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CESIFO WORKING PAPER NO. 3450
CATEGORY 1: PUBLIC FINANCE
MAY 2011

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CESifo *Working Paper No. 3450*

Asymmetric Obligations

Abstract

We use a laboratory experiment to investigate the behavioral effects of obligations that are not backed by binding deterrent incentives. To implement such 'expressive law' we introduce different levels of very weakly incentivized, symmetric and asymmetric minimum contribution levels (obligations) in a repeated public goods experiment. The results provide evidence for a weak expressive function of law: while the initial impact of high obligations on behavior is strong, it decreases over time. Asymmetric obligations are as effective as symmetric ones. Our results are compatible with the argument that expressive law affects behavior by attaching an emotional cost of disobeying the own obligation.

JEL-Code: C920, H410, K400.

Keywords: non-binding obligations, expressive law, public goods, experiment.

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20th April 2011
We thank Steffen Altmann, Armin Falk, Sebastian Kube, and Matthias Wibral for helpful comments and Benedikt Vogt for programming the experiment in zTree. Hannah Schildberg-Hörisch gratefully acknowledges financial support from the German Science Foundation through SFB-TR 15. Nadine Riedel gratefully acknowledges financial support of the Economic and Social Research Council (grant number RES-060-25-0033).

1 Introduction

The traditional law and economics literature argues that laws influence individual behavior because the rules of behavior ('obligations') that they specify are backed by deterrent incentives (see e.g. Becker, 1968, Polinsky and Shavell, 2000). In many cases, incentives attached to obligations are however weak or missing altogether, while the conformity with the obligations is surprisingly high. For example, not casting one's vote, abortion, or the possession of small amounts of cannabis are unlawful, but not chargeable in several countries.[1] Moreover, despite low detection probabilities for tax evasion behavior, observed levels of tax compliance tend to be high and dwarf theoretically predicted levels (see e.g. Andreoni et al., 1998). To provide a further example, Fisman and Miguel (2006) report that although diplomats cannot be fined for parking violations in New York city, they show a certain degree of law-adherence.

Taken together, these examples suggest that deterrence may not capture all channels through which laws affect individual behavior. In fact, recent years have seen a growing interest in the question whether, in addition to deterrence, laws also have a purely expressive function and affect individual behavior even if they are not backed by (binding) incentives. Empirical studies on an expressive function of law are scarce though and yield mixed results. Our paper adds to this literature by presenting a laboratory experiment which is designed to test for an expressive function of law and to assess how and under which circumstances expressive law works.

Our experiment design builds on Galbiato and Vertova (2008a). We run a standard repeated public good game which is augmented by an exogenously imposed obligation to make a minimum contribution to the public good. Despite this obligation subjects can contribute any integer amount of their initial endowment, i.e., also more or less than

[1] Examples for countries with compulsory voting that is not enforced are Argentina, Belgium, Costa Rica, El Salvador, Greece, Guatemala, Honduras, India, Italy, Luxemburg, Mexico, Paraguay, The Philippines, and Venezuela. Under certain circumstances, abortion is unlawful, but not chargeable in Germany, Switzerland, and Brasil. In Brasil, Germany, the Netherlands, and Portugal possession of small amounts of Cannabis is illegal but not fined.

the minimum contribution. To increase the salience of the obligation, we use a system of very weak, probabilistic incentives. In different treatments, we keep the intensity of marginal incentives constant, but vary level and symmetry of obligations across subjects. Similar to Galbiato and Vertova (2008a, 2008b), our analysis investigates the effects of symmetric high and low minimum contributions of 80% and 20% of the initial endowment in situations in which the subjects face identical obligations. While different contribution levels in these treatments point to an expressive functions of law, a compliance with symmetric obligations may partly reflect considerations driven by internalized social norms. To account for this, our analysis, unlike previous work, uses treatments with asymmetric obligations. Asymmetric obligations for symmetric individuals very likely do not coincide with internalized norms and may therefore better represent the 'pure behavioral response' to externally imposed obligations.

Our results provide evidence for a weak expressive function of law. In the symmetric treatments, subjects with high obligations contribute significantly more than subjects with low obligations during the first periods of the game. However, in our repeated game setup with frequent feedback on partner behavior, the effect of high obligations becomes weaker over time and is not strong enough to sustain high levels of cooperation in later periods of the game. Furthermore, we find that, conditional on a given own obligation, public good contributions do not differ between symmetric and asymmetric treatments - also for the initial periods of the game when obligations have a strong impact on behavior. This result implies that asymmetric obligations are as effective as symmetric ones in influencing individual contribution behavior.

Theoretical contributions suggest that an expressive function of law may be related to two channels: First, laws may create a focal point. In settings with multiple equilibria, they can act as a coordination device by changing beliefs on others' behavior and tipping the system towards a new equilibrium (Cooter, 1998). Second, laws prescribe what ought to be done. Consequently, they may attach a non-monetary, emotional cost

to the forbidden acts such as a loss in self-esteem (Bénabou and Tirole, 2008).[2] Our results provide some evidence for the importance of the latter channel. For example, we find that, in later periods of the repeated public good game, individuals with a high obligation (of 80% of their endowment) are significantly more likely to make very small public good contributions below 20% of their endowments than individuals who face a low obligation of 20% of their endowment. This is in line with the notion that subjects trade off a fixed emotional cost of disobeying an obligation with a monetary gain from disobeying.

Our paper contributes to a small empirical literature on expressive law which yields mixed results: Galbiato and Vertova (2008a, 2008b) provide experimental evidence in favor of an expressive function of law. They show that introducing weakly incentivized symmetric and exogenous minimum contribution levels in a repeated standard public good game significantly affects average contribution levels. Similarly, Falk et al. (2006) show that non-binding wage guidelines strongly affect reservation wages of workers and wage offers by employers. In contrast, Feld and Tyran (2006) do not find a significant effect of exogenously imposed minimum contribution levels in a public good experiment.[3]

Galbiato and Vertova (2008b) and Bohnet and Cooter (2005) explore the channels via which expressive law may work. Galbiato and Vertova (2008b) explicitly elicit subjects' beliefs on others' contribution levels in treatments without and with varying levels of symmetric obligations. They find that a subject's *belief* on other players' contribution level is influenced by other players' levels of obligation. Introducing treatments with asymmetric obligations, our design extends their approach by measuring whether a subject's *behavior* changes for a given own obligation if the other player's obligation changes. Bohnet and Cooter (2005) use different experimental games that both have a

[2]Similarly, among others Cooter (1998), Huck (1998), and Bar-Gill and Fershtman (2004) suggest that laws might directly change preferences.

[3]Focusing on the related aspect of social norm activation, Sutter and Weck-Hannemann (2003) and Tyran and Feld (2006) show that obligations which are endogenously implemented through a voting mechanism do affect average individual contribution levels.

unique best strategy for selfish players to investigate whether expressive law 'changes preferences' by comparing behavior in neutrally and morally framed treatments. Additionally, they analyze behavior in a coordination game with multiple equilibria to test whether expressive law acts as a coordination device by changing beliefs on others' behavior. They only find an effect of expressive law in the coordination game.

Analyzing field data Funk (2007, 2010) shows that abolishing the voting duty in Swiss Cantons significantly reduced voter turnout in Cantons where the obligation to vote was backed by a symbolic fine, while the introduction of postal voting (and the associated change in voting costs) did not induce a significant behavioral effect.

The rest of the paper is structured as follows: Section 2 explains the experiment design, section 3 derives the hypotheses. Results are presented in Section 4. Section 5 concludes.

2 Experiment Design

Game and treatments

The provision of public goods is one prominent area in which obligations established by law are often used aiming at enhancing efficiency (think about taxation or voting duties, for example). Our design reflects that obligations usually occur in repeated interactions of a given group of subjects who receive feedback on each other's behavior. We build on the standard workhorse to analyze decision making in the presence of public goods, the Voluntary Contribution Mechanism (VCM) game. We define groups of two subjects i, with $i \in \{A, B\}$. A group size of two allows for an especially strong contrast of different levels of obligations in the asymmetric treatments. The roles of players A and B are randomly assigned at the beginning of the experiment and remain unchanged throughout the experiment. The composition of each group is held constant during the whole experiment (partner matching) and subjects know that. In each of 10 periods, subjects are endowed with 100 experimental currency units (ECU) and have

to decide how many units to contribute to a common group project and how much to keep for themselves. Contrary to a standard VCM game and following Galbiato and Vertova (2008a), obligations are imposed externally: the experimental instructions state that 'there is a minimum contribution that each participant is obliged to give' to the 'common project'.[4] The level of the required minimum contribution varies across treatments, but is held constant over the 10 periods of a given treatment. Since we are interested in the effects of obligations per se, we keep the marginal incentives (i.e. the probability of a control and the associated incentive system) fixed across all treatments, while the level of the minimum contribution required by obligation changes between treatments. In the first treatment, both players face a minimum contribution of 80 ECU (i.e. 80% of the individual endowment). In the second treatment, player A faces a minimum contribution level of 80 ECU, while player B faces a minimum contribution of 20 ECU. In the third treatment, both players face a minimum contribution of 20 ECU. In the following, we will refer to the treatments as '80-80 treatment', '80-20 treatment', and '20-20 treatment', respectively.

Despite the minimum contribution the experimental instructions clarify that 'the participants' actual contributions to the common project can be any integer between 0 and 100 and, thus, can differ from the minimum contributions.' Hence a subject's actual contribution may deviate upwards and downwards from her minimum contribution. To increase the salience of the obligation, we use weak incentives that are not expected to influence a risk neutral or moderately risk-averse subject's behavior.[5] Precisely, we implement a monitoring system where each subject is controlled with a

[4]The concept of a legal obligation is related to, but differs from the concept of social norms that are defined as customary rules of behavior that coordinate our interactions with others (Young, 2008). While social norms arise endogenously and evolutionary in a given society, in our framework obligations basically appear from nowhere and the required rules of behavior might, but need not coincide with social norms.

[5]Galbiato and Vertova (2008b) show that the effects of obligations that are not underlined by any incentives at all are too weak to significantly influence individual behavior. Similarly, Funk (2007) finds that the abolition of the voting duty significantly reduces voter turnout only in those Cantons in which not casting one's vote was subject to a symbolic fine.

probability of 1/12.[6] If the controlled subject's actual contribution falls short of her minimum contribution, she is subject to a fine payment equal to 1.2· ($o_i - c_i$), where $o_i - c_i$ depicts the difference between the subject's minimum contribution o_i and her actual contribution c_i. To ensure constant marginal incentives for contributing, if the actual contribution of the controlled subject exceeds her minimum contribution, she is subject to a reward payment equal to −1.2· ($o_i - c_i$). No penalty or reward is assigned to a monitored subject whose actual contribution is exactly equal to the minimum contribution set up by the obligation. In each period, the expected monetary payoff X_i of subject i is

$$X_i = 100 - c_i + 0.6 \cdot (c_i + c_j) - \frac{1}{12} \cdot 1.2 \cdot (o_i - c_i), \quad i, j \in \{A, B\}, i \neq j \tag{1}$$

where c_i (c_j) indicates the contribution of subject i (the matched subject j) to the public good. The marginal per capita return (MPCR) from the public good is 0.6. Note that the parameters are chosen such that the expected aggregate payoff is maximized if each individual fully cooperates. Formally,

$$\frac{\partial(X_i + X_j)}{\partial c_i} = -1 + 2 \cdot 0.6 + 0.1 > 0, \quad i, j \in \{A, B\}, i \neq j \tag{2}$$

Implementation of the experiment

All seven sessions were held in the computerized laboratory of the University of Bonn (BonnEconLab) in July 2010 using the software zTree (Fischbacher, 2007). In total, 156 subjects took part in the experiment: 44 in the '80-80 treatment' (2 sessions), 66 in the '80-20 treatment' (3 sessions) and 46 in the '20-20 treatment' (2 sessions). Subjects were university students from different fields who were recruited using the software ORSEE (Greiner, 2004). Each subject took part in only one session.

In each session subjects were welcomed and randomly assigned a cubicle in the labo-

[6] As the instructions that are attached in Appendix B illustrate, we took great care in ensuring that our subjects had an adequate understanding of a probability of 1/12.

ratory where they took their decisions in complete anonymity from the other subjects. Subjects received the instructions and answered several computerized control questions that tested their understanding of the decision situation. Only after providing and explaining the right answers on the computer screen, we proceeded to the decision stage. Translated sample experiment instructions as they were handed out to players B in the asymmetric '80-20 treatment' are attached in Appendix B. Analogous instructions were handed out in the other treatments which differed only in the stated minimum contributions. In all treatments, payoff functions and both players' minimum contributions were common knowledge. After each period, subjects received feedback regarding their own and the other player's actual contributions, the overall contributions to the public good, whether one of the players had been controlled and their own and the other player's payoff. After 10 periods we finished each experimental session by asking subjects to answer a brief questionnaire on their risk attitude and socio-demographic characteristics. To assess individual risk preferences subjects were confronted with incentivized decisions between lotteries and sure payoffs inspired by Holt and Laury (2002).

A session lasted roughly 90 minutes. Average earnings were about 19 Euros (about 25 US dollars), comprising a show-up fee of 4 Euros, the payoff from a randomly drawn period in the VCM game, the payoff from the risk attitude decisions, and the payoff from a further experiment that was only announced after the end of the VCM game and is not analyzed in the course of this paper.

3 Hypotheses

We will first compare behavior in the treatments with low and high symmetric obligations, the '80-80 treatment' and the '20-20 treatment'. As the previous literature, we take this as a test for whether there is an expressive function of law: we find affirmative evidence if subjects in the '80-80 treatment' contribute more than subjects in the

'20-20 treatment'.

Hypothesis 1: There is an expressive function of law, i.e. the level of weakly incentivized obligations does affect contribution levels.

The standard economic model predicts that obligations do not affect the behavior of a self-interested, risk neutral, and monetary payoff maximizing individual since the expected individual return from contributing to the public good is negative:

$$\frac{\partial X_i}{\partial c_i} = -1 + 0.6 + 0.1 < 0, \quad i \in \{A, B\} \tag{3}$$

The monetary incentives attached to the obligation are too weak to make contributing to the public good profitable. Consequently, the dominant strategy is full free-riding, a contribution of $c_i^* = 0$.

In contrast, a growing theoretical literature on an expressive function of law suggests that obligations may affect individual behavior even if they are not backed by any or only weak extrinsic incentives (see e.g. Cooter, 1998, Bénabou and Tirole, 2008). When preferences that deviate from pure monetary payoff maximization are taken into account, the level of obligation may affect contributions in a VCM game.

If we find evidence in favor of an expressive function of law, we will proceed by comparing behavior of subjects with the same level of obligation, but different levels of the partner's obligation, e.g. behavior of subjects with an obligation of 80 in the '80-20 treatment' and all subjects in the '80-80 treatment'.

Hypothesis 2: Individual contribution levels are not only affected by the own obligation, but also by the obligation of the partner, i.e. for a given own obligation, individuals contribute different amounts in the symmetric and the asymmetric treatment.

If we can reject Hypothesis 2, we find that asymmetric obligations are as effective as symmetric ones. Comparing symmetric and asymmetric treatments may provide

some hints at how expressive law might work. Essentially the literature proposes two channels through which obligations may affect behavior: First, according to Cooter (1998) if there are multiple equilibria, obligations may serve as a focal point or coordination device as they affect individual beliefs about the contributions of others.[7] It is well-known from the experimental literature on VCM games that a fraction of individuals make positive contributions to the public good even in the absence of obligations. This is generally explained by the idea that these individuals have 'fairness preferences' for processes or outcomes: they are, for example, conditional cooperators (e.g. Fischbacher et al., 2001) or inequality averse (e.g. Fehr and Schmidt, 1999). If sufficiently many individuals have 'fairness preferences', the VCM game may have multiple equilibria. Let us assume that for a given own obligation, the belief of an individual with 'fairness preferences' on the partner's contribution changes if the partner's obligation changes. We would expect that such an individual will contribute different amounts in the symmetric and the asymmetric treatment.

Second, facing an obligation, individuals may incur a non-monetary, emotional cost when disobeying the obligation. A cost of disobeying is in line with Bénabou and Tirole's (2008) general model of prosocial behavior. According to them, prosocial behavior is driven by intrinsic motivation, extrinsic motivation, and reputational concerns, i.e. a concern for social or self-esteem.[8] In our setup obligations can have two effects: they will induce high salience of what is considered the appropriate behavior (namely, obeying the own obligation). Thus, obligations may increase the weight attached to self-esteem concerns.[9] Furthermore, not obeying the own obligation may cause a cost, namely a loss in self-esteem. If obligations affect behavior by introducing

[7]In a setup with symmetric obligations, Galbiato and Vertova (2008b) show empirically that obligations indeed affect beliefs on others' behavior. We did not elicit beliefs in our experiment.

[8]In our design with very weak incentives extrinsic motivation is negligible (as our data will document). In Bénabou and Tirole's (2008) model, intrinsic motivation is unaffected by the introduction of obligations per se. Furthermore, due to anonymity striving for social esteem cannot influence behavior.

[9]In this spirit, a cost of disobeying can also be considered to be one specific illustration for Cooter's (1998) argument that expressive law may shape individual preferences. See also Huck (1998) and Bar-Gill and Fershtman (2004).

a cost of disobeying the own obligation, we would expect individual contributions to be affected by the own, but not by the partner's obligation. Consequently, for a given own obligation, we do not expect behavior to differ in the symmetric and the asymmetric treatment.

4 Results

We will first investigate behavior in the treatments with symmetric obligations and then proceed to analyzing behavior with asymmetric obligations. Appendix A documents that risk preferences do not influence contribution levels given the weak probabilistic incentive system that we use to underline the salience of obligations. Consequently, we can safely abstract from risk preferences in the analysis that follows.

Behavior with symmetric obligations

Figure 1 reports the time series of pairwise contributions from period 1 to 10 for the two symmetric treatments. Pairwise contributions differ substantially between treatments in the first period, with an average of 150 ECU in the '80-80 treatment' and an average of 106 ECU in the '20-20 treatment'. Figure 1 moreover suggests that cooperation levels decline in subsequent periods in the '80-80 treatment', resulting in an average contribution of 117 ECU over period 1 to 10. In contrast, contributions in the '20-20 treatment' are rather stable over time. The average pairwise contribution in period 1 to 10 is 103 ECU. The different time trends imply a convergence of contributions in the two treatments in later periods of the experiment.

A Mann-Whitney test on the difference in pairwise contribution levels between treatments in period 1 shows that contributions to the public good are significantly larger in the high obligation treatments (p=0.004).[10] In line with Figure 1, the differences in pairwise contribution levels across treatments decrease over time and eventually be-

[10]Throughout the paper, we report two sided p-values.

come insignificant. A Mann-Whitney test using pairwise contributions averaged over periods 1 to 10 yields p=0.440.

In sum, these results provide evidence for the existence of a weak expressive function of law: contribution patterns differ between treatments although treatments differ by very weakly incentivized obligations only. The effects of obligations are, however, weak. Our results suggest that obligations are instrumental in shaping behavior in the first period, but their effect on contributions tends to decrease over time.[11] Thus, to some extent, our results differ from the findings of Galbiato and Vertova (2008a) which suggest not only an initial, but a sustained effect of obligations on behavior in a repeated VCM game.

Result 1: We find evidence for a weak expressive function of law. In the first period, subjects with high obligations contribute significantly more to the public good than subjects with low obligations, but contribution levels of subjects with low and high obligations converge over time.

Behavior with asymmetric obligations

We proceed by investigating whether, for a given individual obligation, behavior differs between symmetric and asymmetric treatments. Figure 2 depicts the average *individual* contributions of subjects in the '80-80 treatment' and the '20-20 treatment'. In the asymmetric '80-20 treatment', it distinguishes between players A and B who face an obligation of 80 and 20 ECU, respectively. Figure 2 clearly suggests that individual contributions are affected by the own obligation, but seem to be independent from the partner's obligation. Average contribution levels of subjects with an obligation of 80 ECU are, for example, virtually identical in the '80-80 treatment' and the '80-20 treatment' (75 versus 74.5 ECU in the first period with a similar decline over time). Furthermore, contribution levels of subjects with an obligation of 20 are similar in

[11] Note that since our subjects receive feedback on actual partner behavior, it is plausible to assume that, when forming beliefs, subjects will mainly rely on obligations of their partner in the first period and on feedback on actual behavior of the partner in later periods.

size (53 in the '20-20 treatment' versus 46 in the '80-20 treatment' in the first period) and stable over time for both subjects in the '20-20 treatment' and the '80-20 treatment'. The Mann-Whitney tests in Table 1 confirm that there are no significant differences in contribution levels between symmetric and asymmetric treatments for a given individual obligation.

Table 2 displays estimates of a random effects model using the *individual* contributions per period as dependent variable which allows discriminating between the contribution levels of subjects with low and high obligations in the asymmetric '80-20 treatment'.[12] Individual contributions are explained by dummy variables indicating the different treatments (in the '80-20 treatment' we use an interaction to differentiate between player types), a linear time trend ('Period'), and a dummy variable 'Period 10' to capture potential end game effects. To be able to test whether time trend and end game effects differ between treatments (as suggested by Figure 1 and 2) we allow time trend and end game effect to vary between treatments and, in the '80-20 treatment', by player type. In line with the descriptive and test results above, the estimation results in Table 2 show that individual contribution levels are affected by the own obligation, but are independent from the partner's obligation: The dummy for the '80-20 treatment' that captures behavior of players B is not significant when compared to the '20-20 treatment' (the baseline) and a t-test for equality of coefficients of player As' contributions in the '80-20 treatment' and all players' contributions in the '80-80 treatment' yields p=0.381. Thus, for a given own obligation, behavior is indistinguishable in treatments with symmetric and asymmetric obligations.

Result 2: Individual contribution levels are only affected by the own obligation, but not by the partner's obligation.

[12]The rationale for presenting the results of an OLS model, instead of Tobit, is that the former allows clustering the standard errors at the level of subject pairs. This is important not to treat individual contributions within a pair as independent, i.e. to allow for correlations in the behavior at the pair level over time. Estimating a random effects Tobit model derives similar results, though, which are available from the authors upon request.

Moreover, Table 2 reveals that subjects with an obligation of 20 ECU contribute more than they are obliged. Precisely, we find that they make average contributions of about 50 ECU in both the '80-20 treatment' and the '20-20 treatment'. These contribution rates are comparable to initial contributions in VCM games without obligations and to contributions in treatments with an obligation of zero for a design with the same weak incentive structure as our design (see Galbiato and Vertova, 2008a). Thus, on average individuals appear to stick to their initially preferred contribution level even if their obligation falls short of it.

Furthermore, in line with the results presented in the previous section, Table 2 documents a statistically significant decline in the level of contributions across periods for individuals with a high obligation only (both in the '80-80 treatment' and in the '80-20 treatment').

Finally, all results from Table 2 are robust to adding a dummy variable that indicates whether a subject has been controlled in the previous period. The corresponding coefficient is negative and not significant at the 5% level (p=0.096).

Discussion of results

Result 2 implies that asymmetric obligations are equally effective as symmetric ones. Even non-binding asymmetric obligations for symmetric subjects who very likely do not coincide with internalized norms do affect behavior in the initial periods of the game. Figure 3 reports the fraction of subjects who undercut their obligation in a given period by treatment and, in the '80-20 treatment', by player type. Again, the figure suggests that the probability of undercutting the own obligation is in the first place determined by the subject's own obligation and independent from the partner's obligation. The fraction of non-complying subjects is higher for subjects who face a high obligation compared to subjects who face a low obligation (roughly 30% versus 10% of the subjects in the first period). In line with declining levels of cooperation over time, the fraction of subjects who undercut their obligation increases over time.

Furthermore, Result 2 is compatible with the notion that subject incur non-monetary costs when disobeying an obligation as, for example, a loss in self-esteem as proposed in the model of prosocial behavior by Bénabou and Tirole (2008). One particular test to assess this argument is to compare the probability of subjects with the high and low obligation to contribute less than 20 ECU to the public good. In general, this is relevant for later periods of the repeated game only, as contribution levels at the beginning of the game tend to be significantly higher than 20 ECU in all treatments. If there is a cost of disobeying the obligation, low obligations may help to stabilize subjects' contributions to the public good in later periods of the game since subjects with a low obligation can save the emotional cost of disobeying by foregoing a relatively small monetary gain. Subjects with the high obligation, however, may not only be more likely to disobey their obligation, but also, once they have undercut their high obligation of 80, more willing to undercut the 20 ECU threshold than individuals with an obligation of 20 ECU.

The left panel of Figure 4 suggests that, in period 10, around 50% of the subjects with an obligation of 80 ECU make contributions below 20 ECU. This holds irrespective of whether the partner faces the same obligation in the '80-80 treatment' or a lower obligation in the '80-20 treatment'. Subjects with an obligation of 20 ECU, in turn, have a significantly lower probability to contribute less than 20 ECU in period 10 (around 30%). A similar, although somewhat weaker, picture emerges if we consider periods 5 to 10 (see the right panel of Figure 4). A Fisher exact test that compares all subjects with an obligation of 20 to all subjects with an obligation of 80 documents that the share of subjects who contribute less than 20 differs significantly across the two groups in period 10 (p=0.015).

5 Conclusion

Despite a rising interest in the question whether there is an expressive function of law, empirical evidence on the topic is still scarce und yields ambiguous results. Our results confirm that obligations expressed by law affect behavior even in the absence of binding deterrent incentives - the effect is relatively weak, though. We exploit the difference between setups with symmetric and asymmetric obligations to shed some light on how and under which circumstances expressive law might work. Our results suggest that, for a given own obligation, individual behavior does not differ between treatments with symmetric and asymmetric obligations. Put differently, while the subjects' own obligations are found to influence individual behavior, the obligations of others do not. This finding is compatible with the notion that obligations affect individual behavior by inducing an emotional cost of disobeying an obligation.

Several policy implications emerge from the analysis. First, as we find that obligations can to some extent channel individual behavior, in some situations, policy makers may find it attractive to rely on obligations to avoid costly deterrent incentives. Furthermore, using obligations instead of deterrent incentives may prevent crowding out of intrinsic motivation to behave prosocially, a phenomenon that has found lots of attention in recent years (for survey studies see Frey and Jegen, 2001 as well as Fehr and Falk, 2002).

Second, our analysis suggests that the effects of obligations are subtle and need further study. For example, different levels of obligations may induce different dynamics over time. High obligations seem to be a good tool to induce high cooperation levels in one-shot situations or in the earlier periods of repeated games. In contrast, low obligations can be helpful in stabilizing cooperation at lower levels in the long run and, thus, prevent a complete breakdown of cooperation in later periods of a repeated interaction.

Finally, the power of obligations as policy tool is not restricted to imposing the same

obligation on everybody. Even with homogeneous individuals, asymmetric obligations seem to be as effective as symmetric one.

Appendix A - The Role of Risk Preferences

To underline the salience of obligations, we have chosen an experiment design in which deviations from obligations trigger a weak probabilistic incentive system. Consequently, despite incentives being very weak, individual risk preferences might affect individual contribution levels. In particular, risk averse individuals might contribute closer to the minimum contribution required by obligation because they prefer to insure themselves. Whether this is indeed the case is an empirical question.

To single out subjects' risk preferences we use a procedure similar to Holt and Laury (2002) and Dohmen et al. (2011). Subjects are asked to make five choices between an option A and an option B that are reported in Table A1a. Option A is constant across choices and involves a lottery where subjects win 6 Euros with a probability of 50% and 0 Euros with a probability of 50%. Option B is a secure payment (with a probability of 100%) that varies across choices being 1 Euro in choice 1, 2 Euros in choice 2, 3 Euros in choice 3 and so on. Once all subjects have taken all five choices, one choice is randomly chosen and the computer assigns to each subject the option she has chosen before. Finally, the lottery is run in order to determine payoffs of those subjects who have chosen the lottery option A. Stakes in Table A1a are similar to those in the VCM game. In Table A1b, we classify individual risk preferences in five categories (highly risk loving, risk loving, risk neutral, risk averse, highly risk averse) according to the sequence of choices taken in Table A1a. Table A1b suggests that 88% of the subjects are risk neutral.

In Table A1c, we also test explicitly whether risk preferences affect the deviation of contributions from obligations. In specification (1), a random effects Tobit model estimates the impact of the risk type on the per period deviation of individual contributions from individual obligation. None of the coefficient estimates gains statistical significance suggesting that risk preferences do not determine individual behavior. This is confirmed in specification (2) which additionally controls for a time trend and includes

a dummy for period 10 to capture possible end game effects.

Thus, in line with expectations, the weak incentive system does not induce an effect of risk-preferences on contribution levels. Together with the high fraction of risk-neutral subjects, this result suggests that we can safely abstract from risk preferences in our main analysis.

Appendix B - Instructions

General explanations concerning the experiment

Welcome to this experiment. You are taking part in an economic experiment funded by the German Research Foundation. You and other participants are asked to make decisions. Your decisions as well as the other participants' decisions determine the outcome of the experiment. At the end of the experiment you will be paid in cash according to the actual result. So please read the instructions thoroughly and think about your decisions carefully.

Independent of the outcome of the experiment each participant will receive an additional amount of 4 Euros.

During the experiment we will talk about taler instead of Euros. Your total income will be calculated in taler first. At the end of the experiment your total amount of taler will be converted into Euro:

20 taler = 1 Euros.

During the whole experiment it is not allowed to talk to the other participants, to use cell phones, to listen to music, or to launch any programs on the computer. The neglect of these rules will lead to the exclusion from the experiment and from all payments. If you have any questions, please raise your hand. One of the experimenters will then come to your seat to answer your questions.

In the following paragraphs we will describe the exact experimental procedure. At the end of this introductory information we will ask you to answer some questions that will be helpful to become familiar with the decision task.

The experiment

At the beginning of the experiment all participants are randomly divided into groups of two persons. Neither before nor after the experiment you and the other participant in your group will receive any information on the matched participant. The experiment consists of 10 periods. In all 10 periods, you and the same other participant will form a group.

From now on we will call the participants in each group participant A and participant B. Both participant A and B are endowed with 100 taler at the beginning of each period. In the following the general conditions differ for participant A and B. You have been randomly selected to be participant A.

Overview of the experiment

Participant A and participant B contribute to a common project. Both participants can contribute any whole number between 0 and 100 taler to the common project. Both participants have been assigned a minimum amount that they are obliged to contribute to the common project. There is a control system. If you are controlled and you have contributed less (more) than your minimum contribution, your payoff is reduced (increased).

The common project

In each of the 10 periods participants A and B have to decide, how many of their 100 taler to contribute to the common project. Participants keep all taler that they did not contribute to the common project for themselves. At the end of the experiment, participants are paid out the taler they have kept.

The contributions to the common project of participant A and B are added, multiplied by 1.2 and finally shared equally between both participants. Thus, both participants receive the same individual payoff from the common project:

Individual payoff from the common project
= (contribution of A + contribution of B) $\cdot$ 1.2/2
= (contribution of A + contribution of B) $\cdot$ 0.6

Example: Both A and B contribute 90 taler to the common project. The individual payoff of A and B is $90 \cdot 0.6 = 54$*, respectively.*

So your contribution to the common project increases the payoff of the other participant in your group. Your payoff also increases if the other participant contributes more to the common project. For every token that one participant contributes both participants earn 0.6 taler. Consequently, the total payoff of participant A and B from the common project is 20% ($= 1.2 = 2 \cdot 0.6$) higher than the contributions of participant A and B.

Minimum contribution to the common project

Every participant has to decide how many of his 100 taler he would like to contribute to the common project. In each period there is a minimum contribution that each participant is obliged to give.

- **Participant A** is obliged to contribute at least **80 taler** to the common project.
- **Participant B** is obliged to contribute at least **20 taler** to the common project.

The demanded minimum contributions of the participants do not change over the 10 periods.

The control system

The participants' actual contributions to the common project can be any integer between 0 and 100 and thus can differ from the minimum contributions. In every period there is a chance that a participant's contribution to the common project is being controlled. First the computer randomly selects a number between 1 and 6 (as if throwing a dice). The participant is not controlled if the number is 2,3,4,5 or 6. If the number is 1, the computer again selects a random number between 1 and 6. If the number in this second step is even, the participant is controlled. If the number is odd, the participant is not controlled. Thus, the probability of being controlled is equal to 1/6*1/2=1/12, i.e. about 8.3% for each participant.

The control system remains the same in every period. A control in a certain period does not influence the probability of control in a future period.

What is the effect of a control?

- If the participant being controlled has exactly contributed the demanded minimum contribution, the control has no effect on his payoff.
- If the participant being controlled has contributed less than the demanded minimum contribution, 1.2 taler will be deducted from his payoff for each token he has contributed less than his minimum contribution.
- If the participant being controlled has contributed more than the demanded minimum contribution, 1.2 taler will be added to his payoff for each token he has contributed more than his minimum contribution.

Example: Assume the minimum contribution of a participant is 50 taler. The participant contributes 30 taler to the common project. If this participant is controlled (with probability of 1/12), his payoff will be reduced by $1.2\cdot$ *(minimum contribution - actual contribution) = 1.2* $\cdot(50-30) = 24$ *taler.*

Example: Assume the minimum contribution of the participant is 50 taler. The participant contributes 70 taler to the common project. If this participant is controlled (with a probability of 1/12), his payoff will be increased by $1.2\cdot$ *(actual contribution - minimum contribution) = 1.2* $\cdot(70-50) = 24$ *taler.*

Your decision on the computer

On the computer there is a decision screen for your choice how many of your 100 taler to contribute to the common project.

The screen shows the minimum contribution to the common project that is demanded from you. There is an input box in which you have to enter the amount you have chosen to contribute to the common project (every contribution between 0 and 100 is possible). Please press the OK-Button after you have made your decision how much you would like to contribute to the common project.

Feedback at the end of each period

At the end of each period there is a computer screen showing all results: for both participants

- their minimum contribution
- how many taler they have contributed to the common project
- whether they were controlled
- the total payoff of this period

If you have taken notice of all results, please press the OK-Button.

At the end of the experiment, the computer randomly chooses one of the ten periods whose result will be paid to both participants of your group.

Appendix C - Figures and Tables

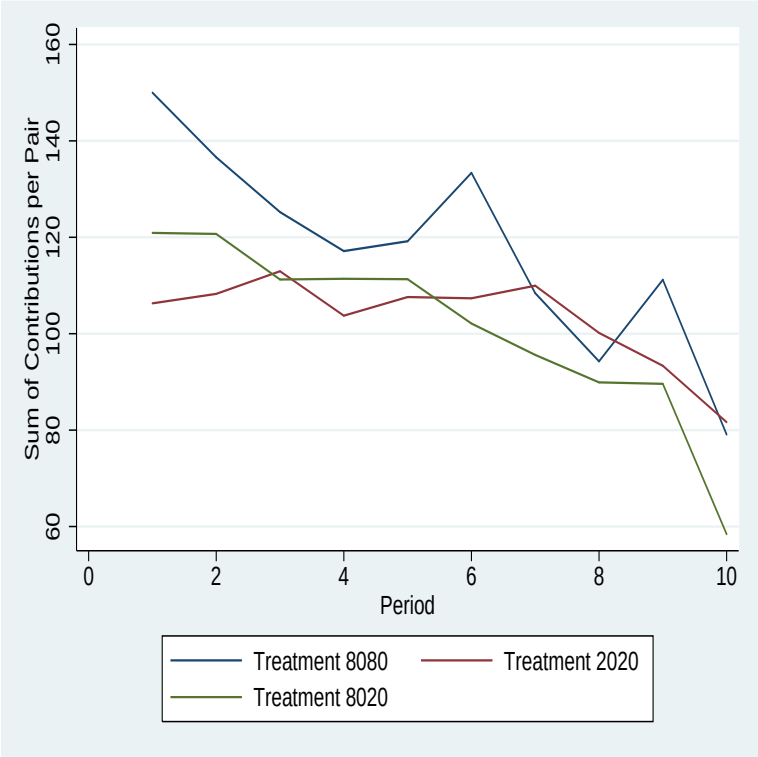

Figure 1: Time Series Pairwise Contributions

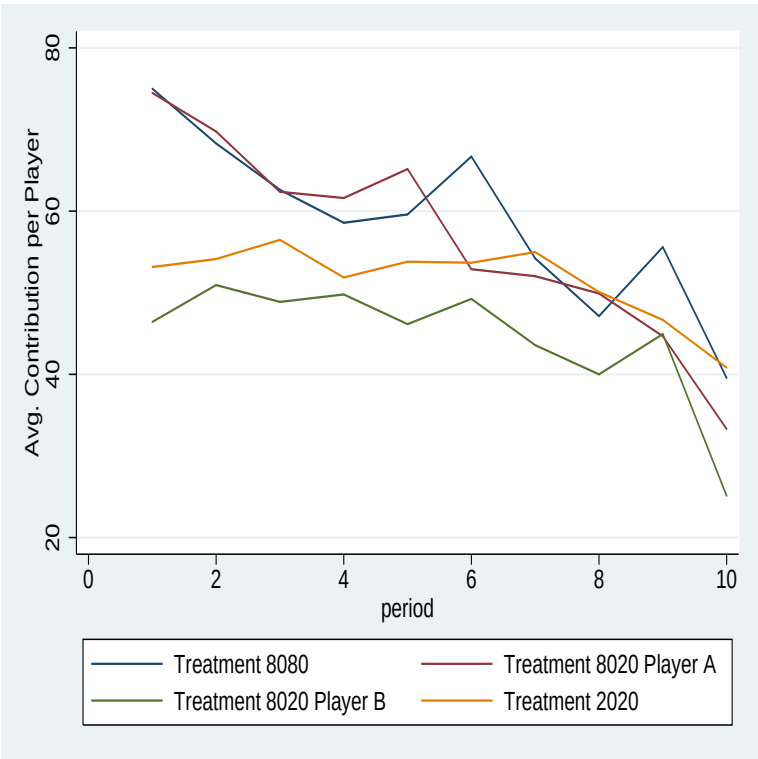

Figure 2: Time Series Individual Contributions

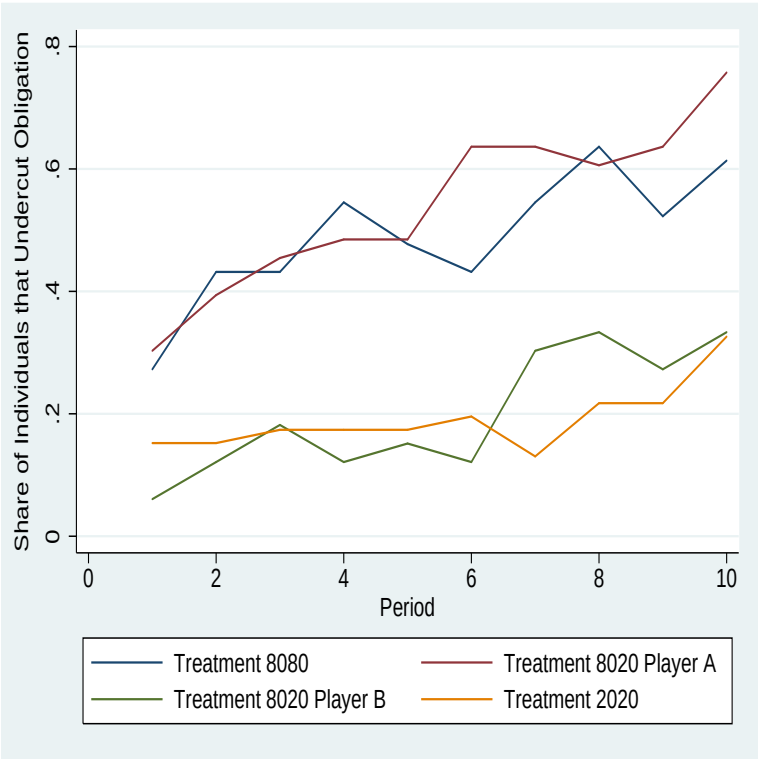

Figure 3: Time Series Fraction of Individuals Undercutting their Obligation

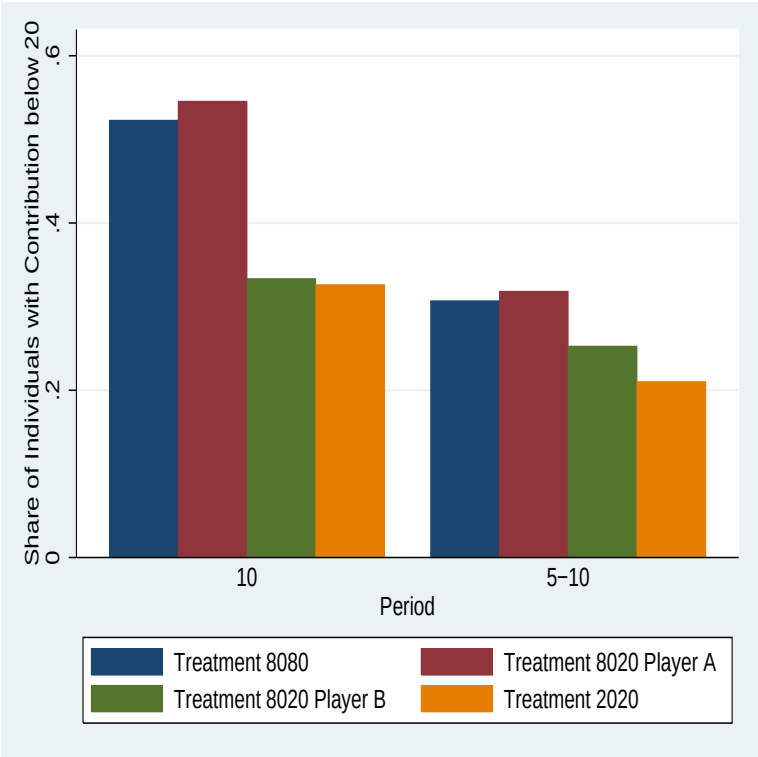

Figure 4: Fraction of Individuals Contributing less than 20 ECU

Table 1: Mann-Whitney Rank-Sum Tests **Difference in Individual Contributions (two sided p-values)**		
	Period 1	*Period 1-10*
all players in 20-20 Treatment versus Player B in 80-20 Treatment	0.356	0.334
all players in 80-80 Treatment versus Player A in 80-20 Treatment	0.430	0.738

Table 2: Individual Contributions per Period Random Effects OLS Model, Periods 1-10	
Treatment 80-80	17.31** (8.179)
Treatment 80-20	-5.21 (7.033)
Treatment 80-20×Player A	25.74*** (5.066)
Period×Treatment 20-20	-0.65 (0.726)
Period×Treatment 80-80	-2.50*** (0.766)
Period×Treatment 80-20	-0.832 (0.630)
Period×Treatment 80-20×Player A	-2.64*** (0.901)
Period 10×Treatment 20-20	-8.67 (6.603)
Period 10×Treatment 80-80	-8.82 (7.341)
Period 10×Treatment 80-20	-17.38*** (5.853)
Period 10×Treatment 80-20×Player A	8.83 (9.672)
Constant	56.03*** (5.378)
# Observations	1,560

*, **, *** indicate significance at the 10%, 5%, and 1% level. Robust standard errors that are clustered at the pair level are presented in parentheses. The dependent variable is the individual contribution per period. 'Treatment 80-80' depicts a dummy variable which indicates the treatment where both players have an obligation of 80 ECU, 'Treatment 80-20' depicts a dummy variable which indicates the treatment where player A faces an obligation of 80 ECU while subject B faces a obligation of 20 ECU. 'Treatment 80-20×Player A' is an interaction term between the dummy 'Treatment 80-20' and a dummy indicating player A. 'Period' depicts a linear time trend, and 'Period×Treatment 80-80' ('Period×Treatment 80-20') the interaction of the linear time trend with the treatment dummies for the corresponding treatments. Analogously, Period×Treatment 80-20×Player A is a triple interaction between the time trend, a dummy indicating the 80-20 treatment and a dummy indicating player A. 'Period 10' is a dummy variable which indicates the last period of the treatment, the interaction terms Period 10×Treatment 80-80, Period 10×Treatment 80-20, Period 10×Treatment 80-20×Player A are defined analogously to the 'Period'-interactions above.

Table A1a: Paired Lottery Choices						
	Option A				Option B	
Choice	Probability	Payment	Probability	Payment	Probability	Payment
1	50%	6	50%	0	100%	1
2	50%	6	50%	0	100%	2
3	50%	6	50%	0	100%	3
4	50%	6	50%	0	100%	4
5	50%	6	50%	0	100%	5

Table A1b: Risk Preferences Associated with Lottery Choices		
Sequence of Choice	Risk Type	# of Individuals
A-A-A-A-A	highly risk loving	1
A-A-A-A-B	risk loving	3
A-A-A-B-B	risk neutral	56
A-A-B-B-B	risk neutral	82
A-B-B-B-B	risk averse	7
B-B-B-B-B	highly risk averse	4
other sequences	inconsistent choices	3

Table A1c: Absolute Deviation of Contributions from Obligations Random Effects Tobit Model, Periods 1-10

Explanatory Variables	*(1)*	*(2)*
Highly Risk Averse	-17.51	-17.53
	(15.81)	(15.82)
Risk Averse	-10.89	-10.88
	(12.10)	(12.10)
Risk Loving	12.73	12.68
	(18.79)	(18.80)
Highly Risk Loving	-16.57	-16.49
	(31.29)	(31.29)
Period		1.286***
		(0.304)
Period 10		-1.525
		(2.930)
# Observations	1,530	1,530

*, **, *** indicate significance at the 10%, 5% and 1% level. Robust standard errors are presented in parentheses. 'Period' depicts a linear time trend, 'Period 10' is a dummy variable which indicates the last period.

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