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Laws and Norms: Experimental Evidence with Liability Rules[*]

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Résumé/Abstract

We conduct an experiment where participants choose between actions that provide private benefits but may also impose losses on strangers. Three legal environments are compared: no law, strict liability for the harm caused to others, and an efficiently designed negligence rule where damages are paid only when the harmful action causes a net social loss. Legal obligations are either perfectly enforced (Severe Law) or only weakly so (Mild Law), i.e., material incentives are then nondeterrent. We investigate how legal obligations and social norms interact. Our results show that liability rules strengthen pro-social behavior and suggest that strict liability has a greater effect than the negligence rule.

Mots clés/Key words: Behavioral law and economics, liability rules, social norms, social preferences, legal norms.

Codes JEL/JEL codes: C91, K13, D03

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1 Introduction

A main purpose of liability rules is to deter socially inefficient behaviors in case of negative externalities. Under the strict liability rule, individuals must compensate the harm they impose on others irrespective of precautions or circumstances. Under a negligence or fault-based rule, individuals must compensate if their behavior fell short of some legal standard of conduct. In either case, and provided the legal standard in the negligence rule is appropriately set, perfectly enforced liability rules yield socially efficient incentives to avoid causing harm. Conversely, when legal liability is nonexistent or is only imperfectly enforced, e.g., tortfeasors are seldom detected or victims seldom file suit, individuals are under-deterred. The standard prediction is then that behavior will be socially inefficient and negative externalities will arise too often.

Casual observation suggests that there are many situations where people avoid privately profitable but socially harmful behavior irrespective of legal sanctions. There is also a voluminous experimental literature on social dilemma situations, showing that individuals are not solely motivated by their own material payoff. One strand of this literature examines how voluntary contributions to a public good might be influenced by the "legal obligation" to contribute, even if such an obligation is weakly enforced. We design a *Liability Game* where individuals may cause negative externalities and may face legal sanctions because of liability rules.

In our experiment, subjects repeatedly interact with strangers. Each participant must choose between actions that provide private benefits but may also impose losses on others. Participants face varying and randomly occurring circumstances. In some circumstances, the private gain from a harmful action is greater than the loss imposed on others. Causing harm is then socially efficient in the sense that in the long run everyone's wealth would be greater if the harmful action is chosen. In other circumstances the situation is reversed. While the private benefit from the harmful action remains positive, it is smaller than the loss imposed on others. From a social point of view, the harmful action should then be avoided because it reduces average per capita wealth.

We compare three legal environments: no legal liability which we refer to as No Law, strict liability, and an efficiently designed negligence rule. In the latter, the legal standard of conduct is that individuals are not held liable if the loss imposed on others is smaller than the net private benefit from the harmful action. Liability rules are either perfectly enforced (Severe Law) or only weakly so (Mild Law). Under Severe Law, individuals causing harm are always detected. When the rule is strict liability, the individuals are forced to fully compensate victims; with the negligence rule, they must do so only if their behavior did not comply with the legal standard of conduct. Under Mild Law, the individuals causing harm are detected only half of the time. The calibration of payoffs is such that Mild Law should be nondeterrent for most individuals; that is, except for those with an exceptionally high degree of risk aversion.

Under either No Law or Mild Law, the prediction under standard preferences is that participants will always choose the harmful action irrespective of circumstances. Under Severe Law, they will always behave efficiently from a social point of view. Our experiment yields a somewhat different pattern of behavior. Under Severe Law, in circumstances where self and group interests conflict, strict liability and the negligence rule do indeed efficiently regulate behavior. Both rules do much better than No Law, as would be expected if individuals had purely self-interested preferences. However, under Mild Law, both liability rules still do significantly better than No Law even though the threat of legal sanction is essentially nondeterrent. Moreover, strict liability then does better than the negligence rule even though monetary incentives are the same under both rules when private and collective interests are at odds.

We investigate how legal sanctions and social preferences might interact to yield this pattern of behavior. First, we show that behavior is consistent with the assumption that individuals partially trade-off private benefits against the losses imposed on others. Second, compared with No Law, the introduction of legal liability has a norm-activation effect, in the sense that individuals then put greater weight on losses caused to others, which complements the threat of legal sanctions. Third, this effect varies with the content of the liability rules independently of material incentives; it is stronger under strict liability. Finally, we attempt to characterize

the underlying social norms. We show that behavior is influenced by the expression of social disapproval in the form of symbolic punishment points or small costly punishments. Moreover, the main trigger of social disapproval is the belief that a participant has caused harm, irrespective of the prevailing legal rule or of whether the harmful action is socially efficient.

The paper proceeds as follows. Section 2 briefly reviews the related experimental literature. Section 3 presents the experimental design. Section 4 draws on the theoretical literature on social preferences to develop a simple model from which predictions are derived. Section 5 presents the results. Section 6 discusses the interpretation and Section 7 concludes.

2 Related Literature

There are few experimental studies of liability rules in the law and economics literature as such; see Sullivan and Holt (2017). An early paper is Kornhauser and Schotter (1990). They compare strict liability and the negligence rule in the so-called single-actor accident framework where agents can invest in precautions to reduce the probability of causing harm to others. More recently Angelova et al. (2014) considered No Law, strict liability and the negligence rule in the same set-up but with only two precaution levels ("care" versus "no-care"). They find that either liability rule provides socially efficient incentives but that roughly half of the subjects also invest in care under No Law. In both these papers, consistent with the traditional approach in law and economics (Becker, 1968), legal obligations are backed by deterrent incentives. In our experiment, by contrast, the focus is on nondeterrent law. In addition, the occurrence of harm is non-stochastic, i.e., it follows deterministically from one's actions. Socially efficient "care" depends on the choice between actions given one's private circumstances.[1] Non-stochastic harm minimizes the potentially confounding effects of risk aversion and of confusion due to the subjects' computation under uncertainty.

Closely related to this paper is the experimental literature on the effect of "legal obligations" in linear Public Good games. Such games, also known as Voluntary Contribution Mechanisms, have been widely studied because they epitomize the conflict between self-interest and group interest in social dilemma situations; see Chaudhuri (2011) and Villeval (2012) for recent surveys. A smaller strand of this literature has studied the role of weakly incentivized obligations to contribute to the public good (e.g., Tyran and Feld, 2006; Galbiati and Vertova, 2008, 2014; Kube and Traxler, 2011; Riedel and Schildberg-Hörisch, 2013). The aim is to test the notion of "expressive law", i.e., law not backed by binding incentives as defined in Cooter (1998) or McAdams and Nadler (2005) among others.[2]

A rationale often invoked to explain the role of expressive law is that obligations impact behavior because they affect the individuals' beliefs about the behavior of others. If individuals have other-regarding preferences (e.g., inequality aversion or a predisposition for conditional cooperation), social dilemma situations in terms of material payoffs become coordination games in terms of utilities (Fehr and Schmidt, 1999, 2006). Weakly incentivized obligations can then help coordinating on more cooperative equilibria. Another rationale is that obligations may play a role by themselves because of the emotional cost of disobeying obligations. Galbiati and Vertova (2014) show that expressive law works through both channels. Non-binding obligations influence beliefs, which triggers conditional contributions. They also affect preferences, which is captured by a rightward shift in the individuals' conditional contribution schedule.

Although it also deals with a social dilemma situation, our Liability Game differs in many ways from the standard Public Good game. In the latter, it is clear from the set-up that everyone would benefit if all contributed to the public good. In our case, the public good nature of avoiding actions that *inefficiently* cause harm is a step removed. Because the payoffs from

[1] This set-up is similar to the economic model of the public enforcement of law discussed in Polinsky and Shavell (2007). The "accident model"more commonly used in the economic analysis of tort law is reviewed in Shavell (2007).

[2] See Fluet and Galbiati (2016) for a survey. Some of the experimental literature has been concerned with the "democratic dividend" when non-binding obligations are introduced endogeneously by the participants (Tyran and Feld, 2006; Markussen et al., 2014).

one's actions depend on one's circumstances, individuals only benefit on average (or in the long-run under repeated interactions) if all behave efficiently. In addition, when legal obligations are introduced, there is a subtle difference in the message conveyed by the obligation. In the standard Public Good game, the message is that one may be fined for not contributing to the public good, which presumably conveys the obligation to contribute. In our case, as is true of actual liability rules, the explicit message is not that one should not cause harm but rather that one will need to compensate harm caused, possibly only in some circumstances or with some probability.

We also borrow from the Public Good games literature the possibility that individuals impose symbolic or small monetary punishments on others. Informal costly sanctions have been shown to substantially reduce free-riding, both in the Stranger and Partner matching protocols (Fehr and Gächter, 2000, 2002, among others). Our aim here is not to supplement weakly enforced formal legal sanctions with truly effective informal punishment for bad behavior.[3] Rather we seek to capture the expression of social disapproval, as a reflection of the underlying social norms, and to inquire how behavior might respond to disapproval. Purely symbolic punishment or the mere fear of disapproval have also been shown to affect behavior (Masclet et al., 2003; Rege and Telle, 2004; Noussair and Tucker, 2005; Dugar, 2013). In our Liability Game, however, one's actions or circumstances are only imperfectly observed by others.[4] They can be inferred, if at all, only from the overall frequency of harmful actions or from condemnations under the prevailing liability rule. As with real life liability rules, subjects are allowed to express diffuse disapproval of certain actions or of individuals who have been condemned but will otherwise remain strangers.

3 The Experiment

The experiment consists of two phases. The first phase is the core of the experiment. Subjects play the *Liability Game*, a game in which legal rules and the enforcement policy change across treatments. Each round of play involves two stages. In the first stage participants choose their actions and may or may not be subject to legal sanctions. In the second stage they have the opportunity to informally sanction other participants. The game is repeated 10 times with nonmonetary punishments and is followed by a modified version of the same game in which nonmonetary punishments are replaced by small monetary punishments, also repeated 10 times. Finally, in the second phase, we run a questionnaire for demographics and additional control questions.

3.1 Liability Game

Common Set-up. After a preliminary phase of control questions, participants are introduced to the Liability Game with a new set of instructions. They are told that they are going to play a game that will be repeated 10 times. At each round, they will be randomly and anonymously matched into groups of 4 participants.

Participants start each round with an initial endowment of 20 ECU. At each round they need to choose between two actions, Y and X. Action Y yields an income of 6 ECU and does not affect the other participants' earnings. Action X yields a state-dependent income and reduces by 4 ECU the earnings of each of the three other participants in the group. At the beginning of each round, a random state is drawn for each participant among four possible states, A, B, C and D, with equal probability (i.e., 25%). States are independently drawn and are private

[3] When social punishment is costly, we impose a one-to-one ratio between the cost to the punished and the cost to the punisher. Nikiforakis and Normann (2008) show that social punishment is effective in sustaining cooperation in the long run only when the ratio is substantially above unity.

[4] Costly social sanctions in Public Good games under noisy monitoring have been studied by Grechenig et al. (2010) and Ambrus and Greiner (2012).

information all along the game. The states define a participant's circumstances with respect to the private benefit of action X: this action yields an income of 14 ECU in state A, 16 ECU in state B, 20 ECU in state C, and 22 ECU in state D.

Treatments. Participants were subjected to five different treatments defined in terms of the prevailing liability rule and the enforcement policy.

- **No Law (NL).** In the first treatment, there is no liability rule. Each participant has to bear the losses caused by the actions X of other participants in the group. A participant's net payoff per period, in addition to the endowment at the start of the round, is therefore (i) the private benefit from one's own action Y or X, (ii) minus the losses caused by the actions X of other participants.
- **Severe Strict Liability (SSL).** In the second treatment, participants are told they will be required to compensate the other group members for the losses caused by their decision to engage in action X. Therefore no one suffers from the other participants' decision to engage in X. The net period income equals (i) the private benefit from one's own action Y or X, (ii) minus the damages (12 ECU) for compensation if action X was chosen.
- **Severe Negligence Rule (SNR).** In the third treatment, participants are told they will be required to compensate for the losses caused by their action X if they were in state A or B. A participant therefore suffers from the other participants' actions X only if these actions were undertaken in the circumstances C or D. The net period income equals (i) the private benefits from one's own action Y or X, (ii) minus the damages (12 ECU) for compensation if they choose X in state A or B, (iii) minus the losses caused by the other participants' decision to engage in X in the circumstances C or D.
- **Mild Strict Liability (MSL).** The fourth treatment is similar to the second treatment, except that participants who engage in X are made to compensate only with a probability equal to 0.5, henceforth the detection or enforcement probability. The net period income equals (i) the private benefit from one's own action Y or X, (ii) minus the eventual damages (12 ECU) for compensation if they choose X and are detected, (iii) minus the losses caused by the other participants' decisions to engage in X that were not detected.
- **Mild Negligence Rule (MNR).** The fifth treatment is similar to the third treatment, except that participants who engage in X in state A or B are made to compensate only with a probability of one half. The net period income equals (i) the private benefit from one's own action Y or X, (ii) minus the eventual damages (12 ECU) for compensation if the participant chooses X in state A or B and is detected, (iii) minus the losses caused by the other participants' decision to engage in X when either they were in state C or D or they were in the states A or B but were not detected.

Nonmonetary punishments and payoffs. At the end of each period, participants learn the number of other group members who chose action X. In all treatments but *No Law*, participants also know whether each of the other three group members (anonymously identified as player 1, 2 or 3) had to compensate other participants, i.e., was held "legally liable". Individual actions and states of nature are therefore private information except in so far as actions and states can be inferred from the assignment of liability or from the total number of actions X.

After receiving this information and learning their period payoff, participants have the opportunity to assign disapproval points (between 0 and 6) to each other participant in their group. The disapproval points are individual. After the assignment of disapproval points, a final screen displays to each participant the amount of disapproval points the participant received.

More formally, the condemnation of individual i is defined as follows:

$$\text{condemned}_i = \begin{cases} 0 & \text{in No Law} \\ X_i & \text{in Severe Strict Liability} \\ \mathbb{1}_{A,B} X_i & \text{in Severe Negligence Rule} \\ \mathbb{1}_{\text{det}} X_i & \text{in Mild Strict Liability} \\ \mathbb{1}_{\text{det}} \mathbb{1}_{A,B} X_i & \text{in Mild Negligence Rule} \end{cases}$$

where $\mathbb{1}_{A,B}$ is a dummy variable equal to 1 if individual i is in state A or B and equal to 0 otherwise; $\mathbb{1}_{\text{det}}$ is a dummy variable equal to 1 if individual i is detected after engaging in action X, and is 0 otherwise.

Monetary punishments and payoffs After the ten rounds of the Liability Game with disapproval points, participants are given a new set of instructions and learn that they will play another 10 rounds of the previous game. The only change compared to the 10 previous rounds is that disapproval points are replaced by costly sanction points. Participants have the opportunity to impose sanction points on other group members. Each point decreases both the participant's and the target's payoff by 0.5 ECU. Each participant can assign up to 6 sanction points to each group member.

3.2 Control Questions.

Before playing the game, participants were asked a series of questions to insure that the game was well understood. We generated a mock stage game in which we displayed the actions, situations and condemnations of a virtual group of participants. Control questions were designed to address all the mechanisms that affect the period payoffs. Participants had to fulfill, step by step, a table which required to compute the losses each participant imposed and bore, the compensation each of them gave and received, and their final payoff.

3.3 Questionnaire

After completion of the Liability Game, participants are asked to fill out a questionnaire on demographics (age, gender) and on preferences and self-perception. These include (i) self-declared political orientation, (ii) attitude with respect to state intervention in the economy, (iii) self-assessed risk aversion, (iv) the extent to which they see themselves as selfish, (v) how much they think others see them as selfish, (vi) the extent to which they feel concerned about the well-being of others, (vii) how much they think others see them as being concerned by the well-being of others. For cross-study comparison purposes, the last four questions were adapted from Angelova et al. (2014).

4 Model and Predictions

Our set-up seeks to replicate the use of liability rules in an anonymous society. Individuals repeatedly interact with strangers under a given legal regime. With purely self-interested agents, the equilibrium prediction is that of a one-shot game at each period of play. When one's circumstances are C or D, the strictly dominant strategy is to choose action X in all legal regimes. When the circumstances are A or B, action X is strictly dominant under No Law while action Y is strictly dominant under Severe Law irrespective of the legal regime.

In the circumstances A and B under Mild Law, action X is chosen by a risk neutral under both legal regimes. By contrast, a sufficiently risk averse might then choose action Y to avoid bearing risk. However, given the initial endowments and the probability of detection, only an extremely risk averse would do so. For example, given a Constant Relative Risk Aversion utility of wealth function, an individual in the circumstance A who expects all three other individuals in his group to choose X in all circumstances will himself choose Y only if his coefficient of

relative risk aversion is above 3.5. This is outside the normal range for relative risk aversion coefficients found in laboratory experiments, often estimated to be between 0.5 and 1.5 (see for instance Holt and Laury 2002). We conclude that our Mild Law is nondeterrent except possibly for unreasonably risk averse individuals. In what follows, for the case of imperfect enforcement, expected values are taken as an acceptable approximation of certainty equivalents.[5]

Efficiency concerns. The experimental literature suggests some departure from pure self-interest. In the present setting, it is natural to think of non purely self-interested preferences in terms of a willingness to balance the private benefits of one's actions against the losses they impose on strangers. Borrowing from Charness and Rabin (2002) and others[6], we postulate that individuals have a utility function of the form:

$$u_i = (1 - \lambda_i)\pi_i + \lambda_i \sum_j \pi_j$$

where π_j is the total payoff of individual j and λ_i is the the weight the individual puts on social efficiency as measured by the total group payoff, including that of individual i. If all individuals have λ_i equal to zero, preferences reduce to pure self-interest.

Individual i's payoff can be written as

$$\pi_i = w_i + g_p$$

where w_i is the part of the individual's payoff that does not depend on his action (but may depend on the actions of others) and g_p is the private benefit from this action. Similarly,

$$\sum_j \pi_j = w_i + w_{-i} + g_s$$

where w_{-i} is the part of the other group members' payoff that does not depend on individual i's action and g_s is the social benefit of the action, i.e., the effect on the total group payoff. The individual's utility is therefore

$$u_i = (1 - \lambda_i)(w_i + g_p) + \lambda_i(w_i + w_{-i} + g_s). \tag{1}$$

The individual chooses the action which maximizes the above expression. Factors affecting w_i and w_{-i} or beliefs about these values are irrelevant in this decision problem.

Let y denote the gain from action Y, x the gain from action X and h the harm caused to others. For action Y, $g_p = g_s = y$. For action X, in expected value, $g_p = x - ph$ and $g_s = x - h$ where p is the probability of having to compensate the harm. Depending on the circumstances, the legal regime and the enforcement policy, p is either zero, one half or unity. Let us denote with capital letters the net consequences of action X compared to action Y, i.e.,

$$G_p = x - y - ph, \quad G_s = x - y - h.$$

Then individual i chooses X if

$$\Delta u_i = (1 - \lambda_i)G_p + \lambda_i G_s \tag{2}$$

is positive. Note that (2) can be rewritten as

$$\Delta u_i = G_p - \lambda_i(G_p - G_s)$$

where $G_p - G_s = (1 - p)h$ is the expected uncompensated harm imposed on others. Thus, the social concern parameter λ_i can be interpreted as the rate at which the individual trades-off private benefits against the net loss caused to third parties.

[5] In the subsequent analysis, we rejected the hypothesis that the certainty equivalent significantly differs from the expected value.

[6] See Andreoni and Vesterlund (2001), Engelman and Strobel (2004), Charness et al. (2016)

Obviously, $G_p \geq G_s$. If action X is socially efficient, i.e., $G_s > 0$, then (2) is positive and action X is chosen irrespective of the value of λ_i, the legal regime and the enforcement policy. If action X is socially inefficient, i.e., $G_s < 0$, and the law perfectly internalizes the harm, i.e., $G_p = G_s$, then (2) is negative and action Y is therefore chosen. It follows that the social concern parameter λ_i matters only in circumstances where self and group interest conflict (i.e., $G_p > 0$ and $G_s < 0$) and where liability rules are imperfectly enforced or non existent.

For such cases, whether social concern makes a difference overall will depend on the distribution of the λ_i's in the population and on the choices facing the individuals. In circumstances such as A or B, an individual with a sufficiently large λ_i will choose action Y even under No Law because this is the socially efficient action. In the same circumstances, an individual who would not have chosen Y under No Law may well do so when liability rules are introduced, even if enforcement is nondeterrent, because the private gain G_p is decreasing in p while the social gain G_s is unaffected. Also, under No Law or under Mild Law, an individual who would have chosen Y in the circumstance A may well choose X in the circumstance B. This follows from the fact that both G_p and G_s are increasing in the gross benefit x from action X. Our prediction is therefore as follows: (i) in the circumstances A or B, the proportion of agents choosing X will decrease from No Law to Mild Law and Severe Law; (ii) under No Law or Mild Law, the proportion of agents choosing X will increase between the circumstances A and B.

Additional considerations. It may well be that, other things equal, some individuals strictly prefer not to choose action X. Specifically, when both actions are equally efficient, i.e., $G_s = 0$, and the legal system perfectly internalizes the harm caused to others, i.e., $G_p = G_s$, then some individuals strictly prefer action Y and presumably no one strictly prefers action X. This modifies the expression in (2) to

$$\Delta u_i = (1 - \lambda_i)G_p + \lambda_i G_s + \delta_i$$

where $\delta_i \leq 0$ captures a willingness to pay to avoid action X *per se*, i.e., even when the harm is compensated. The parameter may reflect a variety of motivations other than related to private and social gains, e.g., a pure reluctance to cause harm or the disutility from social disapproval when one is found to have caused harm.[7]

So far we have assumed that the λ_i's are completely exogenous. A possibility is that they also incorporate reciprocity considerations and ultimately depend on the equilibrium, as modeled in Charness and Rabin (2002). Another theoretical justification is provided by Segal and Sobel (2007). They assume that individuals have preferences over the strategies of others rather than only over outcomes. They show that an individual's preferences can then be represented as a linear combination of all the agents' utility functions over outcomes, where the weights depend on the equilibrium strategies. This is consistent with the utility function in (2) where the individual's λ_i is obtained at equilibrium. At a more practical level, as discussed in Section 2, the literature on public good games with nondeterrent legal obligations has emphasized that such obligations may help coordinate conditional cooperators on better equilibria.[8] Another possibility is that legal obligations directly modify preferences. For instance, liability rules may introduce a sense of obligation or reinforce a "responsibility norm" irrespective of sanctions and expectations.

To allow for such phenomena, we take it that the social concern parameter (possibly at equilibrium) and the reluctance term may well depend on the legal regime. The expression in (2) is now modified to

$$\Delta u_i = (1 - \lambda_{ir})G_p + \lambda_{ir} G_s + \delta_{ir} \tag{3}$$

[7]Thus δ_i can be related to the social and self-esteem concerns in Bénabou and Tirole (2006, 2011); see also Deffains and Fluet (2013) for an application to liability rules in the accident model. In Section 5.2, δ_i is related to the socio-demographic variables and occurrences in the game such as punishment points received.

[8]With reference to (1), beliefs about w_i and w_{-i} and therefore about the strategies of others will now be relevant in one's decision problem.

where the legal regime is denoted by r and is either No Law (NL), strict liability (SL) or the negligence rule (NR).

If legal liability does not crowd out social concerns, λ_{ir} will be at least as large under SL or NR than under NL. In the circumstances A and B, a change from No Law to Mild Law then reduces the proportion of individuals choosing X through two channels: (i) first, the private benefit of action X is reduced because of the liability risk; (ii) secondly, the law may reinforce social concerns. The latter effect may itself depend on the content of the liability rule. Of course, such regime specific effects matter only when the law is imperfectly enforced.

5 Results

Procedures. The experiment was computerized using z-Tree (Fischbacher 2007). We ran 10 sessions (two per treatment) in May, July and September 2016 in Québec (Canada) and Strasbourg (France). Each session included 20 participants, amounting to five groups of four subjects at each round, except for one No Law session that included only 16 participants. Overall, 196 participants took part in the experiment. An ECU was convertible to Canadian dollars at 30 ECU = 1 dollar or to Euros at 40 ECU = 1 Euro. The same co-author supervised all sessions.

Decriptive Statistics Figure 1 displays the proportion of actions X undertaken in each of the four possible circumstances under every legal regime. Clearly the presence of a legal system and the extent to which it is enforced greatly impact decisions when self and group interests conflict, i.e., in the circumstance A and B. In these circumstances, the proportion of actions X is greatest under No Law and reaches the smallest level under Severe Law, both under strict liability and under the negligence rule. Thus, it seems that a perfectly enforced legal system successfully achieves its main objective.

However, the data also partially contradict the theoretical predictions based on purely self-interested preferences. First, in the circumstances A or B, there is a significantly smaller proportion of actions X under Mild Law than in No Law. In these cases, it is privately inefficient to undertake Y but almost about half of the participants choose to do so. Secondly, the proportion of actions X increases with the circumstances: more participants tend to undertake X in situation B compared with A or in situation D compared with C, although standard preferences would predict similar choices. Under Mild Law, we also observe that in the circumstances A and B strict liability yields a smaller proportion of actions X than the negligence rule. In fact, both under Mild and Severe Law, strict liability also yields a smaller proportion of actions X in the circumstances C and D where it is both privately and socially optimal to choose X.

We proceed as follows. First, we test the explanatory power of a simplified version of the theoretical model proposed in section 4. The goal is to assess how much the individuals' decisions can be explained in a framework combining only self-interest and social efficiency concerns together with some of the additional considerations discussed in Section 4. Next we take into account the socio-demographic variables and additional factors that may impact the decision to undertake X. Finally, we explore the decisions to impose social sanctions on other participants.

5.1 Preliminary analysis

We first turn to a simple approach for understanding the data on the basis of the model developed in Section 4. For simplicity, we assume that all participants share the same fixed set of preferences except for an additive noise term in maximizing utility. This term crudely captures preference heterogeneity among participants. We fit the logistic regression

$$P = \frac{e^{\gamma \Delta u}}{1 + e^{\gamma \Delta u}} \tag{4}$$

where P is the probability of undertaking action X, Δu is the difference in utility between the actions X and Y as defined in (3), and γ is the parameter capturing the sensitivity of behavior

to differences in utility. The size of γ reflects the explanatory power of the model. Thus, we estimate a binary-response logit with the propensity score

$$\gamma\left[(1-\lambda_r)G_p + \lambda_r G_s + \delta\right],\ r \in \{NL, SL, NR\}$$

Table 3 shows the regression results for a variety of restrictions on the parameter values. In Model 1, all parameters are constrained to equal zero except γ. This specification corresponds to purely self-interested preferences. In Model 2, we allow for social concerns with a parameter that does not depend on the legal regime. The parameter is highly significant and the log-likelihood improves markedly. Individuals put non-negligible weight on the group payoff in addition to their own private benefit. In Model 3, we allow the constant term to differ from zero. The term has the expected sign indicating a reluctance to choose action X everything else equal, but the gain in explanatory power is slight and the average willingness to pay to avoid action X *per se* is very small (0.27 ECU).

In the last three models, we allow the social concern parameter to differ between legal regimes. The major gain here is with respect to the value of the parameter under strict liability. In Model 4a, λ_{SL} may differ from $\lambda_{NL} = \lambda_{NR}$. The difference is highly significant. Individuals put greater weight on others' payoff under strict liability compared with No Law and the negligence rule. Model 4b does the same with respect to λ_{NR} but this is much less successful. Finally, in Model 5, all restrictions are removed. The social concern parameters are quantitatively important in all legal regimes and they differ significantly between regimes. In this more flexible model, the reluctance parameter δ essentially vanishes. Figure 2 illustrates the predictions of the model.[9] To summarize, we have the following results.

Result 1 Individuals care about others' payoff. In the absence of legal obligations, there is a trade-off rate of 28% between private benefits and the losses imposed on others.

Result 2 Legal rules crowd in social concerns. The trade-off rate between private benefits and the losses imposed on others increases to 37% under the negligence rule and to 50% under the strict liability rule.

5.2 Determinants of action X

The model of Section 4 explains a great deal of the data. About 43% of the individual decisions[10] are explained by expected private benefits, the effect on group payoff, and the impact of legal rules on social concerns. We now consider further refinements. We exploit the repeated choices of each individual by adding individual effects. In addition, we include the control variables of the questionnaire and also consider the impact of social disapproval and informal costly sanctions on the decision to undertake X.

In the Tables 4 and 5, the decisions to choose X over Y are analyzed by logistic regression with individual random effects and cluster at the session level.[11] The variable G is defined as $G = G_s - G_p$, i.e., it is the expected uncompensated loss imposed on others expressed as a negative value. In the regression of Table 4, the social concern variable is constrained to be the same in all legal regimes. For simplicity, the estimated coefficients are presented in their raw form. For comparison with Table 3, the coefficient of G_p should be read as $\beta_1 = \gamma$; the coefficient of G should be read as $\beta_2 = \gamma\lambda$. Hence the social concern parameter is computed as $\gamma = \beta_2/\beta_1$. In Table 5, the social concern parameter is allowed to differ between legal regimes, so the coefficient of G is interacted with a regime specific dummy variable.

[9] Allowing δ to differ between legal rules was not significant. We also tested for the role of risk aversion under imperfect enforcement with dummy variables subtracted from the expected private gain. This was also not significant.

[10] On the basis of the Pseudo R^2

[11] We cluster data at the session level to take into account the potential dynamic session effects. See Fréchette (2012).

As in the previous section, the participants' behavior is partly explained by a concern for the loss they can impose on others. In Table 4, the estimated coefficient of the net loss variable G is significant in all specifications. Depending on the specification, its value varies between 0.37 and 0.39 (in the columns 2a to 5a) which is very close to the value estimated in Model 3 of Table 3. When we allow the coefficient to differ between legal regimes as in Table 5, we again obtain that the social concern parameter in the presence of liability rules is substantially larger than under No Law. The parameter is around 0.25 under No Law, 0.53 under the negligence rule and 0.57 under strict liability. The difference between strict liability and the negligence rule is no longer significant.

Our experiment allows participants to express disapproval of their fellow participants at the end of each round. Social sanctions have been showed to influence behavior in public good experiments. Our results suggest that individuals are indeed less likely to undertake X when they have received nonmonetary punishment points at the previous round. This effect more pronounced with monetary punishment points. The behavioral impact of social sanctions occurs mainly in situations where individuals were disapproved of after undertaking X, whereas disapproval following action Y does not affect subsequent decisions. Last, the proportion of X actions by other participants in the past history of the game does not seem to affect one's decision to undertake action X. Note also that there is clearly much heterogeneity between individuals. Everything else equal, those who have chosen the action causing harm in the past are also significantly more likely to do so in the future.

Result 3 Individuals are less likely to reiterate a harmful action when they have been disapproved of or informally sanctioned at the previous period in situations where they have engaged in the harmful action.

5.3 Determinants of social sanctions

A second objective for introducing social sanctions, which we now deal with, is to identify the determinants of disapproval as a reflection of the underlying social norms. Because our groups are rematched after each round, disapproval can only be expressed about essentially anonymous persons, e.g., those who have been found liable.

Participants largely took advantage of the possibility to express disapproval. Participants received on average 4 to 8 nonmonetary punishment points per round depending on the treatment considered. Costly sanctions are assigned less often, i.e., social sanctions are sensitive to the cost of punishment. When a legal regime is in force, social disapproval appears to be mainly concentrated on participants who were held liable, hence who are known to have undertaken X. This holds both when social disapproval is free (Figure 3) and when it is costly (Figure 4). However, there is also much disapproval of individuals who have not been held liable. Under No Law, no one is ever held liable but participants received on average 8 disapproval points per round.

We ran a series of regressions on the decision of individual i to punish participant j of his group at round t. Recall that, at the end of each round, participant i observes whether participant j was condemned or not and he also observes the total number of actions X for which individuals were not held liable. From the latter, participant i can infer the probability that a non-condemned participant j undertook the harmful action. This inference does not depend on the legal regime and in some cases the up-dated probability may very well equal unity. This allows us to disentangle two effects: (i) how one's belief that j engaged in X affects one's disapproval of j; (ii) the effect of a condemnation *per se*, in addition to its role in revealing that j engaged in X.

The results are displayed in Table 6. The coefficient of the explanatory variable condemned_j is the number of punishment points assigned on average to a participant who has been found liable. The variable $(1\text{-condemned}_j)\text{pX}$ is the probability that a non-condemned participant j engaged in action X. Its estimated coefficient can therefore be interpreted as the number of punishment points assigned to a non-condemned participant who is believed to have engaged

in X for sure (i.e., when (1-condemned$_j$)pX equals unity). Overall the difference between the coefficients of the two variables is not significant (or is very small). The main driver of disapproval therefore appears to be the belief that other participants engaged in the harmful action. There is no significant disapproval effect of legal condemnations *per se* in addition to their informational role.

Engaging in action X does not necessarily imply socially inefficient behavior. The same observation holds with respect to legal liability, except under the negligence rule. We inquired whether there is additional disapproval of a participant who is believed to have *inefficiently* engaged in X, whether the participant was condemned or not. The variable pX_AB captures participant i's belief that participant j engaged in X in the circumstances A or B. The aim is now to disentangle between disapproval of individuals who are believed to have caused harm and of those who are believed to have caused harm inefficiently.[12] The coefficient is not significant. We conclude that there is no evidence that efficiency concerns constitute a determinant of disapproval.

Finally, a tendency for "blind revenge " with respect to nonmonetary punishment points is also observed. Participants are more likely to sanction other participants the more they have been sanctioned themselves at the previous round. The effect is significant but quantitatively small and is non existent when social sanctions are costly. Although "blind revenge " is more likely to occur when an individual was disapproved of after undertaking Y as opposed to X, the difference is not statistically significant.

Result 4 The main driver of social disapproval is the belief that a participant has engaged in the harmful action, whether the participant was legally condemned or not.

6 Discussion

Framing effects in Public Good games have been extensively discussed. For instance, subjects contribute more when the positive externality of contributing to the public good is stressed rather than the negative externality of not contributing (e.g., Andreoni, 1995; Park, 2000). In a review paper, Cartwright (2016) remarks that positive-negative framing should be distinguished from give-take framing, i.e., whether subjects are asked to contribute to a public good or take from a public resource. He also suggests a third dimension related to how the participants' initial allocation is presented.

By their very nature, liability rules involve framing. They posit a reference point defined by the individual's endowment, more generally an entitlement, with respect to which compensable losses are considered. This was implicit in the terminology used in the experiment. Under No Law, the instructions specified endowments, the private benefits from possible actions, and the fact that some actions caused losses to others and that one could suffer losses due to the actions of others. When legal liability was introduced, it was described as the obligation to compensate the losses caused to others. In Cartwright's typology, our instructions can therefore be described as a negative-take-endowment framing. Obviously the same ultimate payoff configurations could have been presented very differently, merely as a function of the group members' actions without the notions of endowments or losses.

Participants unambiguously express disapproval of individuals who cause losses. Those actually found liable face somewhat greater disapproval but the difference is barely significant.

[12]The variable pX_AB is the probability that a participant undertook action X in situation A or B ($p(X\&AB)$). In other words, it is the probability of the joint events X and AB. We compute it as the product of the probability that an individual undertook X (i.e. $p(X)$) and the probability that an individual undertook action X in situation A or B given that he/she undertook action X ($p(AB|X)$). For treatments SSL, MSL and NL, the conditional probability equals the ratio of the number of actions X undertaken in A or B over the total number of actions X undertaken in the treatment, i.e. the empirical frequency. In SNR, it is equal to 1 if the individual is condemned, and to 0 if he/she is not condemned. In MNR, it equals 1 if the individual is condemned, and the empirical frequency if he/she is not condemned.

Also, whether the action causing harm is socially efficient does not seem to matter in the expression of disapproval. This can be read directly from the Figures 5 and 6. When liability rules are perfectly enforced, most individuals behave efficiently in terms of the overall group income. Under strict liability, individuals found liable therefore most likely behaved efficiently, i.e., they must have chosen the harm causing action in the circumstances C or D. These individuals should face no disapproval if participants primarily disapproved of actions that inefficiently cause harm.[13] However, individuals found liable under strict liability receive on average the same number of disapproval points as those found liable under the negligence rule, who for sure behaved inefficiently. Moreover, whether harm was compensated or not has no effect either on the expression of disapproval. Individuals condemned under the perfectly enforced strict liability rule face roughly the same disapproval level as the average individual under No Law, who most likely has caused harm but without compensating. Finally, individuals react (at least slightly) to disapproval received but only after choosing the action causing harm. Presumably this is when they feel disapproval was 'justified'.[14]

We posited a utility function with social welfare concerns. Our set-up, however, is one-sided: individuals can benefit the group only by sacrificing private benefits in order to avoid causing losses. The social concern parameter is therefore best interpreted as the rate at which individuals trade-off private benefits against losses imposed on others (i.e., individuals would perhaps not be driven by the same parameter if sacrificing private benefits increased the wealth of others). We allowed for the possibility that 'observed' parameters might be equilibrium-dependent and in particular that they could differ between legal regimes. We also allowed for a 'pure reluctance' to undertake the action causing harm which may depend on a variety of motivations (e.g., a distaste for social punishments) and is unrelated to the trade-off between private benefits and losses to others. Pure reluctance as defined here acts as a fixed cost of engaging in the harmful action. Both social concern and pure reluctance seem to be at work in the participants' behavior.

Our main finding is that liability rules increase social concern compared to No Law, i.e., it modifies the trade-off between private benefits and losses to others, hence it improves behavior even under nondeterrent enforcement. However, heterogeneity in the reluctance term with sufficiently large values for some individuals will also generate the step-like shapes under Mild Law in Figure 1. The same factor may explain why under strict liability (with either Mild or Severe Law) some individuals refrain from the harmful action even when it is desirable from a collective point of view. In other words, the risk of legal sanctions combined with other motivations then yields some overdeterrence.

7 Conclusion

An extensive theoretical literature has discussed the merits of strict liability and fault-based legal systems in deterring behavior that generate negative externalities. This body of research concludes that both types of rules, when perfectly enforced, achieve efficiency by aligning self-interest on collective interest.

We designed an experiment to investigate how agents behave with or without liability rules and when rules are weakly enforced. Our set-up is related to public good games in which participants are randomly matched with strangers and where private and group interests potentially conflict. In our setting, participants must decide between two actions, one of which generate negative externalities. In principle the legal rules considered completely align private and group

[13] This is also the prediction in Deffains and Fluet (2013) in a model where heterogeneous individuals earn social esteem when they are thought to trade-off appropriately private benefits and losses to others. Under perfectly enforced strict liability, everyone behaves the same, hence being found liable is not stigmatizing.

[14] The assignment of punishment points is nonstrategic because of the Stranger Matching protocol. In Public Good or prisoners' dilemma experiments, abstracting from revenge punishments, social sanctions are essentially targeted towards those who behave badly, i.e., do not contribute or defect (e.g., Falk et al., 2005). This is consistent with the role of indignation in motivating social sanctioning behavior (e.g., Hopfensitz and Reuben, 2009). In our experiment, bad behavior seems to be equated to causing losses to others.

interests but they are insufficiently deterrent when poorly enforced.

The participants' behavior contradicts the predictions under standard self-interested preferences. First, the evidence suggests that individuals are willing to partially trade-off private gains against the losses imposed on others. Second, our experiment reveals that the weight given to social concerns relative to private benefits is increased by the introduction of liability rules. This suggests a *norm-activation* effect, i.e. social concerns are reinforced by the normative message conveyed by liability rules, but the precise channel through which the effect operates warrants further research. There is weak evidence that the effect is stronger under strict liability than under the negligence rule. Compared with the negligence rule, the obligation under strict liability perhaps appears unequivocal and more equitable: in principle at least, one is always "responsible" for the harm caused to others.

A further contribution of our paper consists in analyzing the role and determinants of social disapproval in this setting. As expected, participants are indeed less likely to engage in harmful conduct when they have been informally sanctioned by other group members. Moreover, individuals tend to disapprove of other group members who have or may be believed to have engaged in actions generating negative externalities, irrespective of legal condemnations. Causing harm rather than harm combined with socially inefficient behavior is the main driver of social disapproval. A plausible interpretation of our findings is that liability rules (in particular strict liability) increase the salience of this underlying social norm.

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A Tables

Table 1: Description of the variables.

Variable Name	Description
expGains_{it}	Expected private gains of individual i at round t of undertaking X rather than Y given the situation $k(it)$.
socialGains_{it}	Social contribution to the group welfare of individual i at round t of undertaking X rather than Y given the situation $k(it)$.
recDisap_{it}	Number of non-monetary punishment points received by individual i at round t.
recSanctions_{it}	Number of monetary punishment points received by individual i at round t.
X_{it}	Dummy variable equal to 1 if the individual i undertakes action X at round t, 0 if she/he chooses Y.
givDisap_{ijt}	Number of non-monetary punishment points given by individual i to participant j at round t.
$\text{givSanctions}_{ijt}$	Number of monetary punishment points points given by individual i to participant j at round t.
historyX_{it}	Proportion of actions X that other group members of individual i undertook until round t.
condemned_{jt}	Dummy variable equal to 1 if individual j was condemned at round t, 0 otherwise.
uncompens_{it}	Number of uncompensated accidents (other than those of individual i) for group $g(i)$ at round t.

Table 2: Descriptive Statistics

Variable	Mean	St. Dev.	Min	Max
expGains	6.505	6.759	-4	16
socialGain	.0133	3.151	-4	4
recDisap	6.262	4.615	0	18
recSanctions	.789	1.823	0	12
X	.7059	.4557	0	1
givDisap	2.087	2.441	0	6
givSanctions	.263	1.032	0	6
historyX	.696	.1839	0	1
condemned	.2616	.4396	0	1
uncompens	.2629	1.032	0	6

Table 3: Structural Econometrics. (N=3,920)

Model	Restrictions	γ	λ_{NL}	λ_{SL}	λ_{NR}	δ	LL
(1)	$\lambda_{NL} = \lambda_{SL} = \lambda_{NR} = \delta = 0$	.299*** (.01)					-1439.1
(2)	$\lambda_{NL} = \lambda_{SL} = \lambda_{NR}; \delta = 0$	.471*** (.019)	.391*** (.022)	.391*** (.022)	.391*** (.022)		-1366.9
(3)	$\lambda_{NL} = \lambda_{SL} = \lambda_{NR}$	.46*** (.019)	.349*** (.033)	.349*** (.035)	.349*** (.035)	-.273* (.158)	-1365.4
(4-a)	$\lambda_{NL} = \lambda_{NR}$	.464*** (.019)	.319*** (.035)	.488*** (.045)	.319*** (.035)	-.141 (.045)	-1357
(4-b)	$\lambda_{NL} = \lambda_{SL}$	.46*** (.02)	.351*** (.035)	.351*** (.035)	.344*** (.044)	-.276* (.159)	-1365.4
(5)	none	.463*** (.019)	.278*** (.044)	.498*** (.046)	.374*** (.044)	-.078 (.162)	-1355

Significance level: *** significant at 1% level; ** significant at 5% level; * significant at 10% level.
LL is the log-likelihood.
For Model 4-a: $H_0 : \lambda_{NL} = \lambda_{SL}$; p<1%.
For Model 4-b: $H_0 : \lambda_{NL} = \lambda_{NR}$; p=84.7%.
For Model 5: $H_0 : \lambda_{NL} = \lambda_{SL}$; p<1%.
$H_0 : \lambda_{NL} = \lambda_{NR}$; p<1%.
$H_0 : \lambda_{SL} = \lambda_{NR}$; p<1%.

Table 4: Regression of the decision to undertake action X.

Method	RE Logit					
Model	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)
Gp	0.588***	0.552***	0.563***	0.769***	0.765***	0.599***
	(0.0897)	(0.0764)	(0.0733)	(0.169)	(0.167)	(0.0943)
G	0.237**	0.203**	0.208**	0.285**	0.296**	0.274**
	(0.105)	(0.0936)	(0.0937)	(0.129)	(0.130)	(0.116)
recDisap_{t-1}		-0.0503***				
		(0.0141)				
$\text{recDisap}_{t-1} \times X_{t-1}$			-0.0770***			
			(0.0137)			
$\text{recDisap}_{t-1} \times Y_{t-1}$			0.0429			
			(0.0499)			
$\text{recSanctions}_{t-1}$				-0.139***		
				(0.0537)		
$\text{recSanctions}_{t-1} \times X_{t-1}$					-0.202***	
					(0.0324)	
$\text{recSanctions}_{t-1} \times Y_{t-1}$					-0.0310	
					(0.0596)	
X_{t-1}			0.431**		0.440***	
			(0.204)		(0.140)	
historyX						1.557
						(0.959)
Period	0.0386***	0.0685***	0.0699***	0.143***	0.137***	0.0455***
	(0.0145)	(0.0254)	(0.0267)	(0.0445)	(0.0424)	(0.0146)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual RE	Yes	Yes	Yes	Yes	Yes	Yes
N	3920	1960	1960	1,764	1,764	3724

Significance level: *** significant at 1% level; ** significant at 5% level; * significant at 10% level.
Robust standard errors clustered at the session level.

Table 5: Regression of the decision to undertake action X (cont'd).

Method	RE Logit					
Model	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)
Gp	0.608***	0.575***	0.589***	0.783***	0.779***	0.615***
	(0.0849)	(0.0725)	(0.0688)	(0.150)	(0.149)	(0.0906)
G $\times \mathbb{1}_{NL}$	0.167**	0.145*	0.146*	0.201	0.216*	0.190*
	(0.0842)	(0.0834)	(0.0844)	(0.126)	(0.127)	(0.104)
G $\times \mathbb{1}_{NR}$	0.333***	0.307***	0.321***	0.390*	0.392**	0.349***
	(0.127)	(0.0992)	(0.0992)	(0.201)	(0.193)	(0.134)
G $\times \mathbb{1}_{SL}$	0.367***	0.326***	0.336***	0.442***	0.443***	0.379***
	(0.106)	(0.0838)	(0.0821)	(0.145)	(0.142)	(0.111)
recDisap$_{t-1}$		-0.0527***				
		(0.0124)				
recDisap$_{t-1}$ $\times X_{t-1}$			-0.0819***			
			(0.0506)			
recDisap$_{t-1}$ $\times Y_{t-1}$			0.0467			
			(0.0527)			
recSanctions$_{t-1}$				-0.128**		
				(0.0510)		
recSanctions$_{t-1}$ $\times X_{t-1}$					-0.184***	
					(0.0346)	
recSanctions$_{t-1}$ $\times Y_{t-1}$					-0.0322	
					(0.0634)	
X_{t-1}			0.458**		0.411***	
			(0.203)		(0.125)	
historyX						1.042
						(0.903)
Period	0.0389***	0.0712***	0.0728***	0.144***	0.138***	0.0464***
	(0.0145)	(0.0257)	(0.0271)	(0.0443)	(0.0423)	(0.0151)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual RE	Yes	Yes	Yes	Yes	Yes	Yes
N	3920	1960	1960	1,764	1,764	3724
$H_0 : \beta_{NL} = \beta_{NR}$ (p-val)	0.051	0.013	0.011	0.317	0.326	0.045
$H_0 : \beta_{NL} = \beta_{SL}$ (p-val)	< 0.001	<0.001	<0.001	0.031	0.029	0.002
$H_0 : \beta_{NR} = \beta_{SL}$ (p-val)	0.592	0.6555	0.750	0.723	0.707	0.600

Significance level: *** significant at 1% level; ** significant at 5% level; * significant at 10% level.
Robust standard errors clustered at the session level.

Table 6: Decision of individual i to give non-monetary or monetary punishment points to individual j at period t.

Method	GLS with RE									
	Non-monetary punishment					Monetary punishment				
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
condemned$_j$	1.191***	1.809***	1.735***	1.733***	1.726***	0.211***	0.261***	0.238***	0.211***	0.210***
	(0.184)	(0.204)	(0.264)	(0.249)	(0.250)	(0.0483)	(0.0650)	(0.0432)	(0.0502)	(0.0508)
(1-condemned$_j$) pX		1.493***	1.470***	1.437***	1.452***		0.115	0.107	0.118	0.120
		(0.211)	(0.195)	(0.211)	(0.202)		(0.148)	(0.134)	(0.134)	(0.140)
pX_AB			0.209	0.0579	0.0870			0.0614	0.123	0.127
			(0.450)	(0.394)	(0.387)			(0.202)	(0.210)	(0.223)
recDisap$_{t-1}$				0.0595***	0.0844***					
				(0.0124)	(0.0116)					
recDisap$_{t-1}\times$ X$_{t-1}$					-0.0217					
					(0.0172)					
recSanctions$_{t-1}$									0.0322***	0.0182
									(0.00874)	(0.0119)
recSanctions$_{t-1}\times$ X$_{t-1}$										0.0203
										(0.0204)
X$_{t-1}$					-0.128					-0.0301
					(0.173)					(0.110)
Period	0.0536***	0.0432**	0.0429**	0.0124	0.0116	-0.00938	-0.0102	-0.0103	-0.00763	-0.00740
	(0.0193)	(0.0210)	(0.0211)	(0.0201)	(0.0196)	(0.00871)	(0.00975)	(0.00990)	(0.00991)	(0.00975)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(Individual $\times$ Period) RE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$H_0 : \beta_{cond_j} = \beta_{(1-cond_j)pX}$ (p-value)		0.0793	0.271	0.150	0.171		0.167	0.286	0.455	0.497
N	5,880	5,880	5,880	5,292	5,292	5,880	5,880	5,880	5,292	5,292

Significance level: *** significant at 1% level; ** significant at 5% level; * significant at 10% level.
Robust standard errors clustered at the session level.

B Figures

Figure 1: Proportion of X actions across treatments and situations.

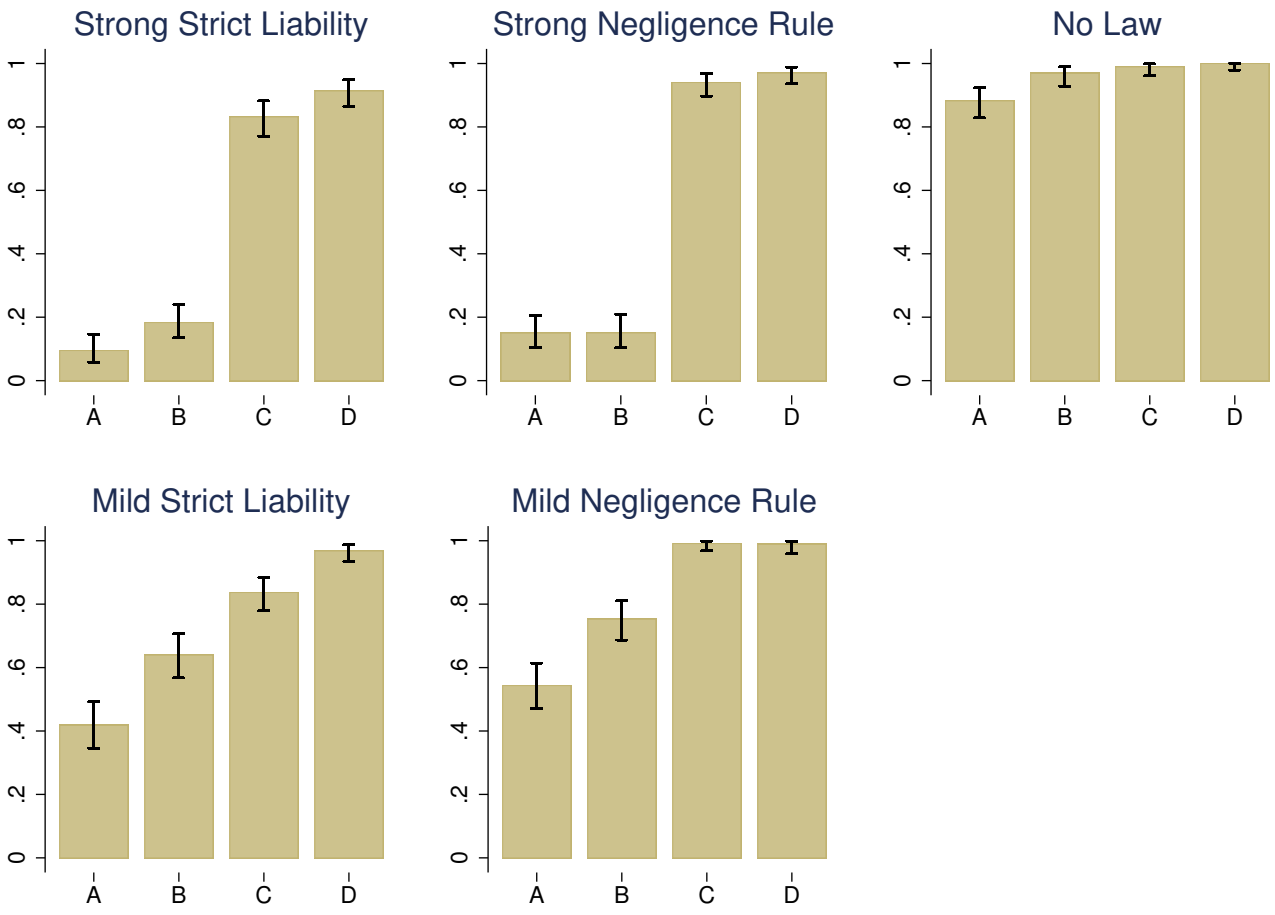

Figure 2: Prediction of behaviors after logit regression (Model 5, table 3).

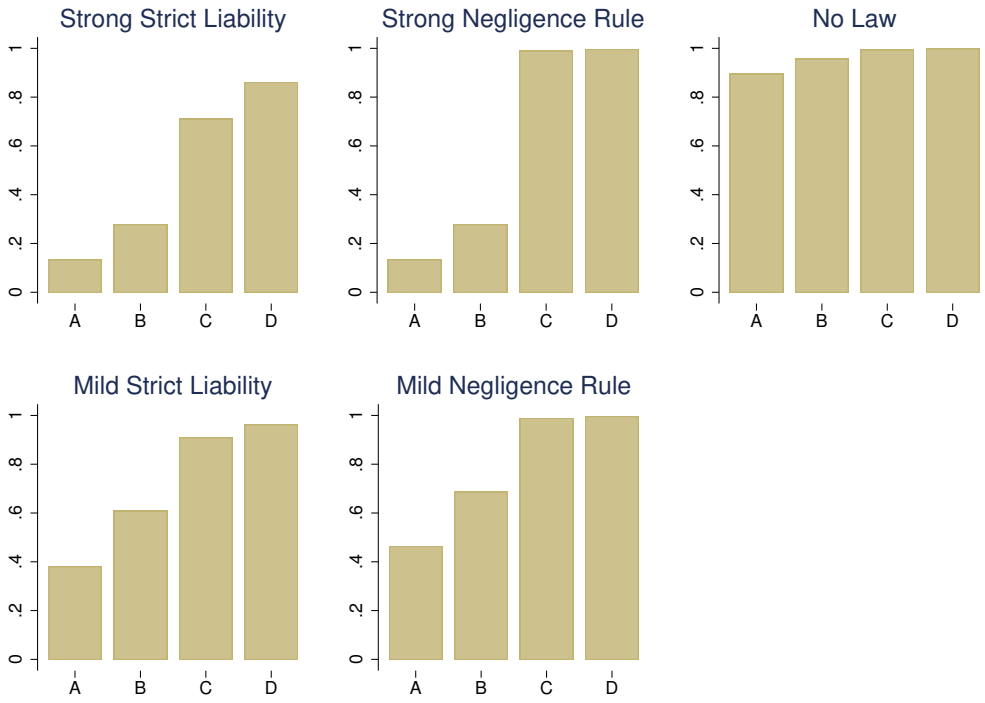

Figure 3: Average non-monetary punishment points per condemnation status and treatment. (Not Cond: not condemned; Cond: condemned)

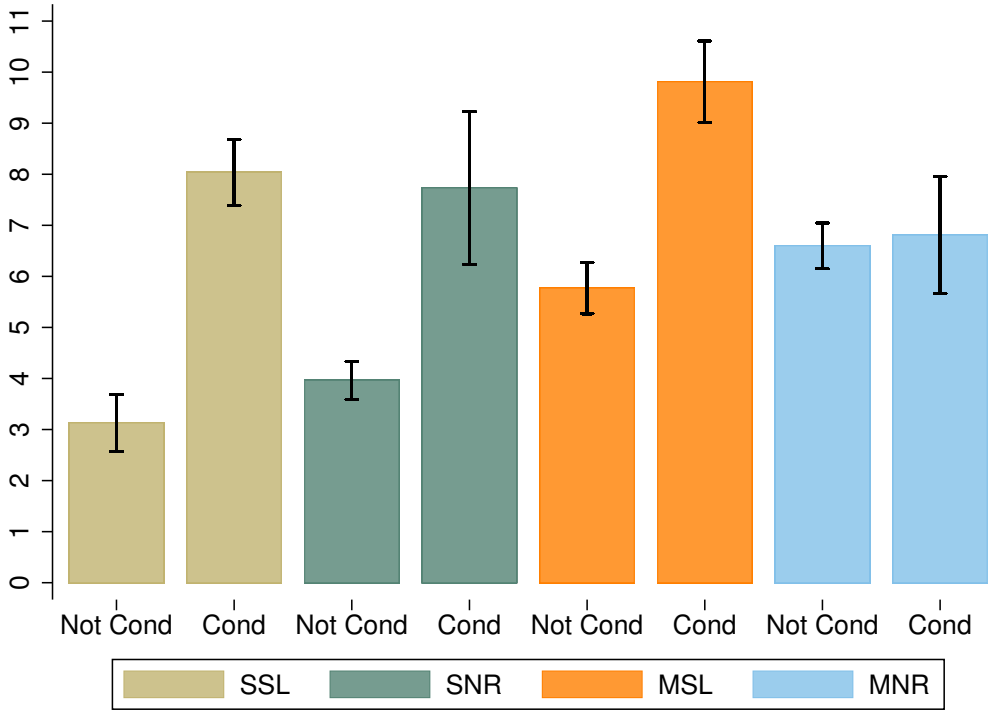

Figure 4: Average monetary punishment points per condemnation status and treatment. (Not Cond: not condemned; Cond: condemned)