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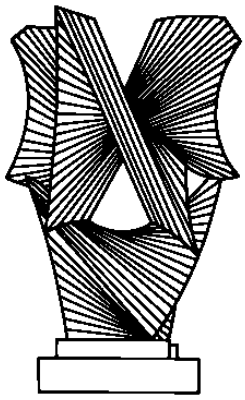

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REVERSIBLE REWARDS

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Abstract

This article offers a new mechanism of law enforcement, combining sanctions and rewards into a scheme of "reversible rewards." A law enforcer sets up a pre-committed fund and offers it as reward to another party to refrain from violation. If the violator turns down the reward, the enforcer can use the money in the fund for one purpose only—to pay for punishment of the violator. The article shows that this scheme doubles the effect of funds invested in enforcement, and allows enforcers to stop violations that would otherwise be too difficult to deter. It argues that reversible rewards could be used to bolster enforcement in international and domestic law, and could also be applied strategically in litigation.

* Helpful comments were provided by Oren Bar-Gill, Pete Leeson, Richard McAdams, Ariel Porat, Eric Posner, and workshop participants at Harvard and the University of Chicago.

INTRODUCTION

There are two general ways to induce people into action. One is to reward them for the desired behavior; the other is to punish them for the undesired behavior. The typical normative inquiry in the law enforcement literature focuses on the reward/sanction or carrot/stick selection and asks when one device is more effective than the other.[1] A basic insight advanced in this literature is that sanctions are superior to rewards when they are credible: a credible threat of sanctions does not need to be carried out and thus costs nothing. An effective reward, by contrast, needs to be paid. The typical descriptive inquiry seeks to explain legal patterns: Does the law's (frequent) use of sanctions and (less frequent) use of rewards conform to the theory of efficient enforcement?

This article offers a new insight to advance the normative inquiry on efficient enforcement. The idea is simple: instead of choosing between sanctions and rewards, an efficient scheme could *combine* the two. If sanctions and rewards are interlocked together in a particular way, compliance can be obtained at a lower cost. Specifically, we develop a novel concept of *reversible rewards*; a reward that entices its recipient to comply with its donor's demands, reinforced with a threat that the same reward could be reversed against its recipient in case of non-compliance. Compliance that cannot be obtained by simple sanctions or rewards could be induced by reversible rewards.

Reversible rewards work as follows. One party—the "Enforcer", who is seeking to influence the behavior of another party, the "Violator"—sets up a reversible reward fund. The money in the fund is pre-committed and cannot be recovered by the Enforcer. This money is offered to the Violator as a reward for choosing a course of conduct that the Enforcer prefers. If the Violator turns down the reward and does not change its behavior, the Enforcer can use the money in the fund for one purpose only: to pay someone to punish the Violator.

We show that this scheme *doubles* the incentive effect that money spent on enforcement generates. This doubling effect is desirable—in fact, crucial—in situations in

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[1] Donald A. Wittman, *Liability for Harm or Restitution of Benefit?*, 13 J. Legal Stud. 57 (1984); Saul Levmore, Saul, *Waiting for Rescue: An Essay on the Evolution and Incentive Structure of the Law of Affirmative Obligations*, 72 Virg. L. Rev. 879 (1986); Giuseppe Dari-Mattiacci, *Negative Liability*, 38 J. Legal Stud. 21 (2009); Giuseppe Dari-Mattiacci and Gerrit De Geest. *Carrots, Sticks, and the Multiplication Effect*, 26 J. L., Econ. & Org. 365 (2010).

which either simple sanctions or simple rewards are ineffective. A sanction or a reward might be ineffective because it is too costly. Sanctions could be too expensive for the Enforcer relative to the harm they save. Similarly, rewards that succeed to buy off the Violator's compliance might be too high. In these scenarios where ordinary enforcement falls short, reversible rewards can fill the void. Enforcement that might otherwise seem too costly to be effective could be obtained at (roughly) half the cost. This leads Violators to modify their behavior in a greater number of circumstances than conventional enforcement schemes suggest.

To illustrate intuitively the double effect of reversible rewards, imagine a party trying to influence the policies of election candidates through a campaign contribution of a fixed sum. The money can be offered to candidate A or to candidate B for some quid pro quo—some policy that a candidate is willing to support in return for this contribution. But the contributor can do better than offering one candidate the reward. It can instead offer a reversible reward by setting up a fund, depositing the same amount of money into it, and offering candidate A the choice between taking this sum or having it directed to candidate B. If candidate A declines, he would lose twice: he would lose the spending advantage over his rival that this money could buy, and the rival would gain a spending advantage by receiving this sum. The "wedge" that the reversible reward creates (the difference in the spending capacity of the two candidates) is doubled, twice the face value of the reward. This means that the contributor can get the same quid pro quo that any simple contribution buys at half the cost by using a reversible contribution.

Reversible rewards could be used in law enforcement: an enforcer could offer a violator a smaller reward for ending the violation, coupled with the threat that declining the reward would lead to a confirmed sanction. This enforcement scheme would be particularly useful in international law, where ordinary enforcement methods are limited, threats of sanctions are rarely credible and rewards are often too costly to fund. Reversible rewards could also be used in litigation: a defendant could offer a plaintiff a smaller settlement, coupled with the threat that declining it would lead to trial and attrition. Reversible rewards could also be used to advance regulation: the government could offer rewards for regulatory compliance, backed up by sanctions for violations, and interlink the two through a pre-committed fund.

The concept of reversible rewards contributes to the rewards-versus-sanctions inquiry. It is also closely related to the literature on credible enforcement. This literature has wrestled with the question how legal rights might be protected when rightholders' threats to enforce those rights are not credible. The solutions to the credibility problem often build on some nuanced understanding of the costs of enforcement and on various mechanisms to overcome the credibility problem.[2] In this paper we offer a solution that has not been previously proposed or applied. Our task, therefore, is to argue that reversible rewards are plausible, promoting enforcement in areas where the reach of ordinary sanctions and rewards is limited.

I. AN ILLUSTRATION OF THE ARGUMENT

Party A engages in an activity that is harmful to party B, and which party B seeks to stop. Denote Party A as the "Violator" and Party B as the "Enforcer." There are two ways in which the Enforcer can induce the Violator to discontinue its harmful behavior. It can either sanction the Violator for causing the harm, or it can reward the Violator conditional on the Violator ceasing the violation. Both sanctions and rewards are assumed to be costly for the Enforcer, and the challenge is to devise an enforcement scheme that stops the violation at the minimum private cost to the Enforcer.

To make the problem concrete, assume that the Violator's activity causes a harm of $100 to the Enforcer. Assume, also, that the gain enjoyed by the Violator is only $80. It is therefore socially optimal to cease the violation. To achieve this, the Enforcer can inflict a sanction *s* on the Violator, but let us assume that the cost of inflicting such a sanction is greater than *s*. Specifically, assume that the cost is 1.5*s*. For example, to inflict a loss of $100 on the Violator the Enforcer would have to bear a cost of $150, and so on. Alternatively, the Enforcer can offer a reward *r*, and let us assume that the cost of such reward is *r*. Namely, sanctions cost the Enforcer more than the pain they inflict on the Violator, whereas

[2] Lucian A. Bebchuk, *Suing Solely to Extract a Settlement Offer*, 17 J. Legal Stud. 437 (1988) (uncertainty about costs); Lucian A. Bebchuk, *A New Theory Concerning the Credibility and Success of Threats to Sue*, 25 J. Legal Stud. 1 (1996) (divisibility of costs); Oren Bar-Gill and Omri Ben-Shahar, *The Prisoners' (Plea Bargain) Dilemma*, 1 J. Legal. Anal. 737 (2009) (sequential enforcement).

rewards consist of simple transfers of cash.

A. Simple Sanctions

The Enforcer can impose any level of sanction on the Violator. In order to deter the violation, the sanction has to be at least $80, which equals the Violator's gain from violation. Thus, such a sanction costs the Enforcer at least $120.

A simple sanction is not effective in this situation. Often sanctions are levied after the harm has already occurred and thus have only a retaliatory effect. If the Enforcer derives no utility from retaliation, it would have no incentive to inflict a sanction if its cost is greater than 0. Alternatively, it can be assumed that the sanction has an incapacitating effect, forcing the Violator to cease the harmful activity. Then, it would be rational for the Enforcer to impose it only if the cost of such a sanction does not exceed the harm it eliminates. Since the cost of such a sanction for the Enforcer is at least $120, it exceeds the harm of $100 that the Enforcer suffers from the violation. Thus, the Enforcer's threat to inflict even an incapacitating sanction is not credible. A Violator, recognizing this, is not deterred by the threat of a sanction. Thus, simple sanctions fail to stop the violation.[3]

B. Simple Rewards

Alternatively, the Enforcer can induce the Violator to cease its violation by offering a reward. Since the Enforcer has more to lose from the violation than the Violator has to gain—recall that we assume that the violation is inefficient—there is room for a Coasian bargain, a "bribe." Any reward of at least $80 and of no more than $100 would make both parties better off. Assuming, for the moment, that the Enforcer has greater bargaining power, it can offer a reward of slightly more than $80 in return for the Violator ceasing the violation. In reality, of course, various transaction costs might make a reward bargain costly to achieve. What this example shows, then, is *not* that a reward would necessarily succeed. All it shows is that, under perfect conditions, a successful reward can cease the violation at the minimum cost of $80 to the Enforcer.

The question we are interested in is whether the Enforcer can do better. Can it induce compliance without having to spend this much money in a reward?

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[3] In much of the analysis below, we will assume that sanctions are merely retaliatory. This assumption will help us sharpen the insight that even when sanctions are least credible, the reversible reward scheme can use them to create stronger deterrence.

C. Reversible Rewards

The core contribution of this paper is to devise an enforcement mechanism that reduces the cost of credible enforcement. We call it "reversible rewards" because it uses a reward to lure the Violator to end the harm, but also reverses the reward against the Violator if the Violator continues its harmful conduct. The reversible rewards scheme has three simple elements:

(1) The Enforcer deposits money in an irrevocable fund, which can be used for two alternative purposes, as follows.

(2) If the Violator ceases the harmful activity, the entire money in the fund is given to the Violator as reward.

(3) If the Violator does not cease the harmful activity and the Enforcer decides to punish the Violator in retaliation, the money in the fund is used to reimburse the Enforcer for the cost of sanctioning.

Under this scheme, the reward offered to the Violator is backed up by an explicit threat: if the violation continues, not only will the Violator forfeit the reward, but it will also bear a sanction. Since the cost of inflicting the sanction would be reimbursed to the Enforcer from the fund, we say that the reward is reversible *i.e.,* it can be diverted into a sanction after being rejected by the Violator. Note that if the Enforcer fails to punish an ongoing violation, the money would be squandered and may not be recovered by the Enforcer. That the Enforcer can only recover this money as a reimbursement for a sanction renders the Enforcer's threat to impose the sanction credible.

A reversible reward would be significantly lower than the \$80 that was necessary for the minimum effective non-reversible reward. Now, it is enough to deposit slightly more than \$48 in the fund to stop the violation. To see why, consider first the maximum sanction that the Enforcer would be willing to impose if the violation continues. Expecting to be reimbursed up to \$48 from the fund, the maximum sanction that the Enforcer would have an incentive to inflict is $s = 32$. This sanction would cost the Enforcer $1.5s$ (namely $1.5 \times 32 = 48$), exactly the amount available in the fund. Thus, the threat to inflict a sanction of \$32 would be credible. A lower sanction would also be credible, but the Enforcer gains nothing by lowering the sanction (the marginal cost to him of unit of sanction is \$0.) Finally, a sanction exceeding \$32 would not be fully reimbursed and thus the threat to impose it would not be credible.

Recognizing the credibility of the threat to inflict a sanction of s= 32, the Violator has to choose between two options: a violation, which would entail a net payoff of $48 (that is, a gain of $80 from continuing violation minus a sanction of $32); or ceasing the violation and collecting the reward, which would yield an immediate identical payoff of $48. Thus, endowing the fund with a little more than $48 (say, $50) would be enough to make the Violator strictly prefer compliance over violation. A reversible reward of at least $48 can lead to full compliance.

D. Reversible Reward: Why It Works

The example above illustrated that the reversible reward scheme can succeed where simple sanctions fail, and that it costs less than a simple reward. Two distinct factors explain why the success of this scheme is general and not merely an artifact of the particular example we chose: (1) the *double effect* of the expenditure—using the same money to fund both the reward and the punishment; and (2) solving the problem of the credibility of threats to sanction through a *pre-commitment* device.

1. *The Double Effect*

A reversible reward uses the same money twice. In the Introduction, we illustrated this double effect through examples of how a campaign contribution is offered to two opposing candidates, operating once as a carrot and another time as a stick. There, a non-complying candidate loses twice: first by forgoing the offered campaign contribution and, second, by witnessing the same resource being redirected to his or her opponent.[4]

Put differently, the enhanced incentive to comply is generated by a "wedge" between the payoffs available from violation and from compliance. The greater this wedge, the stronger the incentive. This wedge can be "stretched" in two directions: the Enforcer can offer a higher payoff for compliance, or a lower payoff for violation. A simple reward operates in the first direction by offering a higher payoff for compliance. A simple sanction operates in the second direction by offering a lower payoff for violation. A reversible reward operates in both directions by doubling the wedge and thus doubling the effect of the Enforcer's fund.

[4] To be sure, in equilibrium the money can be used at most once, but because it is factored into the off-equilibrium moves—because parties act in the "shadow" of what this money can do in differenct scenarios—it has the double effect.

The idea of resorting to both rewards and sanctions to influence parties' incentives is not novel. But conventionally sticks and carrots are presented as alternative ways to enhance compliance. Under the law of restitution, a party who commits a desirable act—rescue, salvage, enhancement of property value—can in some circumstances collect a reward from the beneficiary. Under tort law, a party who commits an undesirable act—injury, damage, destruction of property value—is in most circumstances liable to pay compensation to the injured party. Saul Levmore has studied the potential simultaneous use of sanctions and rewards.[5] Levmore identified situations in which law or contracts reward good behavior and at the same time punish bad behavior. For example, some jurisdictions provide rewards for rescue and penalties for failure to rescue. Or, stores incentivize sales staff by offering commissions for generating high sales and penalties for generating low sales. Or, construction contracts sometimes include "risk/reward" terms, with penalties for delayed completion and rewards for ahead-of-schedule completion. The reversible reward mechanism differs from these examples by utilizing the double wedge effect in a specific manner: Not only are rewards and sanctions offered simultaneously, but their funding is linked.

We use the term "double" effect loosely. More precisely, the effect of reversible rewards could be somewhat less than double the effect of a simple reward, depending on the precise magnitude of the excess cost associated with sanctions. In the original example involving a cost multiplier of 1.5*s*, the reward fund of $80 was reduced to somewhat less than half, $48. The excess cost of sanction mitigated the double effect of the reverse portion of the reward. A multiplier of 2*s* would mitigate the double effect even more, increasing the required size of the reversible reward to at least $54.[6] If, instead, the sanction involved excess efficiency (a cost multiplier of less than 1, say 0.5*s*), the money used to finance the sanction would have a larger incentive effect than the same money used for a reward. In this case the reversible reward more than doubles the incentive effect and reward fund

[5] Saul Levmore, *Waiting for Rescue: An Essay o the Evolution of Incentive Structure of the Law of Affirmative Obligations*, 72 Va. L. Rev 879, 891-906 (1986); Saul Levmore, *Carrots and Torts*, in CHICAGO LECTURES IN LAW AND ECONOMICS 203, 221 (Eric Posner, ed., 2000).

[6] Such a reversible reward fund could finance a sanction of $27. The Violator would prefer to take the reversible reward of $54 than commit a violation and net $80 - $27 = $53.

would have to be less than half the simple reward.[7] Thus, the cost structure of the sanction affects the exact size of the necessary reversible reward fund, but its qualitative effect of delivering a "dual punch" is maintained in all settings.[8]

2. *Credible Commitment*

Reversible rewards can be used with or without a pre-committed fund. We mentioned the risk/reward clauses in contracts and bonus/fine schemes in employment. The particular reversible reward scheme we develop here adds another aspect—a pre-commitment of the fund—which bolsters the credibility of the threat to reverse the reward into a sanction. Because of this pre-commitment of funds, the Enforcer has nothing to lose by carrying out his threat to sanction. This is particularly helpful in situations where the Enforcer would have to inflict the sanction *after* having already suffered the harm, and thus would have no incentive to do so. With the effective cost of sanctioning reduced to zero at the time the sanctions have to be implemented, the Enforcer's threat to inflict even purely retaliatory sanctions becomes credible through this mechanism. Indeed, as we will demonstrate in the next section, the size of the fund that needs to be pre-committed depends on the type of sanctions involved. Pure retaliatory sanctions require a larger pre-commitment than sanctions that also have an incapacitating effect.

The success of the reversible rewards can also be analyzed through the lens of a bargaining model. The interaction between the Enforcer and the Violator can be viewed as a negotiation problem in which the parties bargain over the price for the Violator's compliance. This price depends on the parties' relative bargaining power—the factors that affect their respective abilities to extract a favorable concession from the other side. At the basic level, the greater the harm suffered by the Enforcer, the more it is willing to pay for

[7] When the cost of sanction is 0.5*s*, the minimum necessary fund would be just under $27. Such a fund could finance a sanction of $54. The Violator would prefer to take the reversible reward of $27 than commit a violation and net $80 - $54 = $26. It should be pointed out that when sanctions are cheap, it would more likely be the case that simple sanction could be used to fully deter the behavior, and reversible rewards would not be needed.

[8] In some settings, a reward could also entail excess cost—the money paid by the donor is less than the money received by the target. This factor would reduce the efficacy of rewards generally, but it would not undermine the advantage of reversible rewards. In our original numerical example, if a reward of *r* now costs 1.25*r*, a simple reward of $80 would cost $100. A reversible reward fund, when the sanction has no excess cost, would cost $45. Such a fund could finance a sanction of $45 and a reward of $36. The Violator would prefer to take the reversible reward of $36 than commit a violation and net $80 - $45 = $35.

the violation to end. Likewise, the greater the gain enjoyed by the Violator, the more it demands as a reward. A simple reward is merely a bargain struck within these outside options available to the parties—between the harm or the benefit of the violation—making both parties better off.

A reversible reward adds to the Enforcer's bargaining power because it changes the outside option available to the Violator. The certainty of being subjected to an ensuing sanction reduces the payoff from violation. Through the pre-committed fund of the reversible sanction the Enforcer "ties its own hands" to carry out the sanction, thus changing the bargaining range and securing a better bargain. By using a reversible reward the Enforcer can negotiate a more favorable deal, commensurate with the sanction the Enforcer credibly threatens to inflict.

II. FORMAL ANALYSIS

A. Framework

A risk-neutral Violator has an opportunity to engage in a conduct that harms another risk-neutral party, the Enforcer. The benefit to the Violator is b if he pursues the activity and 0 otherwise, and the harm to the Enforcer is h if the Violator pursues the activity and 0 otherwise.

The Enforcer can threaten to impose any sanction s, where s denotes the monetary equivalent of the disutility of the sanction to the Violator. The cost of sanction to the Enforcer is $c(s)$. For simplicity, assume that the sanction cost function is linear: $c(s) = \alpha + \beta s$, where α is a fixed cost of sanctioning and β is a variable cost multiplier. In some cases, β can be negative, as when the Enforcer collects a monetary fine or damages from the Violator. In other cases, β is positive, representing resources the Enforcer has to invest in inflicting the sanction.

The Enforcer can also offer the Violator a reward r for ceasing the activity. The reward is monetary and thus involves a simple transfer from the Enforcer to the Violator and does not generate additional implementation costs.

If the Violator engages in the harmful activity, its payoff is $b - s + r$ and the Enforcer's payoff is $-h - c(s) - r$.

The parties are rational and have perfect information. The timing of their interaction is as follows: at time 0, the Enforcer announces the sanction and reward scheme. At time 1, the Violator chooses whether or not to pursue the harmful activity. If it does, the Enforcer suffers an immediate harm of h. At time 2, the Enforcer can impose a sanction in retaliation. Alternatively, if the Enforcer promised a reward and the Violator complied with the conditions of that reward, the Enforcer must pay the reward. In this setting, the harm occurs immediately at time 1, before and irrespective of any sanction. A sanction can therefore only inflict some cost on the Violator, but it cannot prevent the Violator from engaging in the activity—hence, the sanction is merely retaliatory. However, we also discuss the setting where the sanction can be used to induce the Violator to cease its harmful activity.

B. Simple Sanctions and Rewards

Let us consider as a benchmark the effect of simple sanctions. To deter the harmful activity, the Enforcer has to threaten the Violator with a sanction of at least b. When the sanction is merely retaliatory, this threat is not credible. Any sanction that costs more than 0 would only make the Enforcer's payoff lower in comparison to the situation where the Enforcer imposes no sanction. In both cases, the Enforcer incurs the harm h. Thus, the decision to inflict a retaliatory sanction would yield the Enforcer a payoff of $-h - c(s)$ whereas the payoff from enduring Violator's harmful activity would be $-h$. Once the harm has occurred, the Enforcer has therefore no incentive to punish the Violator.

Even if the sanction can cease the harmful activity and thereby reduce the Enforcer's harm to 0, punishment would be rational only if $c(b) \leq h$. The Enforcer would have to impose a sanction of $s = b$ to induce the Violator to cease its activity, and would thus have to bear a cost of at least $c(b)$. The Enforcer would choose to pursue a sanction only if its cost were lower than the harm from tolerating the violation. In this case the violation can be eliminated, and the Enforcer's payoff would be $-c(b)$.

Consider now the effect of simple rewards. To induce the Violator to cease the violation, the Enforcer needs to offer a reward of at least b. The Enforcer would choose to do this if $b < h$, namely, when it is cheaper to incur the cost of buying off the Violator's compliance than to suffer the harm of Violator's non-compliance.

From the Enforcer's perspective, an incapacitating sanction is superior to a reward

whenever the threat to impose such a sanction is credible (whenever $c(b) < h$)—here, the Enforcer would able to deter the violation at no cost since the threat need not be carried out. In contrast, rewards are superior to sanctions every time the threat of sanctions is not credible. If the sanction is merely retaliatory, the reward can achieve what a sanction cannot as long as $b < h$. Or, if the sanction is incapacitating but $c(b) > h$, the Enforcer again does not have a credible threat to impose the sanction but has the incentive to offer a reward. Thus, if $b < h < c(b)$, the reward works whereas a sanction does not. In the remainder of the discussion we will assume that $c(b) > h$ and that simple sanctions are thus too costly to be credible. The cheaper way to prevent the harm is to offer the Violator a simple reward of b. We will now explore whether a reversible rewards can achieve the same result at a lower cost.

C. Reversible Rewards

At time 0, the Enforcer sets up a fund and endows it with U. The Enforcer instructs that the fund can be used for either rewarding the Violator for compliance or, failing that, rewarding the Enforcer for punishing the Violator. These instructions cannot be modified or revoked. (We will comment below on the legal foundations for this assumption). Specifically, the Enforcer instructs that:

- If the Violator refrains from violation at time 1, the fund's endowment will be transferred in full to the Violator at time 2.
- If the Violator commits the violation at time 1 and the Enforcer punishes him at time 2, the Enforcer's cost of punishment will be reimbursed from the fund, up to the full amount available in the fund.
- If the Violator commits the violation and the Enforcer does not punish him, the money in the fund is squandered (*e.g.,* donated to a neutral charity).

The fund makes the Enforcer's threat to inflict sanctions credible in a number of circumstances where a threat to inflict simple sanctions would lack this credibility. Denote by $s^*(U)$ the maximum sanction that could be fully reimbursed from a fund *i.e.,* the highest possible sanction that meets the condition $c(s) \leq U$. When $c(s) = \alpha + \beta s$, then

$$s^*(U) = \frac{U - \alpha}{\beta}$$

For example, if $\alpha = 0$ and $\beta = 1$ (namely, $c(s) = s$), then $s^*(U) = U$. The costlier it is to impose

a sanction (*i.e.,* the higher the values for α or β), the lower is the maximum sanction that the Fund can credibly support.

The question we are interested in is the following: what is the minimum necessary fund to induce the Violator to forgo the benefit *b* and thus refrain from the harmful activity altogether? Denote the minimum fund by $\underline{U(b)}$. The Violator is faced with a choice: either to refrain from the activity and accept the reward of $\underline{U(b)}$, or engage in the activity with a payoff of $b - s^*(\underline{U(b)})$. Given the Violator's choice, the Enforcer chooses the minimum *U* that induces the Violator to refrain from the activity:

$$U(b) \geq b \quad s^*(U(b))$$

which yields:

$$U(b) = \frac{\alpha + \beta b}{1 + \beta}$$

Several observations can be made:

1. *More credible than simple sanction.* Recall that for simple sanctions to work, they cannot impose costs on the Enforcer that exceed Enforcer's benefits from Violator's compliance. Even when sanctions are incapacitating, they are credible only if $c(b) < h$. In comparison, the cost of setting up a Fund to deter the harmful activity is smaller any time $\beta > 0$. β denotes the marginal cost of sanctions. Thus, any time it costs something to levy an additional unit of sanction (that is, when the cost of the sanction depends on the size of the sanction), a reversible reward achieves full deterrence at a lower cost than a simple sanction. Thus, it could work as an effective enforcement scheme in situations in which simple sanctions fail.

2. *Cheaper than simple rewards.* The cost of a reversible reward is lower than the cost of simple reward any time

$$b > h > \frac{1}{1+\beta} c(b) = \frac{\alpha + \beta b}{\beta + 1}$$

Thus, any time $b > \alpha$, a reversible reward is cheaper than a simple reward scheme, irrespective of β, the marginal cost of sanctions. The intuition is this: any time $b > \alpha$, the money in the fund can be used to generate some non-zero sanction. In contrast, when $\alpha >$

b, the fixed cost of sanction will deplete the reward fund before any pain can be inflicted on the Violator. With the ability to sanction guaranteed, the reward necessary to create an incentive for the Violator to give up *b* is smaller.

3. *Example.* Assume *c(s)* = 100 + *s*, and *b* = 200. The minimum effective sanction is 200, which costs 300 to impose. The minimum simple reward is 200. A fund of $\underline{U}$ would generate a credible threat to impose a sanction $s^* = U - 100$. Thus the minimum necessary fund is $U = \frac{1}{2}(100+b)$, which equals 150. It offers a reward of 150, backed by a sanction of 50.The reversible reward scheme achieves compliance at a cost of 150, which is less than the cost of simple sanctions or rewards. If *h* > 150, a reversible reward credibly eliminates the harm, whereby a simple sanction is not credible and a simple reward is costlier in comparison.

4. *Legal Foundations*. The pre-commitment element of the fund requires that the money would be truly sunk. The fund needs to be structured as an irrevocable trust, whereby the trustee is barred from accommodating any conflicting ex-post instructions by the fund's initiator. While contract law does not recognize the power of parties to write non-modifiable contracts,[9] trust law provides the legal framework to make such hands-tying commitments.[10]

D. Divisible Sanction Costs

By pre-committing a fund, the reversible reward scheme divides the strategic decision into two stages—an initial stage in which the fund is set, and a later stage in which the fund is utilized. We now explore an additional strategic advantage of this divisibility effect.[11]

1. Numerical Example

Return to the example studied in Section I. We assumed the Violator's benefit to be $80, the harm from the activity $100, and the cost of inflicting a sanction *s* 1.5*s.* We noted that a merely retaliatory sanction would never be credible because it would not eliminate the harm of $100 and would simply amount to another expense. Cost divisibility would not

[9] Christine Jolls, *Contracts as Bilateral Commitments: A New Perspective on Contract Modification*, 26 Journal of Legal Studies 203 (1997).

[10] Kevin E. Davis, *The Demand for Immutable Contracts: Another Look at the Law and Economics of Contract Modification and Renegotiation*, 81 *New York University Law Review* 487 (2006).

[11] For a model of the effect of cost divisibility on the threat to enforce, see Bebchuk, supra note &&.

matter, because incurring any cost greater than $0 would not be rational for the Enforcer. Incapacitating sanctions would also lack credibility as it the Enforcer would need to incur a cost of at least $120 to deter the harm of $100.

Cost divisibility could solve this credibility problem. The key would be for the Enforcer to lower its sanctioning costs at time 2, when the decision to inflict the sanction is made. This can be accomplished by dividing its costs into a pre-committed sunk portion and a subsequent avoidable portion. The Enforcer would deposit just enough money in the fund at time 0 (sunk portion) to render his subsequent threat to expend the remaining cost of the sanction credible at time 2 (avoidable portion)—thus ensuring that the threat would not need to be carried out. In the above example the Enforcer would initially need to deposit just over $20 in the fund, even if the fund is committed solely to finance a simple sanction without any rewards. If the Violator subsequently engages in the harmful activity, it would only cost the Enforcer less than $100 to pay for a fully deterring sanction at that time. Since the upfront deposit into the fund is sunk and no longer factors into his strategic calculation, it would be rational to spend anything under $100 to terminate the harm of $100. Since the threat to impose a sanction becomes credible at this stage—the Violator now knows that the Enforcer can pay the full $120 to impose a sanction that costs the Violator a disutility of $80—the Violator would be deterred. Thus, the Enforcer manages to stop the Violator's activity by spending only $20 upfront. As long as the money in the fund is sunk, the threat to punish becomes credible. Further, the money deposited into the fund does not need to be paid out as a reward. It can remain in the fund to deter possible further violations.

While the divisibility of simple sanctions can render them cheaper than simple rewards, the enforcement costs can be further lowered if the Enforcer exploits the divisibility feature in setting up a reversible reward fund. Here, the money deposited in the fund at time 0 can be used, not only to fund a subsequent sanction at time 2 but also as a direct reward to the Violator if the Violator ceases his activity voluntarily at time 1. In this case, the Enforcer only needs to deposit just over $8 in the fund—that is, the cost to the Enforcer is reduced from $20 to $8. Here is why: If the Violator is offered $8 as a reward to stop the harmful activity, the Enforcer no longer has to threaten a full sanction of s =80. Instead, a sanction of s = 72 would suffice. This is because the wedge between a reward of

$8 and a sanction of $72 is, again, $80, equal to the Violator's gain from the activity. Accepting the reward confers the Violator a payoff of $8 which is no less than the net payoff of $8 the Violator obtains from continuing the harmful activity (the benefit from activity ($80) – sanction ($72)). In order to inflict a sanction of s = 72, the cost to the Enforcer would be $1.5 \times s$, or $72 \times 1.5 = \$108$. But since $8 would be paid out the fund, the remaining cost for the Enforcer would only be $100, and the threat to inflict it would be credible. Thus, setting a fund of just over $8 would make the threat to sanction credible and lead the Violator to cease the activity.

2. Formal Analysis

The Enforcer endows an irrevocable fund with U. Consider, first, a scenario in which the fund is used solely to reimburse the Enforcer for the cost of a sanction, but is not offered also as a reward to the Violator. Expecting to be reimbursed up to U, the maximum sanction that the Enforcer can credibly threaten to impose is $s^*(U)$, which is the solution to:

$$c(s) - U = h.$$

If he inflicts the sanction, the Enforcer's incurs a cost of $c(s) - U$. If he doesn't, he incurs a cost of h. Thus, when $c(s) = \alpha + \beta s$, then

$$s^*(U) = (h+U-\alpha)/\beta.$$

The minimum necessary fund to induce the Violator to forgo the benefit b and refrain from the activity, denoted by $\underline{U}(b)$, must satisfy $s^*(U(b)) = b$. When the sanction is equal to the benefit, the Violator's incentive to engage in the activity is eliminated. Thus,

$$\underline{U}(b) = \alpha + \beta b - h.$$

Notice that the cost of the divisible sanction to the Enforcer is significantly smaller than the cost of a simple sanction, $\alpha + \beta b$. Under plausible conditions, it is also cheaper than the cost of a simple reward, b.[12]

The above scenario exploits the divisibility effect in a situation where the Enforcer employs simple sanctions. However, the Enforcer can do even better—*i.e.,* deter the harmful activity at a lower cost—by using reversible rewards that combine the divisibility

[12] The cost of the enforcement fund is lower than a simple reward whenever $\alpha + \beta b - h < b$, or $b < (h - \alpha)/(\beta - 1)$. The smaller the fixed cost of sanction, and the greater the variable cost, the more likely is the enforcement fund to be cheaper than a simple reward.

effect with the wedge effect. Now, the money in the fund is offered to the Violator in return for ceasing the activity or, alternatively, to the Enforcer for financing the sanction against a non-compliant Violator. The minimum necessary fund to induce the Violator refrain from the activity, $\underline{U}(b)$, must now satisfy

$$U(b) \geq b - s^*(U(b)).$$

The Violator's choice is either to refrain from the activity and accept the reward of $U(b)$, or engage in the activity with a payoff of $b - s^*(U(b))$. The Enforcer will thus choose the minimum U that is sufficient to induce the Violator to refrain from the detrimental activity, which yields:

$$\underline{U}(b) = (\alpha + \beta b - h)/(1+\beta).$$

Relative to the simple sanction fund mechanism, the reversible reward fund reduces the cost of the fund by a multiplier of $1/(1+\beta)$. Without the reversible reward, and exploiting the divisibility effect alone, the fund needed to be endowed with at least $\alpha + \beta b - h$ for the subsequent threat to be credible. Thus, just like in the basic analysis of reversible rewards, any time $\beta > 0$—that is, anytime the cost of the sanction increases with the size of the sanction—the reversible reward achieves full deterrence at a lower cost than a simple divisible sanction fund. A reversible reward is also cheaper than a simple reward any time $U(b) < b$, namely, $\alpha - h < b$. Unless the fixed cost of sanction, α, is so high as to overshadow all other costs, the reversible reward scheme makes enforcement more affordable.

III. APPLICATIONS

This section illustrates the usefulness of reversible rewards in various legal settings, where one party seeks to credibly and cost-effectively change the incentives of another party. Whether it is to perform a contract, refrain from harmful conduct, or settle a suit—the affected party can combine rewards and sanctions to generate incentives more cheaply than by using sanctions or rewards alone.

For example, a contracting party may want to prevent a harmful breach, but cannot do so by merely threatening to sue for damages because the cost of securing a remedy is high, or the remedy would not fully compensate the injured party. Faced with a threat to

breach a contract, this party can deposit some money in an irrevocable fund and offer it to its counterparty as a reward for adequate performance (namely, as a bonus above the already agreed upon price). If the counterparty turns down the bonus and breaches the contract, the deposited fund could be used instead to finance the cost of securing a remedy. By using such a reversible bonus, a contracting party can secure full performance of the contractual obligations at a lower cost.

The same is true if a party is trying to prevent a harmful action by another, including stop a nuisance, trespass, defamation, or pollution. When the threat to sue for redress is not credible and does not deter, a reversible reward could be a feasible way to secure the right. The scheme is also applicable when a party is trying to induce another party to work harder—an employer asking an employee to exert greater effort. In fact, workers are already subject to bonus/sanction policies. As we mentioned, construction contracts sometimes include a bonus for early completion as well as a fine for late completion. A reversible reward goes beyond the simple co-utilization of rewards and sanctions; it pre-commits a fund to finance sanctions when rewards are turned down, thus making the threat of sanctions more credible through a dual use of the same money.

In the remainder of this Section we survey some applications in more detail.

A. Settlement Bargaining

Reversible rewards can be employed by a defendant to improve its strategic position and secure a more favorable settlement.[13] The defendant establishes a fund and offers the money in it to the plaintiff as settlement. If the plaintiff turns down this settlement offer, the defendant uses the money in the fund to pay attorneys to mount a non-compromising defense. To the extent that such defense would make it costlier for the plaintiff to win a judgment, the plaintiff would be better off accepting the settlement offer.

Consider the following illustration. A plaintiff has a claim that, if litigated, would lead to a judgment of $100. If unopposed, the plaintiff would incur no litigation costs. If,

[13] Others have noted how fee arrangements with attorney can affect the strategic structure of settlement bargaining. See, e.g., Lucian A. Bebchuk, and Andrew T. Guzman, *How Would You Like to Pay for That? The Strategic Effects of Fee Arrangements on Settlement Negotiations*, 1 Harv. Neg'n L. Rev. 53 (1996); David Croson and Robert Mnookin, *Scaling the Stonewall: Retaining Lawyers to Bolster Credibility*, 1 Harv. Neg'n L. Rev. 65 (1996). Croson and Mnooking examine the effect of pre-committed fee on the plaintiff's ability to extract a settlement. Here, instead, we demonstrate the effect of a pre-committed fund on the defendant's ability to *lower* the settlement.

instead, the defendant defends against the claim, the plaintiff's litigation cost would rise. Assume that the more the defendant spends on litigation, the costlier it would be for the plaintiff to secure the $100 judgment. For simplicity, assume that if defendant spends C on litigation, the plaintiff would also have to spend C to win the $100. In this scenario, the defendant has no incentive to drag the plaintiff to litigation: he prefers to pay $100 outright in settlement than incur $100+C in litigation. Thus, the defendant's threat to litigate and impose costs on the plaintiff is not credible.

The defendant can, instead, utilize a reversible reward in the following way. He would deposit $50 in the fund and offer this sum as final settlement to the plaintiff. If the plaintiff turns down the $50 settlement from the fund and insists on a higher settlement, the money in the fund could be used only to fund litigation cost, up to the full value of $50 that is pre-committed in the fund. Now, the plaintiff would be willing to settle for $50 to avoid litigation, because litigation would yield him a payoff of $50 ($100 judgment minus the litigation costs of $50). Because the fund is sunk, the defendant's threat to spend the money to litigate the case is credible. As long as the defendant cannot use the $50 in the fund to pay for a settlement greater than $50 (that is, as long as the maximum settlement paid from the fund is set at $50), the defendant can credibly threaten to litigate by paying an extra $50 rather than settling for the full $100.

In this example, the reversible reward scheme saves the defendant half of the settlement costs by reducing the cost from $100 to $50. In general, the magnitude of the saving depends on the "sanction" that the defendant can impose—*i.e.,* on the proportion by which the plaintiff's costs would rise when the defendant spends C in litigation. If, for example, the plaintiff costs rise only by ½C, then the settlement offer would have to be $67.

Practically, for this technique to work, the defendant has to set up the fund in a way that would make it impossible to use the money in any other way than stipulated. Specifically, the defendant has to contract with an attorney such that, if the settlement offer from the fund is turned down, the attorney must launch a defense with the full sum available in the fund, and cannot free the money to pay for higher settlement offers. Otherwise, the plaintiff would be able to undermine this scheme by counter offering a settlement of a little less than $100.

B. Enforcing Safety Standards

Reversible rewards can be applied as a tool in government enforcement of regulatory standards. Consider, for example, standards relating to safety of oil drilling. The 2010 oil spill in the Gulf of Mexico demonstrated the need for better regulation and better enforcement. The dominant approach to a regulatory failure is to increase sanctions for violations. But relying on a punitive approach alone is likely to be costly. Revoking or delaying drilling licenses leads to a reduction in oil production and growth in unemployment. The cost of importing oil or other sources of energy also go up as the domestic supply of oil goes down. Alternatively, enforcement could be based on rewarding and subsidizing prudent drillers for their compliance. While the idea of rewarding big oil companies may not be politically appealing, rewards for good safety record can form an effective and less costly regulatory response that leads to safer drilling and fewer accidents.

If the government uses a reversible reward fund, the cost of rewards could be cut without sacrificing deterrence. Compliant firms will collect the reward; noncompliant ones will face sanctions backed by the money freed up from the fund when the reward is not collected. If oil companies still chose to engage in unsafe drilling, they would face a higher likelihood of penalties as earmarked funds would be reversed to cover the government's costs of punishing them. The pre-commitment element of the fund would be particularly helpful in the case of drilling. Oil companies may not be adequately deterred as they count on regulators' unwillingness to rein in drilling due to the importance of oil for the country's energy security and independence. The credibility of sanctions can also be compromised given that oil companies are big donors for politicians. The risk of regulatory capture may dilute the credibility of a threat to sanction in the absence of a mechanism that sends a credible signal of the government's commitment to punish precarious drilling. Setting up a pre-committed fund could also offer an effective way of tying the hands of the next administration that might be less willing to regulate drilling.

Finally, the fund could be financed through royalties that the oil companies pay to the government in return for a permission to drill. When engaged in particularly dangerous drilling activities (*i.e.,* deep-water offshore drilling), the company would need to pay a higher royalty to the fund. Similarly, royalty rates would increase with a history of accidents—in the way car insurance payment increases when the driver has manifested his

propensity for accidents. Here, the most reckless drillers would end up financing the bulk of the fund, including the rewards for their prudent competitors and the government's efforts to sanction the reckless drillers themselves. This should offer a more potent—and less costly—way to regulate oil companies than simply racking up civil and criminal fines or trying to halt drilling altogether, assuming safe drilling still is socially beneficial.

C. International Enforcement

Enforcement problems are particularly challenging in the international context. In the absence of supranational enforcement bodies, states are not able to rely on an objective third party carrying out enforcement on their behalf. States sometimes resort to economic sanctions, and occasionally the use of military force—but these are costly and often unsuccessful. Trade sanctions, for example, impose costs on the sanctioning state whose firms and consumers are deprived from the benefits of economic exchange. Other times, states try to enforce international law by offering rewards to violators if they cease their harmful activity. The US could, for instance, offer direct cash transfer to compensate a polluting country for the cost of reducing pollution and retrofitting its plants. But these rewards, too, are costly and often politically contentious.

These enforcement problems are often magnified by collective actions problems. International treaties aimed at solving global cooperation problems are notoriously hard to enforce. International organizations and courts are limited in their ability to levy sanctions on free riders. Individual countries and ad-hoc coalitions can at times coordinate sanctions for violations, but for problem of global importance coordination is often elusive.

The ongoing effort to negotiate a new global climate change treaty is an illustrative example of a complex multilateral enforcement challenge. While all states would benefit from collective efforts to limit their emissions, they also have the incentive to free ride on other states' efforts to protect the climate. Recent efforts to enact a new global climate treaty have failed because "enforcers"—states eager to reduce emissions—have been unable to persuade "violators" to join a treaty. The cost of buying off the cooperation of countries like China would simply be too high—China has requested an annual transfer of $300 billion from developed countries to finance developing countries' efforts to fight

climate change.[14] The cost of levying effective trade sanctions on an economic power like China is also prohibitive. For example, a carbon border tax on Chinese imports would impose costs on domestic firms and consumers who would be deprived of cheap Chinese imports.

Reversible rewards could generate more compliance than the reliance on sanctions or rewards alone. The scheme would work as follows. Enforcers—most prominently, the EU and the United States—would set up a fund. Instead of endowing it with the full $300 billion that potential violators are demanding for joining the treaty, Enforcers would deposit only about half the amount in the fund. The fund would reward China (and possible other violators) for compliance, by financing China's transformation of its energy infrastructure, transferring environmental technologies, or paying for a host of other tangible inducements. However, if China fails to join a treaty or to fully comply with it, the money in the fund would be used reimburse Enforcers for the costs of inflicting sanctions against China. If the sanction consists of a carbon border tax, the fund could compensate adversely affected domestic parties. Or, the fund could grant subsidies for industries that compete with Chinese manufacturers. It could also be used to cover the costs of mitigating the damage from China's possible trade retaliation.

Thus if the reversible reward is, say, $150 billion, it would create an inducement that is roughly equal to a simple reward of $300 billion. The choice for China between violation and compliance has a payoff effect of $300 billion.

The primary advantage of the reversible reward is its ability to enhance the credibility and reduce the cost of enforcement. A secondary advantage is in mitigating the collective action problem among the various enforcers who have the incentive to free ride on each others' enforcement efforts. By using a pre-committed fund, each state's participation is measured not by the sanctions it actually levies (on which they have an incentive to cheat and which are hard to monitor), but instead by the amount it contributes to the fund. Unless everybody contributes, no one contributes. Later, if sanctions turn out

[14] In the Copenhagen Conference in 2009, China requested that developed countries commit one percent of their GDP—amounting to over $300 billion annually—to a fund that would help China and other developing countries to comply with the proposed climate treaty. Michael Levi, *Copenhagen's Inconvenient Truth*, FIN. TIMES, Sept./Oct., 2009.

to be necessary, enforcers have fewer incentives to defect and free ride because their cost of sanctioning is fully reimbursed from the fund.

Moreover, to the extent that sanctions are costly to administer, coordinating the sanctions through a centralized fund makes it possible for participating states to allocate the enforcement burden in the most efficient way. For instance, if the cost to one Enforcer of imposing sanctions on China is particularly high, this Enforcer does not need to participate in the actual sanctioning and can instead shoulder the burden by paying more in setting up the reversible reward fund. This is also an option for a state that imports little from China—making their threat to restrict trade vis-à-vis China futile. Finally, as the total cost of enforcement is reduced through reversible rewards, it is likely to be easier to harness a larger coalition of Enforcers to join the enforcement effort in the first place.

D. Foreclosure

Carrying out foreclosure of mortgaged property, or eviction of residential rental property, is expensive for mortgage lenders and for landlords. It is time consuming, during which the property depreciates at a greater pace and, at worst, may even get destroyed by recalcitrant owners and tenants. In these settings the law prohibits self-help, and so eviction requires non-trivial legal costs and private enforcement measures, and can be simply unpleasant. Indeed, properties coming out of foreclosure sell for a substantial discount, sometimes exceeding 25% of the value of the property.[15] The weakness of enforcement is costly to the creditors.

To avoid the costs of sanctioning the defaulting homeowners through litigation and foreclosure proceedings, creditors can instead offer a reward for those who evict voluntarily and swiftly. But as long as homeowners can impose substantial costs on the creditors by refusing to vacate the property voluntarily, the reward necessary to buy their compliance might be substantial.

Instead, creditors could use reversible rewards. Money would be placed in a fund specifically aimed at foreclosing a particular property. It would be offered as reward to a homeowner that voluntary vacates the property in good condition. If the homeowner fails to vacate the premises, the funds would be used to cover the costs of the evictions. Because

[15] http://www.bloomberg.com/apps/news?pid=newsarchive&sid=acYOhFiTDKsc

this money is sunk and can only be accessed by the foreclosing agents, homeowners are more likely to face immediate forceful eviction and would thus be induced to accept the reward instead. As we showed above, it would require a smaller reward to successfully evict the reluctant homeowner when that reward is reversible.

Further, the fund could be established ex ante and financed by the homeowner. A condition to securing a mortgage could be a contribution by the borrower into a fund that would remain untouched until some fraction of the mortgage is paid off, or until default occurs. If the mortgage is paid off, the money would be returned to the homeowner. If, instead, default occurs, the fund is immediately withdrawn and offered as reward to the homeowner for immediate eviction, else used by the creditor to cover foreclosure costs.

CONCLUDING REMARKS

This paper has demonstrated a novel way in which rewards and sanctions can be combined to reduce enforcement costs. The idea is to initially set aside earmarked funds that can subsequently be used to purchase either a carrot or a stick. By pre-committing the fund, a reward can be reinforced with a (now costless) threat of sanction. This scheme doubles the deterrent effect on the target.

Reversible rewards can be used to improve enforcement in a socially desirable way, for example by enticing corporations to adopt better safety standards, or countries to pursue efforts to halt climate change. But reversible rewards can also be used in socially harmful ways. For example, a dominant firm seeking to reduce competition can try to intimidate its competitors. It can use rewards (e.g., bribes to competitors to leave a market) or sanctions (e.g. price war). But since both strategies are costly, a reversible reward could induce the competitor to acquiesce where it otherwise would not, and thus allow the dominant firm to capture the market at a smaller cost.

Why have reversible rewards not been used in practice? Since sanctions and rewards are used all the time—and sometimes interchangeably—it is puzzling why a simple scheme that outperforms them is not utilized. Elements of this scheme are familiar from other arrangements. For example, attorneys are sometimes paid a retainer fee—a pre-committed remuneration irrespective of the amount of work invested—which enhances

the strategic position of their client vis-à-vis its counterparty.[16] Another example relates to bail arrangements: a defendant who posts bail is deterred from fleeing in two ways: first, a fleeing defendant loses the bail money; and second, the money that he posted and forfeited can be used to fund bounty hunters, which increases the likelihood that the defendant will be apprehended. But neither of these schemes combines the pre-commitment and the reversibility features in the way reversible rewards do. Thus, the idea of reversing the rewards remains unexploited despite its potential to contribute to more credible and less costly enforcement of law. Having explored a variety of applications for reversible rewards, we think that its main value is in the international enforcement sphere, in which enforcement problems dominate. Accordingly, in a companion article we examine in greater detail the ways in which reversible rewards could be applied in international law.[17]

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[16] Croson and Mnookin, supra note 13.
[17] Omri Ben-Shahar and Anu Bradford [cite].

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