clean streets are a classic public good (Korobkin and Ulen 2000). Given that (the expected value of) fines for littering are usually quite low, i.e. given that anti-littering ordinances are an example of mild law, it is surprising from an economic perspective that not all people litter on streets. However, in real life, not all people are the same. Some people would not litter even if there were no laws against littering. A second group of people, however, would litter if there were no anti-littering ordinances, but may obey an anti-littering ordinance from an internalized respect for the law. Enacting the anti-littering ordinance (a “deliberate reminder”) may activate respect in these people and therefore reduce littering. A third group of people may make their behavior dependent on how other people behave. Observing that other people do not litter may activate the norm of conditional cooperation in this group, and induce them not to litter. As a result, even though the mild anti-littering ordinance does not deter littering (free-riding), it may nevertheless contribute to cleanliness of streets (increase efficiency in the provision of the public good) by activating cooperation norms. Indeed, several controlled field studies by social psychologists have shown that people tend to litter significantly less in an clean environment than in a littered environment (Krauss et al. 1978, Cialdini et al. 1990).

B) Regulating behavior in large groups and expectations of cooperation

While the activation of conditional cooperation by observing other people's actions may be relatively easy in small communities (like a village), it is more difficult in larger communities (like states with millions of inhabitants). In large communities, *expectations* about how fellow citizens are going to behave may be an important determinant of behavior. Since lawmaking is supposed to play an important role in regulating behavior in large groups, the extent to which lawmaking is successful in fostering cooperation may depend on how it affects expectations about fellow citizens' commitment to obey the law.

The enactment of a mild law by some government authority may or may not induce expectations of widespread law-abiding behavior. This may depend on, for example, how legitimate the enacting body is perceived to be. Such expectations of cooperation, however, may be induced if people express their commitment to obey mild law.

C) Expressing commitment

In small communities, people can express their commitment to cooperate in face-to-face communication. Numerous experimental studies have shown that face-to-face communication significantly increases cooperation in public good games (e.g., Sally 1995, Bohnet 1997). The reason appears to be that people express their commitment to contribute in group discussions. From an economic perspective, these effects are surprising since a public promise to cooperate is just "cheap talk" (Farell and Rabin 1996). While these results are important, face-to-face communication is impractical in large communities. However, *voting* for a law is a form of expressing support for the law which is practical (and practiced, see Butler and Ranney 1994) in large communities. Expression of support in a referendum may be interpreted as a form of commitment to obey the law, inducing expectations of widespread law-abiding behavior. For example, people may expect that most people will not litter if a referendum to introduce an anti-littering ordinance is accepted by a large majority.[3] As a consequence of the activation of conditional cooperation, a law which is supported by a large majority in a referendum may induce widespread law-abiding behavior.

[3] Mild law can be interpreted as a "symbol" for what one ought to do. Voting for mild law may be interpreted by others as a signal of willingness to cooperate. Eric Posner states (1998: 767): "Symbols matter because a person's manifested attitude towards symbols tells others something about that person's character. People rely heavily on this information when deciding whether to engage in cooperative behavior in all realms of life."

3 An experimental approach to the efficiency of mild law

We propose an experimental approach to investigate the efficiency of mild law because experimental techniques provide several important advantages over other modes of empirical investigation. The most important advantages of experimental economics result from the ability to control the environment in which decisions are taken. Controlling incentives and information conditions (e.g., the severity of the sanctions) allows us to derive clear economic predictions which can be tested against observed behavior. In experiments, we can easily observe individual behavior which cannot be observed in the field (in particular, expectations and individual voting decisions). Controlled ceteris paribus-variations across experimental treatments is used to identify causal factors for behavior. In particular, the treatment variations explained below allow us to investigate under which circumstances mild law activates cooperation norms.

3.1 Experimental design

The basic element of all experimental conditions explained below is a linear public good game. In this game, n subjects form a group. Each subject i is endowed with an income of E_i points which must be allocated to either a private good (c_i) or a public good (g_i). All subjects simultaneously take this allocation decision under conditions which vary along two dimensions (see table 1).

The first dimension concerns the severity of a monetary sanction s_i for a subject i who does not comply with the law. The law prescribes full contribution to the public good (which is the efficient contribution level, see below). Therefore, a subject is sanctioned if he or she does not contribute the entire endowment to the public good ($g_i < E_i$). There are three sanction levels. In the "no law" condition, the sanction for free-riding is $s^{No} = 0$. In the absence of a sanction, each subject maximizes his or her payoff fully by free-riding (see section 3.3 for details). In the severe law condition, the sanction (s^{severe}) is high enough to deter a rational and egoistic agent from free-riding. In the mild law condition, the sanction is positive ($s^{mild} > 0$) but too low to deter a rational and egoistic agent from free-riding.

Table 1: Experimental design

	No law (no sanction)	**Mild law** (mild sanction)	**Severe law** (severe sanction)
Exogenously imposed	NoEx	MildEx	SevereEx
Endogenously chosen (voting)	NoEnd	MildEnd	SevereEnd

The second dimension along which the conditions vary is with respect to how law is enacted. The law is either exogenously imposed or endogenously chosen (see table 1). If the law is exogenously imposed, the severity of the monetary sanction s is determined by the experimenter. If the law is endogenously enacted, subjects make decisions in a two-stage game. In the first stage, subjects *vote in a referendum* on whether they want to enact law or not, and participate in the public good game as described above in the second stage. We denote the first-stage conditions as follows: SEVERE for the condition where subjects vote on severe law, MILD for the condition where subjects vote on mild law. The endogenous second-stage conditions, where subjects make contribution decisions are denoted as SevereEnd if severe law is accepted by majority vote, MildEnd if mild law is accepted by majority vote, NoEnd(SEVERE) if severe law is rejected, and NoEnd(MILD) if mild law is rejected by majority vote.

3.2 Procedures and parameters

Subjects are randomly and anonymously allocated to groups of size $n = 3$. Each group member is endowed with $E_i = 20$ points which must be allocated to a private good (c_i) or a public good (g_i), where $E_i = c_i + g_i$. In the no law condition, the payoff of subject i (π_i) comes from the private good and the public good. The income from the public good is the sum of contributions by all $j = 1, ..., n$ group members to the public good ($\Sigma_j g_j$), multiplied by $a = 0.5$, i.e., $\pi_i = c_i + a\ \Sigma_j g_j = (E_i - g_i) + a\ \Sigma_j g_j$. As will be explained in section 3.3, complete free-riding ($g_i = 0$) is a dominant strategy for all subjects in the no law condition.

In the conditions where law prevails, each subject i who does not comply with the law incurs a sanction of s_i points. In these conditions, subject i's payoff function is modified to $\pi_i = E_i - g_i + a\ \Sigma_j g_j - s_i$, where $s_i = 0$ if $g_i = E_i$, and $s_i = s$ if $g_i < E_i$. Mild law and severe law

exclusively differ by the severity of the punishment s in case a subject does not fully contribute. In particular, in the mild law conditions the sanction is $s^{mild} = 4$ points, and in the severe law conditions the sanction is $s^{severe} = 14$ points.

In the exogenous conditions, each subject indicates the contribution g_i to the public good (integer number between 0 and 20), and indicates the expected contribution by the other two group members. In each of the endogenous conditions, subjects participate in a two-stage game. In the first stage they decide on the enactment of law by anonymous majority vote. That is, subjects take a voting decision (Yes or No) and indicate the expected outcome of the referendum in the first stage (see appendix B). Each subject is paid additional 2 points for predicting the outcome of the referendum correctly. In the second stage, each subject i indicates i's contribution g_i as well as expected contributions by the other group members for all possible outcomes of the referendum. Each subject is paid 4 points in all conditions for a correct prediction of other group members contributions. Point incomes were converted into Swiss Francs and paid out immediately at the end of the experiment in cash. In particular, one point was worth $0.45, approximately.

Each subject either participates in the exogenous or the endogenous conditions. The sequencing in the exogenous conditions is as follows: NoEx, MildEx, SevereEx. However, subjects obtained information about the outcome of all conditions only at the end of the experiment. Therefore, the three conditions can be considered to have taken place simultaneously. In the endogenous conditions, the sequencing was MILD, SEVERE. Again, subjects were not informed about the outcomes of either treatment until the end of the experiment. In particular, subjects were not informed about the outcome of the referendum in the first stage before proceeding to the second stage. Instead, subjects had to take second-stage decisions for all possible outcomes of the referendum (see appendix C). That is, subjects indicate their contribution to the group account given their own voting decision and given that 0, 1, or 2 of the other group members approve. This experimental technique is called the "strategy method" (Selten 1967). The advantage of this method is that we know each subjects "reaction" to all possible outcomes of the referendum, even those that will not actually materialize. The strategy method allows us to investigate individual behavior in much greater detail and appears to be behaviorally equivalent to a sequential procedure (see Brandts and Charness 2000).

An important aspect of our experiment is that subjects play the game only once which is known to all subjects (one-shot game). This is important because rational predictions are clear-cut in one-shot games, whereas many outcomes can be rationalized in repeated games (e.g., Kreps et al. 1982). In addition, all decisions are taken by subjects anonymously. That is, no subject obtains information enabling him or her to identify the behavior of another subject (see instructions in appendix A). Anonymity together with the one-shot procedure allows us to exclude the possibility that subjects obey the law because of fear from informal sanctions like shaming and shunning or because they want to build up a reputation as a trustworthy partner.

3.3 Predictions

A) Game-theoretic predictions in the exogenous conditions (one-stage game)

In the NoEx condition, the material incentives are such that complete free-riding by everyone is the unique Nash equilibrium in dominant strategies. To see why, consider an agent i who maximizes his or her payoff $\pi_i = E_i - g_i + a \Sigma_j g_j = E_i - g_i + a\, g_i + a\, G_{-i}$ (where G_{-i} denotes the contributions of the other group members to the public good). The marginal return from contributing to the public good is a, and the marginal cost to provide the public good is 1. Since $a < 1$, $g_i = 0$ maximizes π_i. Since the game is symmetric, $g_i = 0$ for all i is the unique Nash equilibrium in NoEx. Therefore, i's equilibrium payoff is $\pi_i = 20$ points in NoEx (see table 2).

In the MildEx condition, the sanction for free-riding is so low that zero contribution by everyone remains the unique Nash equilibrium in dominant strategies. To see why, note that agent i now maximizes $\pi_i = E_i - g_i + a\, g_i + a\, G_{-i} - s^{mild}$. Since the marginal return of contributing is smaller than the marginal cost of contributing ($a < 1$), partial contribution is never optimal. Full contribution yields a payoff of $\pi_i(\text{full}) = a\, E_i + a\, G_{-i}$, whereas zero contribution yields $\pi_i(\text{zero}) = E_i + a\, G_{-i} - s^{mild}$. Full contribution is rational if and only if $\pi_i(\text{full}) > \pi_i(\text{zero})$, i.e. if $s > E_i\,(1 - a)$. However, since $s^{mild} = 4 < E_i\,(1 - a) = 20\,(1 - 0.5)$, a rational subject does not contribute ($g_i = 0$) to the public good in MildEx. By symmetry, zero contribution by all three group members is the unique Nash equilibrium MildEx. Therefore, i's equilibrium payoff is $\pi_i = 16$ points in MildEx.

In the SevereEx condition, the punishment for free-riding is high enough to induce full contribution by all group members to the public good. Agent *i* now maximizes $\pi_i = E_i - g_i + a\ g_i + a\ G_{-i} - s^{severe}$. Since the marginal return of contributing is still smaller than the marginal return of not contributing ($a < 1$), partial contribution is never optimal. However, full contribution ($g_i = E_i$) is rational because $s^{severe} = 14 > E_i\ (1 - a) = 20\ (1 - 0.5)$. By symmetry, full contribution by all three group members is the unique Nash equilibrium in SevereEx. Therefore, *i*'s equilibrium payoff is $\pi_i = 30$ points in SevereEx.

Table 2: Overview over parameters and predictions in the contribution stage

	No Law (NoEx and NoEnd)	**Mild Law** (MildEx and MildEnd)	**Severe Law** (SevereEx and SevereEnd)
Group size (n)	3	3	3
Endowment (E_i)	20 points	20 points	20 points
Marginal return from private good	1 point	1 point	1 point
Marginal return from public good	0.5 points	0.5 points	0.5 points
i's sanction for free-riding ($g_i < E_i$)	0 points	4 points	14 points
i's equilibrium contribution g_i	0 points	0 points	20 points
i's equilibrium payoff π_i	20 points	16 points in MildEx 20 points in MildEnd	30 points

B) Game-theoretic predictions for the endogenous conditions (two-stage game)

To derive predictions for the two-stage game in the endogenous conditions, we solve the game by backward induction (see appendix E for details). In the first stage, subjects vote in MILD [SEVERE] on the enactment of mild [severe] law. In the second stage, subjects decide on their contributions to the public good according to MildEnd, SevereEnd or NoEnd. The second stage of the two-stage game is the same as the one-stage game described above (i.e., MildEnd is the same as MildEx etc.). Therefore, the same predictions prevail in the second stage of the two-stage game as in the one-stage game.

In the first stage of the two-stage game, a voter can either be pivotal or not pivotal. A voter is said to be pivotal if his voting decision affects the outcome of the referendum. Since the group size is $n = 3$ and the decision rule is majority voting, a voter is pivotal if exactly one

of the other voters approves of the law. He is not pivotal if none or both of the other voters approve. In general, a voter who is only concerned with the (instrumental) effect of his voting decision on the outcome of the referendum is indifferent between approving and disapproving if he is not pivotal. That is, Yes and No are best replies for rational non-pivotal voters in SEVERE and MILD.

If voter *i* is pivotal in MILD, voting against the sanction is the unique best reply. The reason is that a rational voter knows that $g_i = 0$ is chosen by all *i* in the second stage in MildEnd and NoEnd. As a consequence, *i*'s payoff from voting No is $\pi_i(\text{reject}) = E_i$, and from voting Yes is $\pi_i(\text{accept}) = E_i - s_i^{mild}$. Since $s_i^{mild} = 4$, $\pi_i(\text{reject}) > \pi_i(\text{accept})$, and a payoff maximizing agent therefore votes No. Therefore, rejection of mild law and zero contribution is the game-theoretic prediction.

If voter *i* is pivotal in SEVERE, the unique best reply is to vote Yes. The reason is that a rational voter knows that all *i* choose $g_i = E_i$ in SevereEnd, but $g_i = 0$ in NoEnd in the second stage of the game. As a consequence, *i*'s payoff is $\pi_i(\text{reject}) = E_i$, and $\pi_i(\text{accept}) = 3a\ E_i$. Since $3a = 1.5 > 1$, it follows that $\pi_i(\text{reject}) < \pi_i(\text{accept})$, and a pivotal profit maximizing agent will therefore vote Yes.

Table 3: Overview over parameters and predictions in the voting stage

	Mild Law (MILD)	**Severe Law** (SEVERE)
Group size (*n*)	3	3
Best reply for pivotal voter	No	Yes
Equilibrium prediction (first stage)	Rejection	Acceptance

Table 3 summarizes the preceding discussion. The game-theoretic prediction for the first stage of the two-stage game is that mild law is rejected and that severe law is accepted. According to economic logic both the rejection of mild law and the acceptance of severe law constitute Pareto-improvements in comparison with no law. While the equilibrium in MILD is inefficient and the equilibrium in SEVERE is efficient, it should be noted that full contribution is efficient in all treatment conditions. That is, given full contribution, the sum of payoffs over all 3 group members is 90 points in all conditions.

4 Results

In total, 102 subjects participated in the experiment. 42 participated in the exogenous conditions, 60 in the endogenous conditions. Two sessions were conducted in a large lecture hall at the University of St. Gallen. Subjects were undergraduate students of business, law, and economics recruited a few days before the experiment. Subjects earned on average approx. $16 during 80 minutes.

4.1 Does mild law increase efficiency?

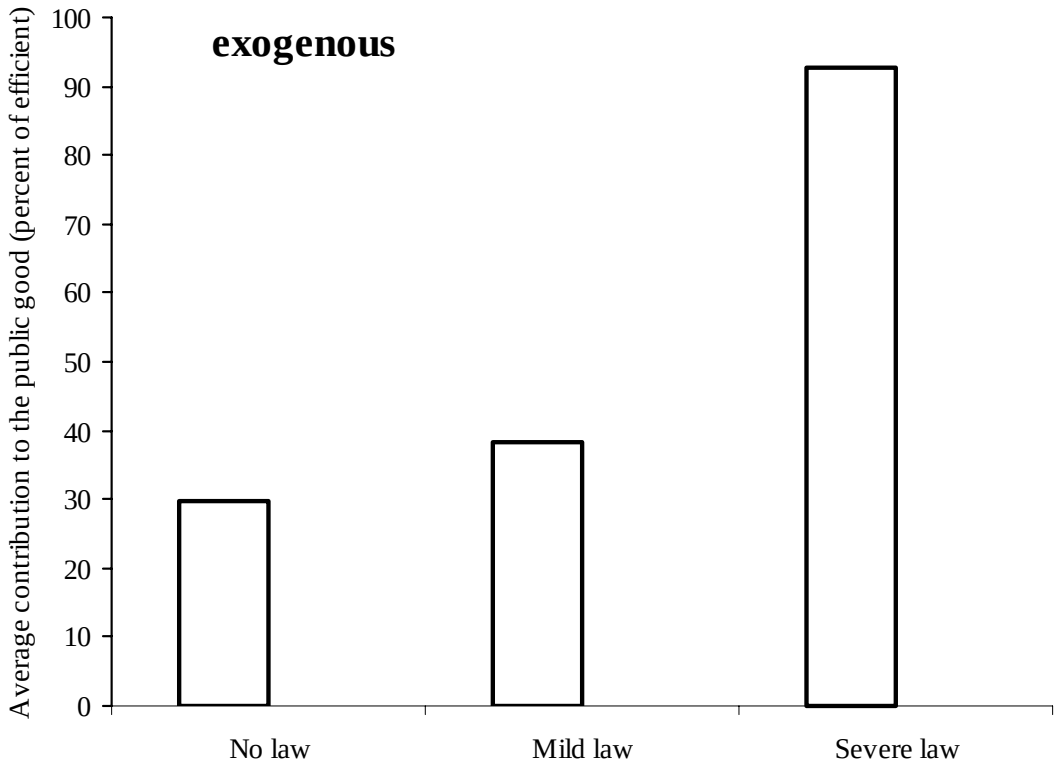
To evaluate whether mild law increases efficiency, we compare it to the efficiency of no law and of severe law. To measure efficiency, we use a gross measure and a net measure of efficiency. While the measure of gross efficiency is concerned with how much subjects contribute to the public good, the net measure is concerned with the final income that subjects obtain. A difference between these two measures of efficiency arises if subjects are sanctioned and if sanctioning is considered as waste. A contribution rate is defined as the average actual contribution to the public good as a percentage of full contributions. Since full contribution to the public good is efficient in all conditions, contribution rates provide a gross measure of efficiency. To evaluate net efficiency, we consider the fact that sanctioning is possible in the law conditions. The measure of net efficiency used below is the average realized income gain from cooperation as a percentage of the potential income gain from cooperation.

Our main finding concerning the efficiency of *exogenous* conditions is summarized in

Result R1 *Exogenous mild law does not increase efficiency. In contrast, exogenous severe law considerably increases efficiency.*

Support for result R1 comes from a comparison of the gross and net measures of efficiency in the three exogenous conditions. The contribution rate is 93 percent in SevereEx, 38 percent in MildEx, and 30 percent in the NoEx condition (see figure 1). According to a Friedman test, contributions are significantly higher in SevereEx than in MildEx (p = 0.000) and NoEx (p = 0.000). That is, severe law almost perfectly resolves the free-rider problem, and induces high efficiency gains. While contribution rates are much higher with severe law than with exogenous mild law, there seems to be a slight norm-activation effect from mild exogenous law. However, contributions are not significantly higher in MildEx than in NoEx (p = 1.000).

Figure 1: Contribution rates in the exogenous conditions (42 subjects in each condition)



In SevereEx, 7 percent (= 3/42) of subjects were sanctioned for not fully contributing, and in MildEx 64 percent (= 27/42) of subjects do not fully contribute. As a consequence, net efficiency was almost three times as high in SevereEx (89 percent) than in MildEx (33 percent) and in NoEx (30 percent).

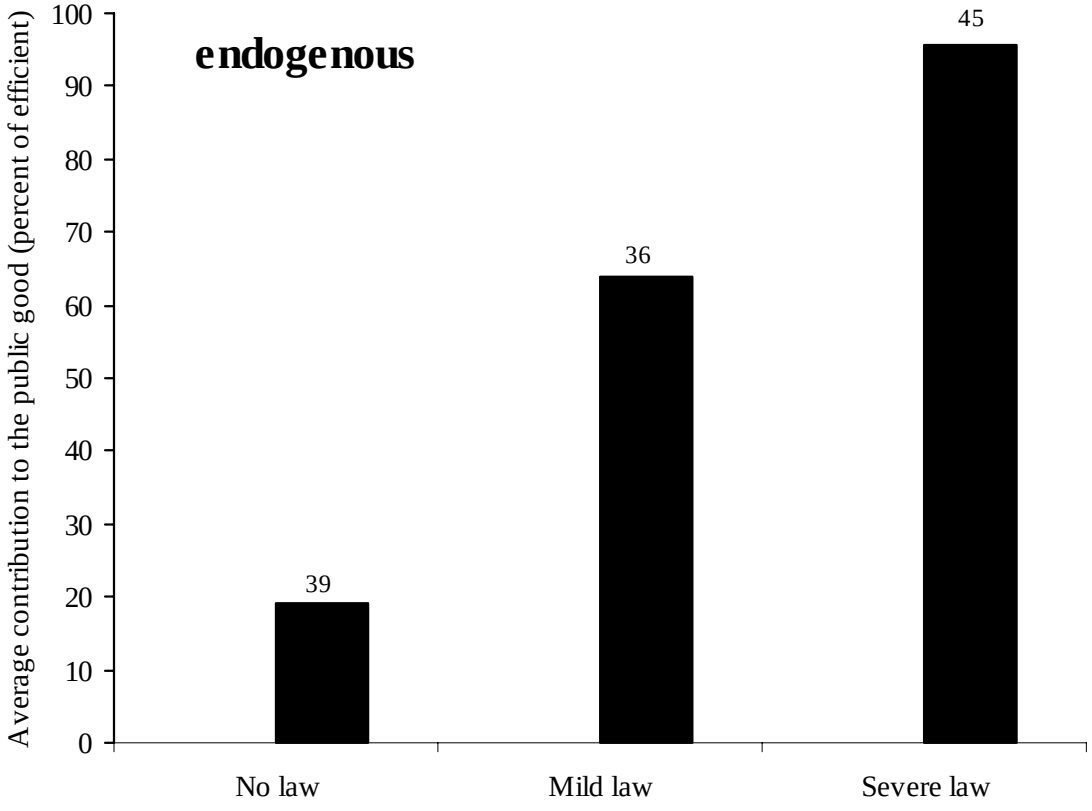
Our NoEx condition replicates the findings from many public good games that people do not fully free-ride even if there is no sanction for free-riding (see Ledyard 1995 for a survey). However, there clearly is a free-rider problem as can be seen from the low contribution rates in the NoEx condition in figure 1. We conclude that exogenous severe law is successful in overcoming the free-riding problem inherent in the provision of public goods, but that exogenous mild law is not successful in doing so.

Our main result concerning the efficiency of *endogenous* conditions is summarized in

Result R2 *Subjects accept mild law in a majority of cases. Efficiency is much higher with endogenous mild law than without law.*

In SEVERE, 70 percent of subjects vote for enactment of severe law. As a consequence, 75 percent of subjects (= 45/60) take second-stage decisions in SevereEnd. In MILD, 50 percent of subjects vote for the enactment of mild law, and as a consequence, 60 percent (= 36/60) of subjects take decisions in MildEnd.

Figure 2: Contribution rates in the endogenous conditions (number of subjects indicated above bars)



Contribution rates were about three times as high with endogenous mild law than without it, and more than six times as high with endogenous severe law than without it. In particular, the contribution rate in MildEnd is 64 percent, but only 22 percent in NoEnd(MILD). The contribution rate is 96 percent in SevereEnd, but only 15 percent in NoEnd(SEVERE). Figure 2 shows that both severe law and mild law are more efficient than no law. In particular, contributions are significantly higher if either law was accepted than if it was rejected according to a Mann-Whitney test ($p < 0.001$). However, gross efficiency in

endogenous severe law is significantly higher than endogenous mild law (p = 0.001). Including the waste from sanctioning does not change the overall picture. In SevereEnd 4 percent (= 2/45) of subjects are sanctioned for free-riding, in MildEnd 42 percent (= 15/36). As a consequence, net efficiency is 62 percent in MildEnd, and 96 percent in SevereEnd, but only 19 percent in NoEnd.

Given that severe law is endogenously enacted, almost all subjects obey the law. That is, 96 percent (= 43/45) of subjects fully contribute in SevereEnd. Given that severe or mild law is rejected, again most (62 percent = 24/39) subjects take rational contribution decisions, and fully free-ride (g_i = 0). However, if mild law is accepted, most subjects take contribution decisions which are in contradiction to the economic prediction. In MildEnd, a majority of 58 percent (= 21/36) of subjects obeys the law and fully contributes, whereas only 28 percent (= 10/36) of subjects take the rational decision to fully free-ride.

Causal effects of mild law versus selection effects

We now explain that the higher efficiency observed in MildEnd as compared to NoEnd(MILD) is due to the efficiency-enhancing effect of mild law, and not due to selection effects. Broadly speaking, a *selection effect* arises if people with unobservable characteristics are allocated in a non-random manner ("selected") into "treatment groups", and if these people differ in an observable way across groups after they received the treatment. To illustrate, consider the example of a policymaker who wants to know whether some governmental employment program causes better reintegration of unemployed into the labor market (see Heckman et al. 1999 for a general discussion). Suppose that the ability or motivation of an unemployed person is an unobservable characteristic *x*, and suppose that the more able among the unemployed tend to participate more in employment programs (*x* is correlated with *y*). Finally, suppose the policymaker observes that those who participated in the program tend to find a job more easily (*y* correlates with *z*). However, the policymaker should not conclude that the employment program was effective (i.e., that *y* caused *z*). Instead, those who participated in the program may have found a job because they were more able and motivated (i.e., *x* caused *z*).

To translate the issue to our investigation, suppose that subjects are to some extent *un*conditionally cooperative – a characteristic that is not observable (*x*). An unconditional cooperator is a subject who (for whatever reason) contributes in any case. However, we do observe whether mild law is endogenously enacted (*y*), and we observe the contribution rates with and without mild law (*z*). Suppose that those who are unconditionally cooperative tend to

vote for mild law. If by chance[4] at least 2 unconditionally cooperative subjects happen to be in the same group, mild law will be accepted (*x* correlates with *y*) and contributions (*z*) will be high. Similarly, if less than 2 unconditional cooperators happen to be in the same group, the law will be rejected and contributions will be low. We would, therefore, observe that contributions are high if mild law is accepted (*y* correlates with *z*), but this may have resulted from selection effects (*x* correlates with *y*), and not from the causal effect of mild law (*y* causes *z*).

Table 4: Contribution rates for Yes-voters and No-voters in MILD

	Yes-voters	**No-voters**
Accepted	A 62%	B 68%
Rejected	C 17%	D 23%

To investigate the importance of selection effects, we consider the contribution decisions of those who voted Yes and of those who voted No separately. According to the reasoning in the previous paragraph, selection effects arise if unconditional cooperators also vote Yes. If selection effects were the driving force behind our results in MILD, the contribution rates of, say, Yes-voters should be the same irrespective of whether they happen to be in a group accepting or rejecting mild law. However, this is clearly not the case. Table 4 shows that contribution rates of Yes-voters are high when mild law is accepted, but low if it is rejected. The same holds for No-voters. In particular, both Yes-voters (compare A and C, p = 0.04) and No-voters (compare B and D, p = 0.01) significantly contribute more if mild law is accepted than if it is rejected according to a Mann-Whitney test. In addition, contribution rates of Yes-voters and No-voters are not different when mild law is accepted (compare cells A and B, p = 0.76), or rejected (compare cells C and D, p = 0.89) according to a Mann-Whitney test. We conclude, therefore, that selection effects are not the driving force behind our results. Instead, the acceptance of mild law induced subjects (independent of their own voting decision) to contribute more.

[4] Note that our experimental design involves randomization. That is, subjects were randomly allocated into groups of 3.

With respect to the comparison of endogenous and exogenous conditions our main finding is summarized in

Result R3 *Efficiency is higher if mild law is endogenously enacted than if it is exogenously imposed.*

Support for result R3 comes from a comparison of contribution rates in the respective exogenous and endogenous conditions. Contribution rates in MildEnd (64 percent) are significantly higher than in MildEx (38 percent) according to a Mann-Whitney test (p = 0.044). Net efficiency in MildEnd (62 percent) is almost twice the net efficiency in MildEx (33 percent). In contrast, endogenous and exogenous conditions are not significantly different for severe law and for no law. Contribution rates are almost the same in the SevereEx (93 percent) and SevereEnd (96 percent) conditions, and are not significantly different in NoEx (30 percent) and NoEnd (19 percent) according to a Mann-Whitney test (p = 0.132).

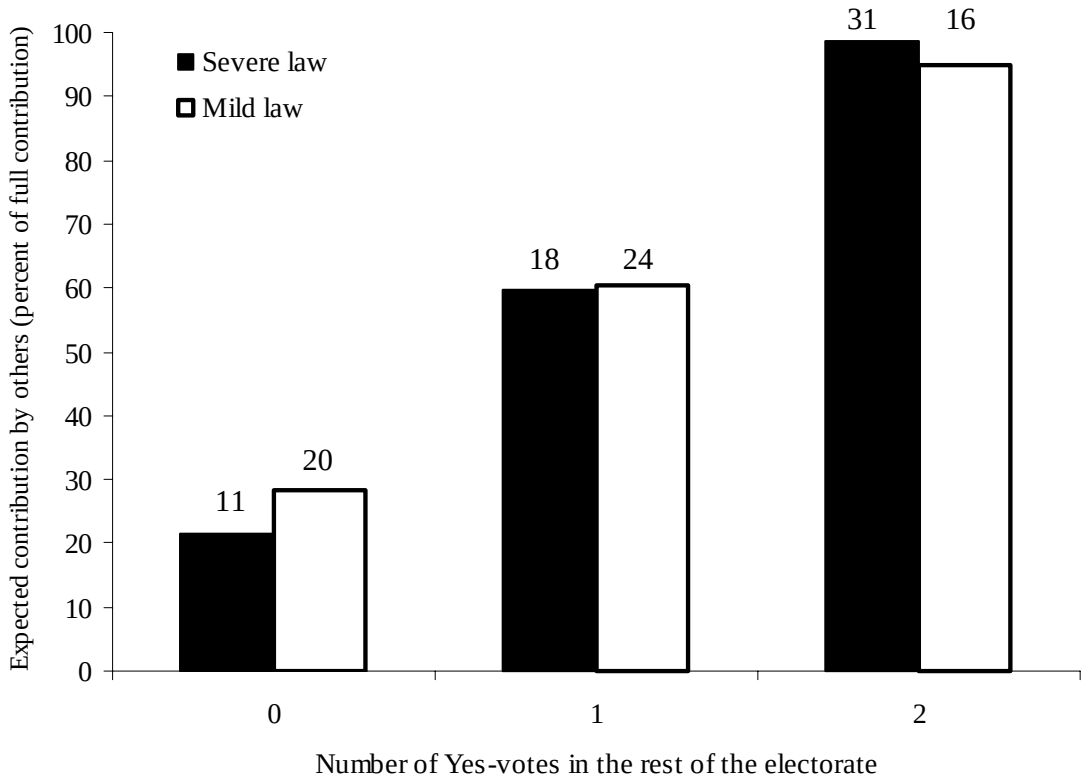
4.2 Why do people vote for mild law, and why do they obey it?

In the following, we focus on subjects' voting decisions in MILD, and on contribution decisions in MildEnd and NoEnd(MILD), while the other conditions serve for purposes of comparison. We show that a combination of conditional cooperation and commitment can explain why cooperation norms were activated.

Result R4 *Subjects expect others to be committed by their voting decisions. That is, subjects expect higher compliance with mild law if many others express support for the law.*

In the following, we denote the expected contribution by others by $E(G_{-i})$. Figure 3 shows that subjects on average expect higher contributions by other subjects if the law receives more support in the electorate. In both treatments, $E(G_{-i})$ rises from about 25 percent of the efficient level if none of the other voters approves to approximately 95 percent if all others express support. Most interesting is that this relation is very similar in the two treatments despite the fact that the "rational" expectations are very different in the two treatments. As explained in section 3.3, the rational expectation in SEVERE is $E(G_{-i}) = 0$ if none of the other group members approved, and $E(G_{-i})$ = 100 percent if all others approved. This is more or less the case (see figure 3). However, in MILD the rational expectation is $E(G_{-i}) = 0$ at *all* levels of approval which is clearly not the case. In our view figure 3 strongly suggests that subjects interpreted other subjects' expression of support for mild law as a commitment that they will fully contribute to the public good.

Figure 3: Support for law in the rest of the electorate and expected contributions by others [E(G_{-i}) in percent of full contribution, 60 subjects per treatment)



Result R5 *Subjects are conditionally cooperative. That is, subjects tend to obey mild law if they expect many others to obey the law.*

Subjects who expect high contributions by others also tend to contribute more in all conditions. For example, the Spearman correlation between $E_i(G_{-i})$ and g_{-i} in MILD is 0.648 (p = 0.000).[5] This is clear evidence for the presence of *conditional cooperation*. That is, subjects are more willing to contribute to the public good if they expect others to contribute to the public good. This finding is in line with results from other experimental laboratory studies (Fischbacher et al. 2001, Keser and van Winden 2000). Moreover, conditional cooperation has also been found to prevail in the controlled field studies of Krauss et al. (1978) and Cialdini et al. (1990) (see section 2.1 for explanations). In the context of our study, this means that people tend to be more willing to obey mild law if they expect many others to do so. This expectation of widespread law-abiding behavior is induced if many people vote for the law (see result R4 and figure 3).

[5] The respective correlations in the other conditions are: MildEx: 0.325 (p = 0.036), NoEx: 0.468 (p = 0.002). In SEVERE: 0.613 (p = 0.000). In SevereEx the correlation is low (0.247) and not significant (p = 0.114) since almost all (39/42) subjects fully contribute and expect full contributions).

5 Summary and conclusions

This paper identifies conditions under which mild law increases efficiency by activating cooperation norms. We show that mild law does not induce widespread law-abiding behavior if it is imposed by an exogenous authority. In contrast, mild law does induce voluntary compliance if it is accepted in a referendum. Therefore, voting may be an institution which allows potential cooperators to signal one another their willingness to cooperate. Voting for the law is interpreted as an act of publicly expressing support for a cooperation norm which induces expectations of higher compliance with the law. Because of conditional cooperation, higher expectations about the cooperation of others translate into higher cooperation rates. In short: people tend to obey mild law if they expect many others to do so. This section provides a discussion of results.

We find that exogenously imposed mild law does not significantly affect average contributions to the public good whereas severe law does. This finding is in line with the economic analysis of law emphasizing deterrent effects, and appears to contradict the norm-activation hypothesis. Should we conclude from these results that enacting mild law is necessarily useless, and that severe law is always better than mild law? We believe that this conclusion is premature for at least three reasons.

First, severe law may necessitate much higher enforcement cost than mild law. These cost differences may put into perspective the large difference in efficiency found in our experiment where both laws are enforced at no cost. Second, even though exogenous mild law has been found to be ineffective in increasing cooperation, it may yield considerable efficiency gains in coordination problems (Bohnet and Cooter 2001). Third, framing may be important in the provision of public goods (Cookson 2000). We use a neutral language in our experiment as is common practice in experimental economics. For example, the sanction is called “deduction” and the public good is called “group account”. However, framing is more suggestive in actual lawmaking (people are “punished for wrongdoing”). If a mild legal sanction is perceived as an indication that an act is unacceptable it may increase cooperation. In contrast, if a mild legal sanction is perceived as the price to pay for acceptable behavior, it may instead reduce cooperation. This may be the case if people behave morally out of intrinsic motivation (an internalized moral obligation), and if this moral obligation is crowded out by monetary incentives (e.g., Gneezy and Rustichini 2000, Fehr and Gächter 2000).

We show that mild law activates cooperation norms and increases efficiency if it is accepted in a referendum. That people are more willing to obey laws they have chosen themselves is supported by evidence from field studies. For example, Marks et al. (1986) show that machine operators in a U.S. factory who contributed decisions about their work environment were more productive and less often absent than workers in a control group. Bardhan (2000) investigates factors affecting the quality of maintenance of 48 irrigation systems in India. He finds that those farmers (of the 480 interviewed) who responded that the rules have been crafted by most of the farmers, as contrasted to the elite or the government, have a more positive attitude about the water allocation rules and the rule compliance of other farmers. In these cases, the quality of maintenance of irrigation systems is significantly higher.

Finally, it should be noted that the magnitude of the efficiency gain from voting on mild law may depend on the margin by which it is accepted. The logic we suggest cuts both ways: while we find that the acceptance of mild law increases cooperation, its rejection tends to reduce it. However, acceptance is most likely if the proposed law overlaps with prevailing norms in the community. Therefore, our study lends support to those who believe that lawmaking can activate prevailing norms. However, it does not lend support to those who hope (or fear) that lawmaking can easily be used (or abused) to create new norms that are not rooted in the community.

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Appendices A to D contain translations of instructions and decision sheets for endogenous mild law (MILD). In brackets [ ], we indicate how instructions for endogenous severe law (SEVERE) differ from MILD.

Appendix A: General instructions for participants

You are now participating in an experiment which is financed by the foundation for basic science of the University. Please read the instructions carefully. You can earn money in this experiment. How much money you earn depends on your decisions and on the decisions of other participants. All the money you earn during the experiment will be paid to you in cash immediately after the experiment.

During the experiment we will not speak of Francs but of points. Your entire income will first be calculated in points. Your point income will then be converted into Swiss Francs according to the following exchange rate:

1 point = 0.70 CHF

All participants are randomly allocated into **groups of 3 members**. None of the participants knows who is in which group, and nobody will be told at the end of the experiment who was in which group.

In this experiment you and the other two group members have to vote in a referendum, take other decisions, and indicate expectations about the behavior of other participants. You will make these indications in written form and we guarantee that all data are subject to privacy. No participant will be informed about the decisions of other participants.

All participants have received the same instructions. Therefore, all members of your group are now reading exactly the same instructions. **You are not allowed to talk during the experiment.** Please raise your hand if you have a question. We are happy to answer your questions in private. It is very important that you follow this rule. If you violate this rule you will be excluded from the experiment and all payments.

In the following, detailed description of the experiment is provided.

Detailed description of the experiment

In this experiment you will vote in a referendum on a proposal (a deduction rule) and take various decisions. The consequences of your decisions depend on the outcome of the referendum. We will first explain the consequences of your decisions. The deduction rule and the procedures of the referendum will be explained later.

1. Your decision

Each participant is endowed with **20 points** which will be called point endowment. Your decision is on how to allocate these 20 points. You have two possibilities:

1. You can allocate some or all points to the **group account** of your group.
2. You can allocate some or all points to your **private account**.

You have to use your entire endowment (= 20 points). The points you put into the group account and the points you put into the private account have to sum to 20.

Once you have taken your decision you have to fill out your decision form. Write your contribution to the group account into column (b); the rest of the points has to be recorded in column (a).

The decision forms are collected by an experimenter when all participants have taken their decisions. We will then calculate the **sum of contributions to the group account** for each group. At the end of the experiment you will be told the sum of contributions to the group account of your group. **Each participants will only be informed about the sum of contributions to the group account but not about individual contributions.**

How do you calculate your point income?

Point income from private account
\+ point income from group account
\- Deduction (if deduction rule applies)
= Point income

Before you take your decision about the allocation of your 20 points, the two accounts are empty (**zero** points). The point income from the **private account** corresponds exactly to the number of points you allocate to the private account. Here are two examples: If you put 20 points on the private account, your point income from the private account is 20 points. If you put 6 points on your private account, your point income is 6 points. Nobody but you obtains income from your private account.

The calculation of your **point income from the group account** is different. This income does not only depend on your contribution to the group account but also on the contributions of the two other group members. Your point income from the group account is calculated as follows:

Your income from the group account = Sum of contributions to the group account x 0.5

The point incomes of the other group members is calculated the same way, i.e. all group members obtain the same income from the group account.

Examples: If the sum of contributions to the group account is 60 points, you and all other group members get an income from the group account of 60 x 0.5 = 30 points. If the sum of points on the group account is 10 points, you and all other group members get an income of 10 x 0,5 = 5 points from the group account.

You get an income of 1 point for each point you put on your private account. If you put 1 point of your endowment to the group account instead, the sum of contributions increases by 1 point. Therefore, your income from the group account increases by 1 x 0.5 = 0.5 points. Note that the income of all group members increases by 0.5 points. Therefore, the total income of the group increases by 3 x 0.5 = 1.5 points. Other group members therefore also obtain income if you contribute to the group income.

On the other hand, you also earn point incomes from contributions of other group members. You obtain 1 x 0.5 = 0.5 points income for each point some other group member contributes to the group account.

2. Referendum on the deduction rule

You and all other group members vote in a referendum on a deduction rule. The deduction rule will be applied if a majority of voters (i.e. 2 or 3 voters) approves of it. The deduction rule will not be applied if a minority (i.e. 0 or 1 voter) approves.

Consequences of the deduction rule

As explained above, your point income consists of your income from the private account plus the income from the group account. **Each group member contributing less than 20 points** to the group account will incur a deduction of 4 points [14 points] if the deduction rule is applied.

To repeat, a member of your group will be deduced 4 [14] points of income if the following conditions apply:

1. The group has accepted the deduction rule (i.e. at least 2 group members vote yes).
2. The contribution of the group member to the group account is less than 20 points.

Voting form

Your decision about whether to accept or reject the deduction rule has to be recorded in the voting form (mark **Yes or No**). In addition, you have to indicate your **expectation** about the outcome of the referendum in this form (i.e. 0, 1, 2 of the other group members vote Yes). You will be paid 2 points in addition if you correctly predict the outcome of the referendum.

Decision form

You have to indicate **for each possible result of the referendum** how you allocate your points to the two accounts.

Complete your decision form as follows:

The columns to the **left** [(a) and (b)]: Indicate how you allocate your 20 points to the private account and the group account. Only integer numbers are allowed.

Right column: Indicate your expectation about the number of points contributed by the other group members (only integer numbers between 0 and 40). You will be paid 4 points in addition if you predict correctly.

Please make these indications for all possible outcomes of the referendum, i.e. for the case that 0, 1 or 2 of the other group members approve of the deduction rule.

We will collect all voting and the decision forms when all participants have completed them. We will then determine the outcome of the referendum in each group and calculate the point income for each participant. At the end of the experiment you will be informed about the outcome of the referendum in your group and the sum of points on the group account.

Note that only the decisions at the actual outcome of the referendum are relevant for the determination of the final payment.

Please do not start to complete the decision form and the voting form until you are asked to do so.

Overview over the experiment:

Decision form: Indicate for each possible outcome how you allocate your 20 points to the private account and the group account [columns (a) and (b)].

1 point on the private account means 1 point for you and 0 points for the others.
1 point on the group account means 0.5 points for you and all other group members.
The points on the two accounts have to add to 20 points for each decision!
In addition, you have to indicate for each possible outcome of the referendum how many points you **expect** other group members to contribute to the group account (right column). You will be paid 4 additional points for a correct expectation.
Voting form: You vote on a deduction rule. The deduction rule will be applied if a majority in your group accepts it (i.e. votes Yes). If the deduction rule is applied, each group member who contributes less than 20 points to the group account will incur a **deduction of 4 [14] points**.
In addition, you have to indicate your expectation about the number of other group members approving the deduction rule. You will be paid an additional 2 points if you predict correctly.
We then collect all forms to determine the outcome of the referendum and the sum of contributions to the group account.
Next, we calculate your point income from the group account and add it to your income from the private account.
At the end of the experiment each participant will be informed about the outcome of the referendum in his group and the sum of contributions to the group account.
Do you have any questions?

Appendix B: Voting form

Proposal: Deduction rule

Each member of the group that contributes less than 20 points to the group account will incur a deduction of 4 points [14 points].

Do you want to accept the deduction rule?

Yes	No
☐	☐

Please tick one.

Expectation *about the outcome of the referendum*

I expect that out of the **two other voters** in my group (please tick one)

Zero approve of the proposal	**One** approves of the proposal	**Both** approve of the proposal

---

Please note:

1. Your group consist of three people, including yourself.
2. The proposal passes if at least two (i.e. two or three) voters approve.

Appendix C: Decision form

Please indicate for each possible outcome of the referendum (0, 1 or 2 of the other group members approve) how you allocate your 20 points to the private account and the group account. Please indicate your expectation about the total number of points that the other group members contribute to the group account in the right column. Note that only the decision and the expectation at the actual outcome of the referendum will be relevant for your income.

1. In case **zero of the other two** group members approves of the deduction rule:

Your **decision**:
(integer number, must sum to 20)

Private account (a)	Your contribution to the **group account** (b)

Your **Expectation**
(integer number from 0 to 40)

Expected contribution by others to the group account

2. In case **one of the other two** group members approves of the deduction rule:

Your **decision**:
(integer number, must sum to 20)

Private account (a)	Your contribution to the **group account** (b)

Your **Expectation**
(integer number from 0 to 40)

Expected contribution by others to the group account

3. In case **two of the other two** group members approve of the deduction rule:

Your **decision**:
(integer number, must sum to 20)

Private account (a)	Your contribution to the **group account** (b)

Your **Expectation**
(integer number from 0 to 40)

Expected contribution by others to the group account

Appendix D: Control questions

[The following questions had to be correctly answered before the decisions were taken]

Please answer all questions. We cannot pay you if you fail to answer all questions. Wrong answers have no consequences whatsoever. If you have a question please ask one of the experimenters.

1. Each group member has an endowment of 20 points. Suppose nobody (including yourself) contributes to the group account. Please calculate

    a) Your point income

        if the deduction rule has been accepted .....

        if the deduction rule has been rejected .....

    b) The point income of the other group members

        if the deduction rule has been accepted .....

        if the deduction rule has been rejected .....

2. Each group member has an endowment of 20 points. Suppose you contribute 20 points to the group account. All other group members also contribute 20 points to the group account. Please calculate

    a) Your point income

        if the deduction rule has been accepted .....

        if the deduction rule has been rejected .....

    b) The point income of the other group members

        if the deduction rule has been accepted .....

        if the deduction rule has been rejected .....

3. Each group member has an endowment of 20 points. Suppose the other two group members jointly contribute 30 points to the group account. Please calculate

    a) Your point income if you contribute – in addition to the 30 points – 0 points to the group account

        if the deduction rule has been accepted? .....

        if the deduction rule has been rejected? .....

    b) Your point income if you contribute – in addition to the 30 points – 20 points to the group account.

        if the deduction rule has been accepted? .....

        if the deduction rule has been rejected? .....

Appendix E: Game-theoretic predictions

This appendix provides the game-theoretic predictions for the two-stage game. The predictions for the one stage game are explained in detail in section 3.3. The two-stage game is solved by backwards induction.

In the **second stage** of the game, the following unique equilibrium outcomes prevail:

(1) With severe law (SevereEnd): $\Sigma g_j = 60 \rightarrow \pi_i = 30$ for all i.

(2) Without law [NoEnd(Severe) and NoEnd(Mild)]: $\Sigma g_j = 0 \rightarrow \pi_i = 20$ for all i.

(3) With mild law (MildEnd): $\Sigma g_j = 0 \rightarrow \pi_i = 16$ for all i.

In the first stage, groups of 3 subjects simultaneously participate in a majority vote on whether to implement a) severe law or no law, b) mild law or no law. If severe law is accepted, all players fully contribute to the public good. Therefore, nobody will be sanctioned, and each player gets a payoff of 30 points. If severe law is rejected, no player contributes to the public good, nobody is sanctioned, and each player gets a payoff of 20 points.

Table 5: Nash equilibria in the two-stage game for severe law

		Player 3			
		YES		NO	
		Player 2		Player 2	
		YES	NO	YES	NO
Player 1	YES	**30**, **30**, **30**	**30**, **30**, **30**	**30**, **30**, **30**	**20**, 20, 20
	NO	**30**, **30**, **30**	20, 20, **20**	20, **20**, 20	**20**, **20**, **20**

The numbers in the payoff matrix show payoffs π for player i (π_1, π_2, π_3) for all possible voting outcomes. As can be seen from the normal-form game in table 5, there are 5 Nash equilibria in the two-stage game. In 4 of the equilibria, severe law is accepted (light shading), in 1 equilibrium severe law is rejected (heavy shading). Intuitively, the multiplicity of equilibria arises because voters can be non-pivotal. A voter is said to be non-pivotal if his or her voting decision does not affect the outcome of the referendum. In particular, a voter is

non-pivotal if both or none of the others approves of the law. By definition, a non-pivotal voter is indifferent between voting Yes or No. Therefore, both Yes and No are best replies (bold numbers indicate best replies). Even though severe law can be accepted or rejected in equilibrium, the acceptance equilibria are "stronger" because Yes is a weakly dominant strategy. In addition, the acceptance equilibria are Pareto-dominant. As a consequence, the game-theoretic prediction in this two-stage game is: Acceptance, Full contribution.

Table 6: Nash equilibria in the two-stage game for mild law

		Player 3			
		YES		NO	
		Player 2		Player 2	
		YES	NO	YES	NO
Player 1	YES	**16**, **16**, **16**	16, **16**, 16	16, 16, **16**	**20**, **20**, **20**
	NO	**16**, 16, 16	**20**, **20**, **20**	**20**, **20**, **20**	**20**, **20**, **20**

Table 6 shows that there are 5 Nash equilibria in the two-stage game with mild sanctions. In 4 of the equilibria, mild law is rejected (light shading), in 1 equilibrium mild law is accepted (heavy shading). Since the rejection equilibria are Pareto-dominant, and since No is a weakly dominant strategy, the game-theoretic prediction in this game is: Reject, $\Sigma g_j = 0$.