Optimal Punishment for Repeat Offenders when the Government Can and Cannot Commit to Sanctions

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Abstract

We show first that for wealth-constrained agents who may engage in an act twice the optimal sanctions are the offender's entire wealth for the first and zero for the second crime if the government can commit to sanctions. Then we ask the question whether this decreasing sanction scheme is subgame perfect when the government cannot commit, i.e., does a rent-seeking government stick to this sanction scheme after the first crime has occurred. If the benefit and/or the harm from the crime are not too large, this is indeed the case; otherwise, equal sanctions for both crimes are optimal.

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I. Introduction

Most legal systems punish repeat offenders more severely for the same offense than non-repeat offenders. Second-time offenders, for example, receive more severe punishment than first-time offenders. Penalty escalation characterizes traditional crimes such as theft and murder, but also violations of environmental and labor regulations, tax evasion, etc. This principle of escalating sanctions based on offense history is so widely accepted that it is embedded in many penal codes and sentencing guidelines.

For the rather well developed law and economics literature on optimal law enforcement escalating sanction schemes are still a puzzle.[1] This literature looks for an efficiency-based rationale for such a practice. Does a sanction scheme that maximizes welfare indeed have the property of sanctions increasing with offense history? So far the results have been mixed. At the very best the literature, which we describe at the end of this introduction, has shown that under special circumstances escalating penalty schemes may be optimal.

The purpose of this paper is to shed some light on this puzzle. We consider agents who may commit a crime twice. The act is inefficient; the agents are thus to be deterred. The agents are wealth constrained so that increasing the fine for the first offense means a reduction in the possible sanction for the second offense and vice versa. The agents may follow history dependent strategies, i.e., commit the crime a second time if and only if they were (were not) apprehended the first time. The government seeks to minimize the probability of apprehension.

First we assume, as is typical in the literature on optimal law enforcement, that the government can commit to sanction schemes. This means the government can use any set of threats to penalize wrongdoers. Our basic result is that the optimal sanction scheme is decreasing rather than increasing in the number of offenses. Indeed, in our framework it is optimal to set the sanction for the first offense equal to the entire wealth of the agents while the sanction for the second offense equals zero. The key intuition is as follows: A money penalty imposed for the second offense reduces the amount a person can pay for the first offense, since the wealth available to pay penalties is assumed to be fixed over the two periods. For that reason, a higher probability event – namely, a first offense that is detected – will be more effective use of

[1]See, e.g., Garoupa (1997) or Polinsky and Shavell (2000a) for surveys of this literature.

the scarce money penalty resource than a lower probability event – namely, a second detected offense.

Why is the probability of detection lower for the second rather than for the first crime? An agent faces the *possibility* of being sanctioned for the second crime if and only if she has already been sanctioned for the first time. Moreover, suppose the first act went undetected and the agent commits the second crime; then there is the possibility that she is apprehended for the second crime for which she is charged, however, the first-time sanction since she has no criminal record. Accordingly, whatever strategy the agent opts for, she is more likely to pay the sanction for the first rather than for the second crime. Shifting scarce wealth from the second to the first sanction, therefore, increases deterrence.

Then we give up the assumption that the government can commit to whatever sanction scheme. We consider the analysis of optimal sanctions without the possibility to fully commit important because judges often have a lot of discretion as to the size of the penalty: they may, for example, reduce sanctions to account for the financial possibilities, the education, the family background, etc. of the wrongdoer. Accordingly, we allow only for sanctions that the government actually wishes to implement should a crime have occurred.[2]

Ruling out full commitment changes the optimal enforcement schemes. Suppose, for example, the government does not care about the sanction as is typically assumed in the literature. Then it will not enforce the penalty if a crime has happened given that there is, say, a small cost of doing so. The rational criminal will anticipate the ex post enforcement behavior of the government. Therefore, she will commit the crime because the threat of being sanctioned is not credible. Once we drop the commitment assumption, the typical deterrence equilibria of the law enforcement literature between potential wrongdoers and the government are based on empty threats. In the jargon of game theory, the equilibria are not subgame perfect or time consistent.

Our decreasing sanction scheme from the first part raises of course the issue of time consistency. Will the government really charge the agent the entire wealth when she was apprehended for the first crime, knowing that then she will commit the second act for sure? Isn't it better for the govern-

[2]In many countries the President may pardon wrongdoers which, essentially, means that sanctions can be reduced.

ment to renege and charge little for the first act so that the agent still has sufficient wealth to pay a sanction that deters the second crime? Given that the first act has been committed anyway, that way the government can at least deter the second act.

To analyze this problem we consider a rent-seeking government. The sanctions paid by the criminals enter the government's welfare function. Our government, therefore, has an ex post incentive to collect fines. The government can commit to a probability of apprehension but not to sanctions. Our basic result is that if the agent's benefit and/or the harm from the crime are small enough, then the scheme where the sanction for the first crime is the entire wealth and the sanction for the second crime is zero is indeed subgame perfect.

To see this, consider the government after the agent has been apprehended for the first crime. If it sticks to our decreasing sanction scheme, it appropriates the entire wealth yet incurs the harm of the second crime. Thus, the lower the harm of the second crime, the more attractive is this option.

The alternative is to set the sanction for the second crime to a level that deters the act. With this option the government does not incur the harm of the second crime, yet forgoes the sanction for the second crime because it is deterred. If the benefit from the crime goes up, the optimal probability of apprehension increases, yet by more than the benefit; accordingly, the actual sanction necessary to deter the second crime falls. Since a low sanction for the second crime means a high amount the government can charge for the first crime, a high benefit of the second crime makes this option attractive. Therefore, only for low benefits the government sticks to the decreasing sanction scheme.

If the benefit and/or the harm of the second crime are large, our decreasing sanction scheme is no longer subgame perfect. The government prefers to deter the second crime should the first crime have occurred. Accordingly, only sanction schemes where each sanction by itself deters the corresponding crime are time consistent. In this case the optimal subgame perfect sanction scheme entails equal sanctions in both periods. Enforcement costs are higher than with the decreasing sanction scheme.

Let us now discuss the related literature. In Rubinstein (1979) even if an agent abides by the law, she may commit the act accidentally. The government wishes to punish deliberate offenses but not accidental ones. Rubinstein shows that in the infinitely repeated game an equilibrium exists where the government does not punish agents with a "reasonable" criminal record and the agents refrain from deliberate offenses.

Rubinstein (1980) considers a setup where an agent can commit two crimes. A high penalty for the second crime is exogenously given. The sanction for the first crime may be lower than the sanction for the second crime. Rubinstein shows that for any set of parameters there exists a utility function such that deterrence is higher if the sanction for the first crime is lower than the sanction for the second crime. Rubinstein does not allow for the second sanction to be lower than the first one.

Landsberger and Meilijson (1982) develop a dynamic model with repeat offenses. Their concern is how prior offenses should affect the probability of detection rather than the level of punishments.

In Polinsky and Rubinfeld (1991) agents receive an acceptable as well as an illicit gain from the criminal activity. The government cannot observe the illicit gains. Repeat offenses are, however, a signal of a high illicit gain. For certain parameter values of the model it may be optimal to punish repeat offenders more severely.

In Burnovski and Safra (1994) agents decide ex ante on the optimal number of crimes. They show that if the probability of detection is sufficiently small, reducing the sanction on subsequent crimes while increasing the penalty on previous crimes decreases the overall criminal activity. This paper is similar in spirit to ours. The main differences are: In their framework agents cannot choose strategies that depend on history, in our setup they can. Moreover, we derive the optimal policy that minimizes enforcement costs and we address the problem of subgame perfection.

In Polinsky and Shavell (1998) agents live for two periods and can commit a crime twice. The sanctions depend on the agent's age and her criminal record. They show that the following policy may be optimal: Young first-time offenders and old second-time offenders are penalized with the maximum sanction. Old first-time offenders may be treated leniently. Accordingly, this result does not say that repeat offenders are punished more severely; old first-time offenders may be punished less severely than old repeat- and young first-time offenders.

Chu, Hu, and Huang (2000) consider like Rubinstein (1979) a legal system that may also convict innocent offenders. The government takes the possibility of erroneous conviction as a social cost into account. The optimal penalty scheme punishes repeat offenders (slightly) more than first-time offenders. Reducing the penalty for first-time and increasing it slightly for repeat offenders has no effect on deterrence. The cost of erroneous convictions is, however, reduced because the probability of repeated erroneous conviction is lower than for first-time mistakes.

Dana (2001) argues that contrary to the assumptions in the literature, probabilities of detection increase for repeat offenders. As a result, the optimal deterrence model dictates declining, rather than escalating, penalties for repeat offenders. Taking the salience and optimism biases from behavioral economics into account makes the case for declining penalties even stronger.

Baik and Kim (2001) extend Polinsky and Rubinfeld (1991) by introducing the possibility of social learning of illicit gains between the two periods. If social learning is more important than the inherent characteristics in inducing offenses, it may be optimal to punish first-time offenders as severely as repeat offenders.

In Emons (2003b) agents have the choice between being criminals or being law abiding. If they choose the criminal career, they commit the act twice; there is thus a barrier to exit. If they choose to be law abiding, they may still commit the act accidentally. If the benefit from the crime is small, the optimal sanction scheme is decreasing in the number of offenses. By contrast, if the benefit is large, the sanction for the first offense is zero while the sanction for the second offense is the agents' entire wealth.

The only paper we are aware of that deals with the problem of subgame perfect sanctions is Boadway and Keen (1998). They consider a government choosing a capital income tax rate and an enforcement policy. The government can commit to the enforcement policy but not to the tax rate. Ex ante the government wishes to announce a low tax rate to induce savings; ex post, when savings have been made, it will renege and apply a high tax rate. Boadway and Keen show that by committing to a lax enforcement policy the government can alleviate the welfare loss implied by its inability to commit to the tax rate.

In the next section we describe the model. In section III we derive the optimal sanctions for a government that can commit and in section IV for a government that cannot commit. Section V concludes.

II. The Model

Consider a set of individuals who live for two periods.[3] In each period the agents can engage in an illegal activity, such as speeding, polluting the environment, conspiring to raise prices, or evading taxes. If an agent commits

[3]The set of agents has mass 1.

the act in either period, she receives a monetary benefit $b > 0$. We consider crimes without social gains. Using the term of Polinsky and Rubinfeld (1991), b is the illicit gain and the crime creates no acceptable gain.[4] The act causes a monetary harm h to society which is borne by the government. Since the damage $h > 0$, the act is not socially desirable. The individuals are thus to be deterred from the activity.[5]

To do so the government chooses monetary sanctions. The government observes whether the crime is the first or the second one. The government uses fines $s_1, s_2 \geq 0$ where s_1 applies to first-time and s_2 to second-time observed offenders.[6] Moreover, the government chooses a probability of apprehension p. This probability is the same for first- and second-time offenses.[7] Since apprehension is costly, the government wishes to minimize p.

In the following section we assume that the government can choose any set of sanctions $s_1, s_2 \geq 0$. In part IV the government can no longer fully commit to sanctions. It can commit to a maximum sanction but the government can choose a lower sanction from the one announced at the outset once a crime occurred. Typically, a judge always finds good reasons to reduce sanctions. By contrast, the probability of apprehension is irrevocably fixed before the agents take their actions. The government cannot easily change the amounts spent on, say, training the police or the tax authorities. Accordingly, in

[4] See also Chu, Hu, and Huang (2000) for an analysis of crimes without social gains. They argue that the gains to the offender are not considered because the crime is not socially acceptable or because the gains of offenders, such as theft or other zero-sum crimes, offset with the victims' losses.

[5] We assume that the benefits and the harms are the same for both crimes. If, e.g., the benefit of the second crime is much higher than the benefit of the first one, this might provide a rationale for escalating penalties.

[6] To have a game with complete information which we can solve by backward induction, we assume that the government also observes the period in which the agent commits the crime. However, we do not allow sanctions to depend on the agent's age. This assumption may be justified by equity reasons in the sense that the fine may not change when the agent is 46 rather than 39. Note that if fines also depend on age, the results will be different: if, e.g., an old offender is apprehended for a crime, be it the first or the second one, then the government will seize her entire assets. The analysis of optimal sanctions when fines depend on the number of crimes and on the age of the wrongdoer is an interesting topic for future research. See Polinsky and Shavell (1998) for a set-up where fines also depend on age.

[7] We thus rule out the case where agents with a criminal record are more closely monitored than agents without a record. See Landsberger and Meilijson (1982) for an analysis of optimal detection probabilities.

section IV we assume that the government can commit to p while it cannot commit to sanctions.[8]

In the law enforcement literature the optimal policy is derived by maximizing the sum of the offenders' benefits minus the harm caused by the offenses minus law enforcement expenditures. Sanctions do not enter the benevolent government's objective function because they are a mere transfer of money.[9] Within this framework the literature derives the results on optimal fines and optimal probabilities of apprehension. See, e.g., Garoupa (1997) or Polinsky and Shavell (2000a).

Nevertheless, these results hold true if and only if the government can fully commit to the probability of apprehension *and* to the announced sanction. To see this, suppose the government incurs a small cost $c > 0$ of cashing in on the fine. Suppose the agent has been apprehended for the crime and then the government strategically decides whether or not to impose the sanction. With such a sequencing, the rational government will not impose the fine: it does not care about the fine anyway and it can safe the cost c. Anticipating this ex post behavior of the government, the threat of being sanctioned is not credible and the agent will commit the act in the first place. To put it in the language of game theory: the equilibrium in the game between the offender and the government is not subgame perfect.

If we want to take the issue of subgame perfection (or time consistency) seriously, we must give the government an incentive to actually collect the fines. We do so by including the sanctions in the government's payoffs.[10] Our government thus maximizes revenues from sanctions minus the harms minus the enforcement expenditure and has thus an incentive to collect the fine should a crime have occurred. To save on notation we take the probability of detection p as a measure of the enforcement expenditure.

This approach can be justified in several ways. Garoupa and Klerman (2002) take the public choice perspective of a self-interested, rent-seeking government which maximizes revenues minus the harm borne by the govern-

[8]Boadway and Keen (1998) use the same commitment structure when studying the time consistency problem in the taxation of capital income.

[9]In the explicit formulation welfare is the criminal's utility (benefit minus expected sanction) plus the government's utility (expected sanction minus harm) minus enforcement costs.

[10]In terms of the explicit welfare function given in the preceding footnote, we simply exclude the criminal's utility (benefit minus expected sanction).

ment minus expenditure on law enforcement.[11] Polinsky and Shavell (2000b) consider the standard benevolent welfare function and add a term reflecting individuals' fairness-related utility. If this fairness-related utility equals the actual sanction, their government maximizes the same welfare function as ours.[12] Finally, if it is costly for the government to raise taxes due to the distortions they create, it has strong incentives to raise money from offenders.

Individuals are risk neutral and maximize expected income. They have initial wealth $W > 0$. Think of W as the value of the privately owned house or assets with a long maturity.[13] The agents hold on to their wealth over both periods unless the government interferes with sanctions. Any additional income they receive in both periods, be it through legal or illegal activities, is consumed immediately. Accordingly, all the government can confiscate is W. If the fine exceeds the agent's wealth, she goes bankrupt and the government seizes the remaining assets. This implies that the fines s_1 and s_2 have to satisfy the "budget constraint" $s_1 + s_2 \leq W$.[14]

To save on notation we set the interest rate zero. An agent can choose between the following strategies:

1. She can choose not to commit the act at all. Call this strategy (0,0) which gives rise to utility $U(0,0) = W$. This is the strategy we want to implement.

2. She can commit the act in period 1 and not in period 2. We call this strategy (1,0); here we have $U(1,0) = W + b - ps_1$. The act generates benefit b; with probability p the agent is apprehended and pays the sanction s_1.

[11] Dittmann (2001) uses a similar approach.

[12] In Rubinstein (1979) the government's payoffs also depend on whether or not it punishes the offender. Unlike the other papers, Rubinstein's government is worse off if it punishes the offender, independently of whether the act was committed intentionally or not.

[13] The policy of the Swiss competition authority is not to use fines that drive the wrongdoer into bankruptcy. Accordingly, in this case W is the amount the firm can just afford to pay.

[14] This assumption distinguishes our approach from Polinsky and Shavell (1998) who work with a maximum per period sanction s_m. Accordingly, they may set $s_1 = s_2 = s_m$, which is typically the optimal enforcement scheme. In their framework s_m is like a per period income which cannot be transferred into the next period. Burnovski and Safra (1994) use the same budget constraint as we do.

3. The agent can commit the crime in period 2 but not in period 1. Call this strategy (0,1) generating utility $U(0,1) = W + b - ps_1$. With strategy (0,1) the agent has the same utility as with strategy (1,0) because the government observes only one offense.

4. Furthermore, the agent can commit the act in both periods which we denote by $(1,1)$ and $U(1,1) = W + b - ps_1 + b - p((1-p)s_1 + ps_2)$. The second crime is detected with probability p. With probability p the agent has a criminal record in the second period and thus is fined s_2; with probability $(1-p)$ she has no record and pays s_1 if apprehended.

5. Finally, the agent can choose two history dependent strategies.[15]

   - First, she commits the act in period 1. If she is not apprehended, she also commits the act in period 2; however, if she is apprehended in period 1, she does not commit the act in period 2. Call this strategy (1,(1|no record;0|otherwise)) with $U(1, (1|\text{no record}; 0|\text{otherwise})) = W + b - ps_1 + (1-p)(b - ps_1)$. Since the agent stops her criminal activities if she is apprehended once, she is never sanctioned with s_2.
   - Second, she commits the act in period 1. If she is not apprehended, she does not commit the act in period 2; yet, if she is apprehended in period 1, she commits the act in period 2. Call this strategy (1,(0|no record;1|otherwise)) with $U(1, (0|\text{no record}; 1|\text{otherwise})) = W + b - ps_1 + p(b - ps_2)$. It turns out that this strategy defines the agents' binding incentive constraint for the optimal sanctions.

Before we start deriving optimal sanctions, we have to ensure that the government indeed wants complete deterrence. This is achieved by assuming $1 < 2h - W$. If the government completely deters, there is neither harm nor revenue and the maximum possible expenditure for deterrence is 1 (recall that we take the probability of apprehension as a measure for enforcement cost). If the government does not deter at all, enforcement costs are zero, the government incurs the harm twice, and the maximal revenue it can obtain is the agents' wealth W. Therefore, if the harm is large enough, the rent-seeking government wants complete deterrence.

[15] These history dependent strategies distinguish our paper from Burnovski and Safra (1994) where individuals decide ex ante simply on the number of crimes.

Let us now derive the sanctions that give the agents proper incentives not to engage in the activity in both periods. We first derive the cost-minimizing sanction scheme that achieves perfect deterrence ignoring the government's commitment problem. This is the standard approach found in the literature. The literature does not further discuss why the authorities are able to commit. One argument in favor of commitment is that the government plays repeated games with potential wrongdoers and, therefore, wants to build up a reputation of being tough. Moreover, laws may be written such that the judge has little to no discretion as to the size of the penalty.[16]

The analysis of the commitment scenario follows Emons (2003a). We will then consider the government's incentives to actually implement this penalty scheme without commitment in section IV. This section is based on Emons (2004).

III. Optimal Fines if the Government can commit

Agents are assumed to have enough wealth so that deterrence is always possible, i.e., $2b < W$. The agent does not follow strategy (1,0), if $U(1,0) \leq U(0,0)$, she does not follow strategy (0,1), if $U(0,1) \leq U(0,0)$, etc. Straightforward calculations confirm that the agent does not engage in strategies (1,0), (0,1), and (1,(1|no record;0|otherwise)), if

$$s_1 \geq b/p; \tag{1}$$

she does not pick strategy $(1,1)$, if

$$s_2 \geq (2b/p^2) - s_1((2/p) - 1); \tag{2}$$

and she does not pick strategy (1,(0|no record;1|otherwise)), if

$$s_2 \geq (b(1+p)/p^2) - s_1/p. \tag{3}$$

insert **Figures 1 and 2** around here

[16]The Three "Strikes and You're Out" Law, California Penal Code Section 667 (b), is an attempt to do just this. In a similar spirit, New York's Rockefeller Drug Laws require that judges impose a mandatory minimum sentence of 15 years to life upon conviction for selling more than two ounces or possessing more than four ounces of a narcotic substance.

Accordingly, with all sanction schemes (s_1, s_2) to the right of the bold line in Figures 1 and 2, the agent has proper incentives and commits no crime. For example, the equal sanction scheme $s_1 = s_2 = b/p$ induces no crimes.

Let us now minimize the enforcement costs, as given by p, while providing incentives not to commit any crime.[17] We will minimize p taking the incentive constraint (3) into account. Then we show that the optimal $\hat{p}$ also satisfies the incentive constraints (1) and (2).

Obviously, Becker's (1968) maximum fine result applies here, meaning that in order to minimize p the government will use the agent's entire wealth for sanctions.[18] Therefore, plugging the budget constraint $s_1 + s_2 = W$ into (3) and differentiating the equality yields

$$dp/ds_1 = (p - p^2)/(b - s_1 - 2p(W - s_1)) < 0$$

for $b < s_1 \leq W$. Consequently,

$$\hat{s}_1 = W,\ \hat{s}_2 = 0,\ \text{and}\ \hat{p} = b/(W - b).$$

Since $b/p < 2b/p(1-p) < b(1+p)/p\ \forall p \in (0,1)$, the incentive constraints (1) and (2) are also satisfied. Accordingly, we have:

PROPOSITION 1: *With commitment to sanctions the optimal sanction scheme is given by* $s_1^* = W$, $s_2^* = 0$ *and* $p^* = b/(W - b)$.

We thus find that the cost minimizing sanction scheme sets $\hat{s}_1 = W$ and $\hat{s}_2 = 0$. First time offenders are punished with the maximal possible sanction while second time offenders are not punished at all. The sanction s_1 is so high that it not only deters first-time offenses but also second-time offenses even though they come for free.

The intuition for this result follows immediately from the incentive constraint (3). The agent pays the sanction s_1 with probability p and the sanction s_2 only with probability p^2. Stated differently: The agent is charged s_2 with probability p if and only if she has paid already s_1. Since paying the fine s_1 is more likely than paying s_2, shifting resources from s_2 to s_1 increases deterrence for given p. Consequently, p is minimized by putting all the scarce resources into s_1.

[17] Since in our setup the harm of the crime exceeds its acceptable benefit, maximizing social welfare boils down to minimizing enforcement costs.

[18] If $s_1 + s_2 < W$, sanctions can be raised and p lowered so as to keep deterrence constant.

It is somewhat surprising that the strategy (1,(0|no record;1|other-wise)) and not the strategy (1,(1|no record;0|otherwise)) defines the binding incentive constraint in the optimal penalty structure. Given that the optimal penalties are decreasing, an agent who was not apprehended for the first crime has a strong incentive not to commit the act a second time: if she is apprehended she pays the high sanction s_1. If the agent was, however, apprehended for the first crime, the second crime comes for free. The sanction s_1 has to be high enough so that she doesn't commit the first crime in the first place.

IV. Optimal Fines if the Government cannot commit

Let us now analyze under which conditions the sanction scheme $\hat{s}_1 = W$, $\hat{s}_2 = 0$ together with the minimal enforcement probability $\hat{p} = b/(W - b)$ is subgame perfect. This means: Does the government really want to implement these sanctions once the agent has committed the first offense? To do so, consider the subgame starting when the agent has been apprehended for the first crime.

If the government sticks to the penalty scheme $\hat{s}_1 = W$, $\hat{s}_2 = 0$, the agent will commit the second offense for sure because it comes for free. The government's payoff then amounts to $W - 2h - \hat{p}$. It incurs the harm twice and seizes the agent's entire wealth with s_1.

The alternative is to lower s_1 and at the same time increase s_2 such that the agent does not commit the second act. Clearly, the rent-seeking government will set $s_2 = b/\hat{p}$, the minimal sanction achieving deterrence. The government goes for the minimal sanction guaranteeing deterrence because, by its very nature, the government will not get this money; that way, s_1 is as large as possible. Using $\hat{p} = b/(W - b)$, we find $s_2 = W - b$ and $s_1 = b$. If the government follows this strategy, its payoffs are $-h + b - \hat{p}$. It incurs the harm from the first crime, collects $s_1 = b$ and there is no more crime.

Comparing the two payoffs, obviously the government prefers to stick to $\hat{s}_1 = W$, $\hat{s}_2 = 0$ if $W - h \geq b$. The government gets the entire wealth less the harm by sticking to the optimal incentive scheme whereas it gets $s_1 = b$ if it chooses to deter the second offense. Therefore, we may conclude that $s_1^* = W$, $s_2^* = 0$ is subgame perfect if the agent's benefit b and/or the harm are not too large. See Figure 1.

Let us now determine the optimal subgame perfect sanction scheme together with the probability of detection p if $W - h < b$. Consider again the government deciding on sanctions after the agent has been apprehended for the first act. If the government wants to deter the second act, it will set $s_2 = b/p$. It chooses the minimal sanction ensuring deterrence because it will not get the money. This way it can collect the maximum amount $s_1 = W - b/p$ for the first act from the agent.

By contrast, the government may wish to induce the second crime. It does so by setting $s_2 < b/p$. The government gets s_2 only with probability p; it collects s_1 for sure because we are in the node where the agent has just been apprehended for the first crime. Since $W = s_1 + s_2$, the revenue maximizing government sets $s_1 = W$ and $s_2 = 0$ if it wants to induce the second crime. This generates a payoff of $W - 2h - p$ for the government.

The government prefers the strategy of inducing the second crime to optimally deterring the second crime if $W - 2h - p > W - h - b/p - p \Leftrightarrow b/p > h$. Deterring the second crime has the cost of the foregone revenue $s_2 = b/p$; inducing the second crime has the cost of the harm h.

The left-hand side of the inequality $b/p > h$ is a decreasing function of p. Accordingly, if it is not satisfied for the minimal probability of apprehension inducing no crimes $\hat{p} = b/(W - b)$, it does not hold for any p deterring both crimes. Therefore, if $b/\hat{p} < h \Leftrightarrow W - h < b$, the government prefers to deter the second crime and does so optimally by setting $s_1^* = s_2^* = W/2$ and $p^* = 2b/W$.[19] See Figure 2.

A low probability of apprehension increases b/p, the sanction which is necessary to deter the second crime. Deterring a second crime thus becomes unattractive. By choosing a low p, the government commits not to raise s_2 to a level which deters. This result is similar in spirit to Boadway and Keen (1998) where the government commits to a lax enforcement in order not to raise tax rates after savings decisions have been made.

We summarize the preceding observations with the following proposition.

PROPOSITION 2: *Without commitment not to lower sanctions if* $W - h \geq b$, *the optimal subgame perfect sanction scheme is given by* $s_1^* = W$, $s_2^* = 0$ *and* $p^* = b/(W - b)$; *if* $W - h < b$, *the optimal subgame perfect sanction scheme is given by* $s_1^* = s_2^* = W/2$ *and* $p^* = 2b/W$.

The government is better off in the first case where it uses the decreasing sanction scheme. In both cases crime is completely deterred. With the de-

[19]If an old agent is apprehended for the first crime, the government would like to raise s_1 to W. Nevertheless, it cannot do so because it committed to maximum sanctions.

creasing sanction scheme the probability of detection and hence enforcement cost is lower than in the second case of constant sanctions.

V. Conclusions

The purpose of this paper is to help understand the difficulties the law and economics literature has in explaining escalating penalties. If a higher sanction for the second crime means a lower sanction for the first crime and vice versa, cost minimizing deterrence in the case of commitment is decreasing, rather than increasing, in the number of offenses.[20] Since an agent can only be a repeat offender if she has been a first-time offender, there is no second offense if we completely deter the first one. This effect seems to be quite robust and should also apply to non-monetary sanctions. Accordingly, if one wants to give a rationale for the widely prevailing escalating penalties, one has to go beyond the simple deterrence model à la Becker.

Section IV is an attempt to do just this. There we analyze subgame perfect sanction schemes, i.e., sanctions which the government indeed wants to implement should a crime have occurred. We consider the problem of time consistency important because judges tend to have a lot of discretion as to the size of the penalty. They anticipate that a high penalty now may reduce the potential for future sanctions. Rational criminals will anticipate this and thus not be deterred by empty threats. A rent-seeking government will stick to the optimal decreasing sanction scheme if it gets more money by allowing the second crime and cashing in the agent's entire wealth with the first sanction than by deterring the second crime. In the opposite case the government prefers to deter the second crime. It does so with equal sanctions for both crimes.

Accordingly, the constraint of time consistency bites. If the government can commit to penalties, decreasing sanctions are always optimal; if the government cannot commit to penalties, decreasing sanctions may still be optimal but so may be equal sanctions. We have not explained escalating sanctions based on offense history which are embedded in many penal codes and sentencing guidelines. Explaining escalating sanctions seems to be not

[20]Similar results hold in repeated moral hazard situations. For example, if agents decide strategically over time on how carefully to treat a consumer durable, optimal incentive compatible warranties tend to increase, rather than decrease, with the product's age. See Emons (1989).

an easy task for the law enforcement literature; see our discussion in the Introduction.[21] Nevertheless, in our set-up the commitment issue ruled out decreasing sanction schemes in some cases. It thus seems that the problem of time consistency is a fruitful track for future research to understand escalating sanction schemes. It is, for example, of interest how the optimal sanction scheme looks like when fines may depend on the number of crimes *and* on the age of the wrongdoer.

[21] The explanations of Rubinstein (1979) and Polinsky and Rubinfeld (1991) seem to be the most reasonable ones. Both models are based on adverse selection. Repeat offenses are a strong signal that the wrongdoer is a hard-core criminal whom the government wants to punish heavily; the government does not want to punish accidental crimes. By contrast, we look at the pure moral hazard problem where the government wants to deter crimes. In this class of models the results of the literature are less convincing and subgame perfection has the potential to add new insights.

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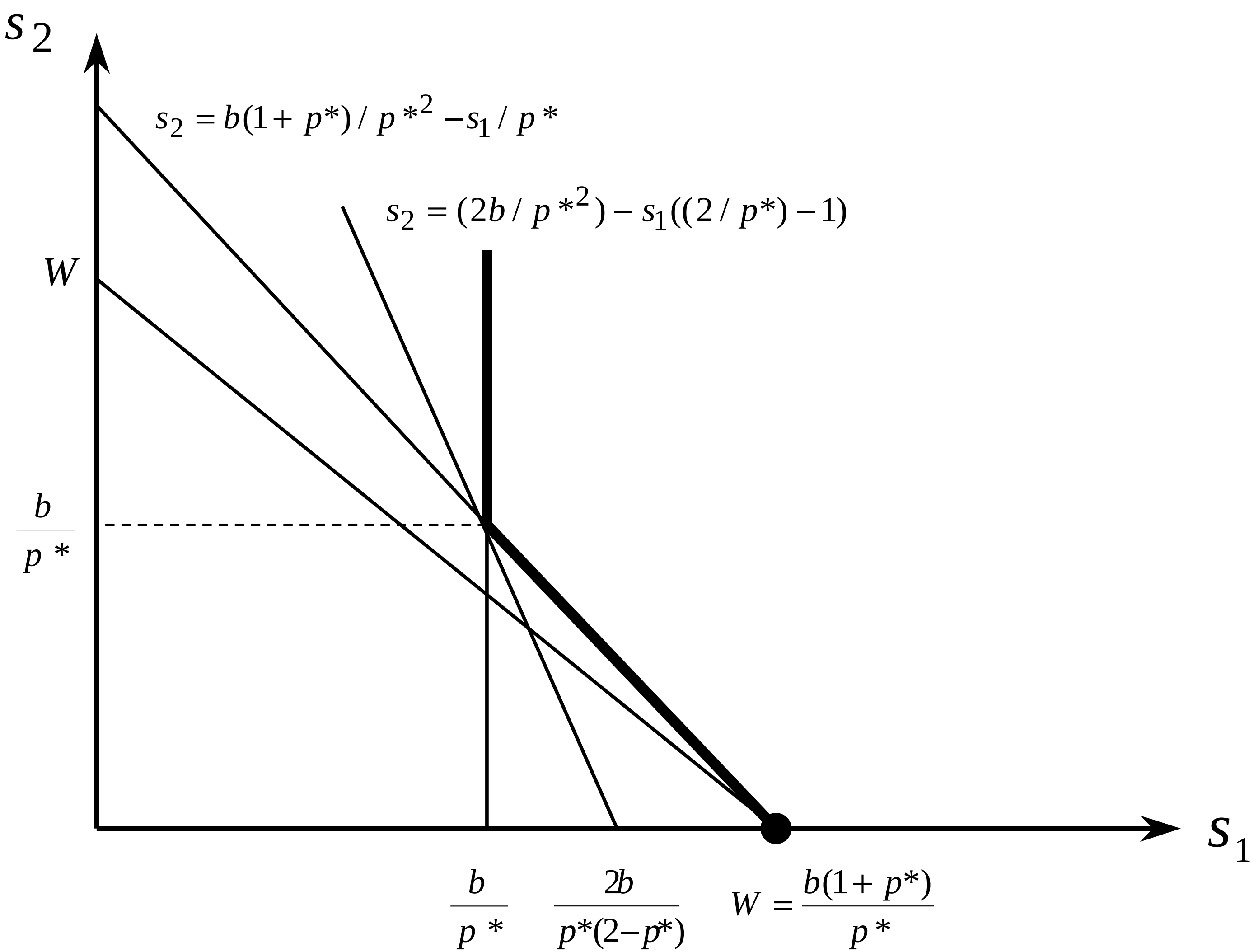

Figure 1: The Set of Incentive Compatible Sanctions and the Optimal Sanction Scheme $(s_1^*, s_2^*) = (W, 0)$ and $p^* = b/(W-b)$

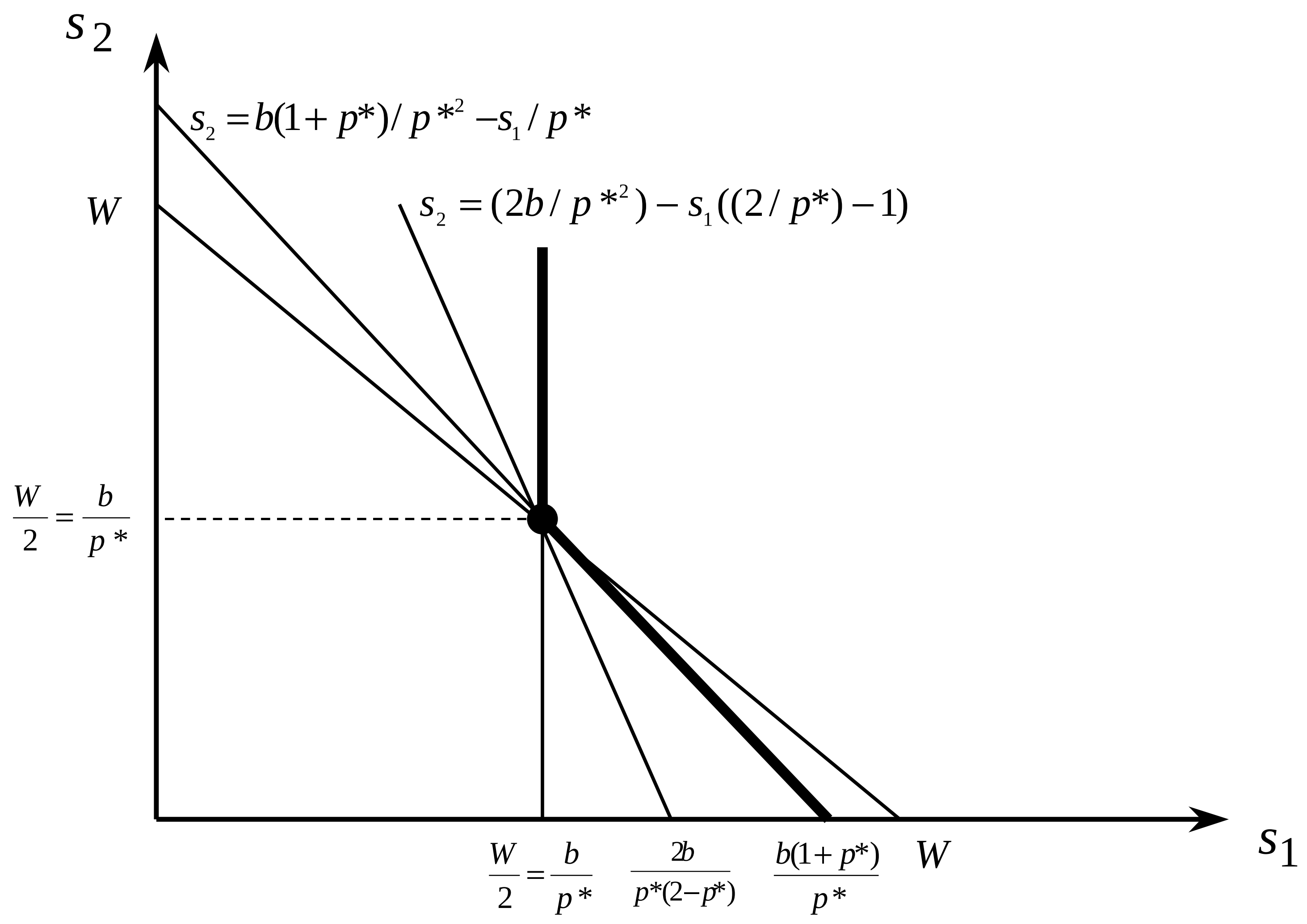

Figure 2: The Set of Incentive Compatible Sanctions and the Optimal Sanction Scheme $(s_1^*, s_2^*) = (W/2, W/2)$ and $p^* = 2b/W$