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**Marginal Deterrence, Escalating Penalties  
and Enforcement Inconsistency**

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## **Marginal Deterrence, Escalating Penalties and Enforcement Inconsistency**

**Marcello Basili\* and Antonio Nicita\*\***

### **Abstract**

The Law and Economics literature on public law enforcement has generally treated separately the issue of marginal deterrence from that of punishing repeated offenders through escalating penalties. We extend the model provided by Emons (2003) to show how pursuing both policies may generate an inconsistent enforcement design.

KEYWORDS: Marginal Deterrence, Recidivism, Escalating Penalties, Incapacitation.

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## 1. Introduction

The Law and Economics literature on law enforcement (Garoupa, 1997; Polinsky and Shavell, 2000, 2007) has outlined two crucial issues: the risk of general under-deterrence when ‘marginal deterrence’ is pursued; and the risk of over-deterrence, when recidivism, i.e. the emergence of repeated offences, is sanctioned by escalating penalties.

While the existing literature has generally treated separately the above two issues, this paper focuses on the joint effects generated by a policy maker who pursues both (i) marginal deterrence and (ii) specific deterrence towards repeated offenders. Thus here we take as given an enforcement policy which aims at jointly implement both. Our assumption is far to be unrealistic as public law enforcement in most developed countries generally is explicitly built on principles which recall marginal and specific deterrence against repeated offenders.

We show how using a unique policy tool – monetary sanctions - to jointly implement marginal deterrence and specific deterrence against recidivists generates perverse effects: given the system of marginal deterrence, escalating penalties for repeated offenders may negatively affect marginal deterrence and vice-versa, given a system of penalties against recidivism, marginal deterrence might be weakened by escalating penalties.

Our conclusion may provide a new explanation for the adoption of non-monetary sanctions as complementary device to monetary sanctions (Garoupa, 1997; Shavell, 2003).

The paper proceeds as follows. First, we briefly recall the trade-off between general and marginal deterrence (in section 2) and the trade-off between over-deterrence and optimal penalties when recidivism is backed by escalating penalties (in section 3). Then, in section 4 we outline, through a simple example, the emergence of a pervasive inconsistency between marginal deterrence and escalating penalties against recidivism. In section 5, we formulate a simple model based on Emons (2003) which outlines our main argument, while in section 6 we show how a hybrid system of monetary and non-monetary sanction, like the Demerit Point System adopted in traffic law enforcement,

may solve the above inconsistency shifting agents' action towards the pre-defined social preferred configuration. Section 7 concludes.

## 2. The trade-off between General and Marginal Deterrence

Let us assume, from the perspective of a rational agent, that he would obtain a gain from committing a harmful act, given that the benefit he gains are larger than the expected sanction, given the probability  $p$  of being caught (Becker, 1968). As a consequence an individual “will commit the act if and only if his expected utility from doing so, taking into account his gain and the chance of being caught and sanctioned, exceeds his utility if he does not commit the act” (Polinsky and Shavell, 2000). Now, if the expected utility of violating legal rules raises with the social harm generated, it might be optimal for the society to introduce a scheme of sanctions increasing with the social harm associated to the single violation unless in all those case in which it is not possible to increase the probability of detection according to the level of harm produced. This principle is known as *general deterrence* or *general enforcement*.

Moreover, the proportionality between sanctions and social harm acts as a sort of ‘signal’ towards offenders on the distribution of social preferences about harmful actions. This is exactly the principle of *marginal deterrence*.<sup>1</sup> The notion of ‘marginal deterrence’ is derived from the generally defined principle, expressed by Beccaria (1767, p. 32), on the proportionality between criminal sanctions and harmful actions. Polinsky and Shavell (2000) described the economic rationale behind this principle in the following way: “in many circumstances, an individual may consider which of several harmful acts to commit, for example, whether to release only a small amount of a pollutant into a river or a large amount, or whether only to kidnap a person or also to kill him. In such contexts, the threat of sanctions plays a role in addition to the usual one of deterring individuals from committing harmful acts: for individuals who are not deterred, expected sanctions influence which harmful acts individuals choose to

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<sup>1</sup> Shavell (1992); Louis Wilde (1992); Mookherjee and Png (1994).

commit. Notably, such individuals will have a reason to commit less harmful rather than more harmful acts if expected sanctions rise with harm”.<sup>2</sup>

Since there must be an upper bound on the effectiveness of sanctions that could be imposed on criminals<sup>3</sup>, the scheme of sanctions will start at the upper bound with the most severe sanction and then it will decrease accordingly to the level of social harm generated.

Let us define as  $S$  the fine designed as a sanction and as  $D$  the social harm associate to a given harmful action  $A$ . For any given probability of detection  $p$ , the optimal fine schedule, accordingly to a wide scholarly literature<sup>4</sup>, is given by:

$$S^*(A)=D/p$$

under the constrain that  $D/p$  does not exceed the maximal possible fine  $Dm$ . When the enforcement is general (i.e. when it is not possible to have a specific detection – and thus a specific probability of being caught – for any harmful act), “sanctions should rise with the severity of harm up to a maximum”<sup>5</sup>.

It is easy to see how a trade-off between marginal deterrence and general deterrence may occur in this case: some less harmful actions may actually be not sanctioned at all, and if they are optimally deterred then it means a risk of under-deterrence for more serious harmful actions. As Polinsky and Shavell (2000) pointed out “fostering marginal deterrence may conflict with achieve deterrence generally: for the schedule of sanctions to rise steeply enough to accomplish marginal deterrence, sanctions for less harmful acts may have to be so low that individuals are not deterred from committing some harmful act”.

In order to illustrate that with an example, let us consider table 1. Let us assume for instance that agents’ utility  $U$  raises with harmful actions  $a1, a2, a3, a4, a5$ , so that  $U(a1)<U(a2)<U(a3)<U(a4)<U(a5)$  while the social harm  $D$  imposed on society raises with harmful actions  $D(a1)<D(a2)<D(a3)<D(a4)<D(a5)$ . Accordingly, let us assume that society decides to impose a scheme of monetary sanctions  $S$ , such  $S(a1)<S(a2)<S(a3)<S(a4)<S(a5)$ . The highest monetary sanction is thus imposed on the most harmful action  $a5$ .

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<sup>2</sup> Polinsky and Shavell (2000) also refer to Bentham (1789, p. 171).

<sup>3</sup> It could be an economic upper bound equal to the total amount of income available to the criminal or to a ‘physical’ constraint of non monetary sanctions, or again determined by fairness reasons.

<sup>4</sup> Becker (1968); Polinsky and Shavell (1979, 1994, 2000); Garoupa (1997).

<sup>5</sup> Polinsky and Shavell (2000).

**Table 1:**  
**marginal deterrence design**

| ACTIONS   | SANCTIONS |
|-----------|-----------|
| <i>a5</i> | 100€      |
| <i>a4</i> | 80€       |
| <i>a3</i> | 60€       |
| <i>a2</i> | 40€       |
| <i>a1</i> | 20€       |
| <i>a0</i> | 0€        |

The trade-off between marginal and general deterrence (Shavell, 2003) could be envisaged in the circumstance that an harmful action like *a0* receives a sanction equal to zero. If we assume that the social harm generated by *a0* is greater than zero than it means that the application of the principle of marginal deterrence implies under-deterrence for *a0*. On the other hand, if we try to correct the value of the sanctions for lower harmful actions, we may provide the wrong signal at the upper levels, treating as substantially ‘substitutable’ – from the point of view of society – two actions which produce two different levels of harm. Marginal deterrence “is naturally accomplished if the expected sanction equals harm for all levels of harm” (Polinsky and Shavell, 2000). Given the system of sanctions in table 1, the actual distribution of harmful actions will depend on detection policy, on agents’ utility and on income constraints.

Standard approach on marginal deterrence, and the correspondent design of optimal sanctions under that framework, are based on two assumptions:

- (i) the choice of harmful actions is limited to one period;
- (ii) offenders only choose one act at any time.

In section 4 we try to remove the above assumptions outlining possible interdependencies between marginal deterrence and repeated violations over time. Before doing that let us consider first, in the next section, the trade-off, envisaged in the law and economics literature, between optimal sanctions and escalating penalties against recidivism.

### 3. Optimal sanctions vs. escalating penalties against recidivism

Beside marginal deterrence, another principle which generally shapes the design of public law enforcement is that of punishing repeated offenders more severely than non-repeat offenders. As Dana (2001) outlined “the general principle of escalating penalties based on offence history is so widely accepted that it strikes most people as simple common sense. The principle is embedded in formal federal, state, government officials at all level of government”.

When expected sanction of repeating a given harmful act increases with the number of repeated offences the problem raised is that of punishing not only the harmful act but also a behavior, often denoted as recidivism. As Garoupa (1997), Dana (2001), and Shavell (2003) outlined, the L&E literature treated escalating penalties based on history offence as a puzzle. If a scheme of sanction is built in period 1 such that fines are based on the optimal deterrence principle, then any sanction will reflect the optimal balance between the net social costs and the net social benefit associated with a given harmful act. That means, in turn, that any increase in the level of sanction will induce over-deterrence, i.e. a social waste: “the illegal discharge of waste into the ocean causes as much social harm when the discharging company is a first-time offender as when it has a long history of such offences. Thus standard economic theory would seem to suggest that, contrary to actual practice, penalties should not escalate based on offence history” (Dana, 2001).

The intuition behind escalating penalties for repeated offenders is that repetition reveals the information regarding the ‘type’ of offender. The information revealed by recidivist behaviour somehow allows the implementation of specific rather than generic enforcement: those who are not deterred in the first instance will continue to violate in the future, thus repeated offences should be deterred by increasing fines (Polinsky and Shavell, 1998)<sup>6</sup>. For instance, in table 2, we show a possible design of sanctions, for action  $a_4$ , increasing with the number of repeated offences.

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<sup>6</sup> However, if fines are optimally designed with respect to social harm one should ask whether it would be efficient to raise the sanction for repeated offences.

**Table 2:**  
**Specific deterrence design against repeated offenders**

| ACTIONS   | SANCTIONS |      |      |
|-----------|-----------|------|------|
|           | 1°        | 2°   | 3°   |
| <i>a5</i> | 100€      | 120€ | 140€ |
| <i>a4</i> | 80€       | 100€ | 120€ |
| <i>a3</i> | 60€       | 80€  | 100€ |
| <i>a2</i> | 40€       | 60€  | 80€  |
| <i>a1</i> | 20€       | 40€  | 60€  |
| <i>a0</i> | 0€        | 20€  | 40€  |

However, as some scholars have outlined (Garoupa, 1997; Polinsky and Shavell, 2000), increasing fines for repeated offences could produce over-deterrence if the total amount of sanctions exceeds the social harm of action *a4*. If the sanction designed for the first offence *a4* is optimal in the first instance (i.e. it is maximal), then increasing the fines for repeated offences will always be sub-optimal. Thus, as Polinsky and Shavell (2007) outlined, for a sanction imposed to repeated offenders to be optimal, one should require that the sanction for the first offence is not maximal in the first instance. However, if this design of sanctions reveals to be optimal ex-post towards repeated offenders, it generates under-deterrence for non-repeat, i.e. it interferes with the principle of marginal deterrence according to which sanctions have been designed at any period for non-repeat offenders.

The debate over the economic rationale against recidivism and on adopting escalating penalties to reach that aim is very rich and open.<sup>7</sup> Some authors contend that if there is any economic rationale for recidivism affecting the design of sanctions, it should be found in imposing decreasing rather than increasing penalties for repeated offenders, since the probability of being detected and caught depends on having been caught in the past. Some other scholars also reach similar conclusion by recurring to behavioural assumptions<sup>8</sup>. It is not our purpose here to understand the economic rationale about having escalating penalties, rather we intend to analyze what happens when a public law enforcement is aimed at both implementing marginal deterrence and punishing recidivism. To this end we need only to emphasize the ‘immediate’ trade-off between optimal deterrence and escalating penalties for repeated offences.

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<sup>7</sup> See also Polinsky and Rubinfeld (1991).

<sup>8</sup> See Dana (2001) for a survey.

#### 4. The vicious circle between marginal and specific deterrence towards repeated offenders

Let us turn back to table 2. Let us assume first that for  $a4$ , a sanction of 80€ is not maximal so as to have under-deterrence if the harm is committed ones, but optimal deterrence if it is committed twice. What happens however in table 2, after agents have committed  $a4$ ? They have two possible choice: to repeat  $a4$  paying a fine of 100€ or to jump to  $a5$  paying a fine of 100€. Since we have assumed that agents' utility increases with harm<sup>9</sup>, then the rational choice of those agents will that of jumping from  $a4$  to  $a5$ . As we can see from table 2 and from figure 1, this result may apply for every level of harm so that at any period it is as if the level of more harmful acts increases over time, showing a high interdependence between marginal deterrence (let us define it 'marginal deterrence') and escalating penalties (let us define it 'specific deterrence towards repeated offenders').

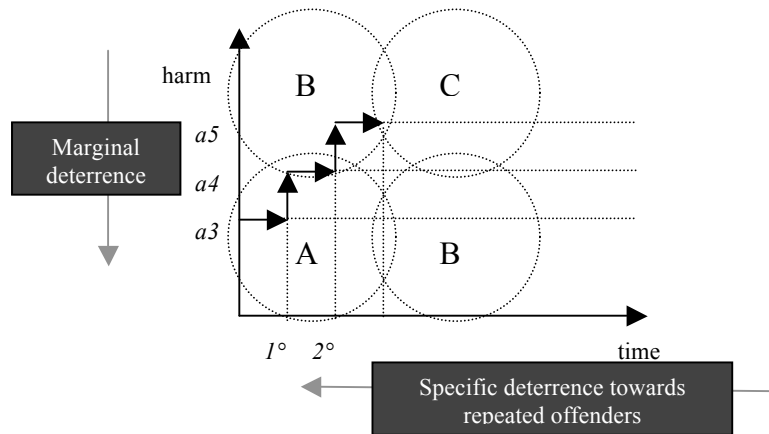


Figure 1

Thus we have here a first result: *specific deterrence towards repeated offenders* may reduce *marginal deterrence* at any period. A trade-off then occurs between punishing

<sup>9</sup> The assumption here is that utility increases both with the harm and with the repetition of the same harm. If sanctions are not increasing with repetition, we assume that if agents select a given action in  $t=1$  she will repeat the same choice in  $t>1$ . However we assume that if sanctions increase with repetition, than for any given amount of sanction at any time, a higher harm implies a higher utility.

for repeated offences or obtaining marginal deterrence at any period. The choices of committing less harmful acts (i.e. the impact of marginal deterrence) will thus depend on the rate of increase in fines for repeated offences: a slower rate may reduce the specific deterrence towards repeated offenders effect, while a higher rate may decrease the marginal deterrence effect.

In the example above, in order to avoid such a trade-off we have two possibilities: (a) increasing the fine of  $a5$  say up to 130€; (b) decreasing the fine of  $a4$ , say from 80€ to 60€. However, in the first case, the increase in fines for  $a5$  may imply over-deterrence if the initial fine was intended to be maximal; in the second case, the decrease of fines for  $a4$ , may eliminate any marginal deterrence between  $a4$  and  $a3$ . Thus, increasing fines for more harmful offences may imply over-deterrence, while reducing fines for less harmful acts implies under-deterrence. For any given system of sanctions there seems to be a trade-off between having optimal marginal deterrence and optimal specific deterrence against repeated offenders.

It is possible to show that the same result applies to the case in which several actions are committed in the same period. When two actions are committed in the same period there might be the case for which agents are indifferent between choosing  $a1$  and  $a2$  in the first instance or  $a3$ . If  $a3$  is associated to a higher utility with respect to  $a1$  and  $a2$ , agents will jump to  $a3$  generating a higher harm. Also in this case specific deterrence against recidivists may conflict with marginal deterrence (in the second period rather than repeating  $a1$  and  $a2$  agents may decide to jump to  $a5$ ).<sup>10</sup>

Of course the above result is simply based on the numbers we have inserted in table 2. It is possible to build a different table that does not present any overlap. However, the question raised here is that any system of sanction should provide optimal deterrence both from a marginal and from a horizontal perspective, whereas marginal deterrence binds specific deterrence towards repeated offenders and vice-versa.

Let us assume that the preferences ordering of the PM – reflecting those of society – is such that low harmful act repeated few times (depicted in figure 1 as the area  $A$ , where the trade-off between marginal and specific deterrence towards repeated offenders is actually solved or dramatically decreased) are preferred to configurations characterized

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<sup>10</sup> It is also possible to imagine that recidivism could be sanctioned in scope. To this end a record of past violations, even if different in type, is sufficient to increase at any time the fine. However, also in this case the trade/off outlined above applies.

by non-repeated very harmful acts and repeated low harmful acts (depicted in figure 1 as the area  $B$ ), which in turn are preferred to situation characterized by repeated high harmful acts (depicted in figure 1 as the area  $C$ ):  $A p B p C$ .

If a PM aims at obtaining a desired level of general deterrence through a design of sanction aimed at implementing (i) marginal deterrence and (ii) escalating penalties for repeated offences, without coordinating the two policy tools, the final effect could be that of increasing under-deterrence at an time, towards the area  $C$ .

## 5. A simple model

In this section we provide a simple framework derived from Emons (2003) in order to illustrate trade-offs and vicious circles between marginal and specific deterrence towards repeated offenders when a policy maker aims at implementing marginal deterrence and at increasing penalties against recidivists.

As in Emons (2003) we consider a set of individuals who live for two periods  $t=1, t=2$ . In each period the agents can select an action (for simplicity an illegal activity  $x$  or  $y$ ), receiving a benefit from this behavior. Let us assume that in each period  $t_i$  (with  $i=1, 2$ ), the agent has three possible choices:

- (i) status quo, i.e. the agents does not engage in any illegal activity
- (ii) select  $x_i$ ,  $i=1, 2$  (time period) receiving a benefit  $b>0$  in each period and causing in each period a monetary harm  $h>0$  to society, with  $h>b$ ;
- (iii) select  $y_i$ ,  $i=1, 2$  (time period) receiving a benefit  $c>0$  in each period and causing in each period a monetary harm  $k>0$  to society, with  $k>c$  and with  $c>b$ .

Let us define the utility function of the agent in each period as  $U_t=U(0, x_i, y_i)$ , thus agent's total utility from the two periods is given by  $U=[U(0, x_1, y_1)+ U(0, x_2, y_2)]$ . However since  $h>b$  and  $k>c$ , both the illegal actions available to the agent in each period are not socially desirable and individuals are to be deterred from incurring in

illegal activities at any period. In order to deter illegal actions the government chooses sanctions and probability of detections for each action in each period.

In particular the government may consider to both impose sanctions increasing in social harm in any period and to punish recidivism. i.e. to increase penalties according to previous records<sup>11</sup> of past offences.

Thus taking these policy aims as given, when an action is observed, the government cannot evaluate if an agent is in the first or second period of her life. The government only observes whether the crime is the first or the second one committed by an agent. Accordingly, the government uses fines  $s1$ ,  $s2$  respectively for  $x1$  and  $x2$ , and  $z1$  and  $z2$  for  $y1$  and  $y2$ , where  $s1$  and  $z1$  apply to first-time and  $s2$  and  $z2$  to second-time observed offences.

Moreover, the government chooses a probability of apprehension: *general enforcement* (the probability of apprehension  $p$  is the same for each action in each period) and *specific enforcement* (the probability is  $p$  for  $x_i$ ,  $i=1, 2$  and  $q$  for  $y_i$ ,  $i=1, 2$ ). We focus here only on general enforcement (thus  $p$  is applied to  $x_i$ ,  $i=1, 2$  and to  $y_i$ ). The following tables summarizes the framework proposed.

| Actions | Private benefit | Social harm | Sanction if observed once | Sanction of observed twice |
|---------|-----------------|-------------|---------------------------|----------------------------|
| $y$     | $c$             | $k$         | $z1$                      | $z2$                       |
| $x$     | $b$             | $h$         | $x1$                      | $x2$                       |

We further assume that individuals are risk neutral and maximize expected income. They have initial wealth<sup>12</sup>  $W > 0$ . If the fine exceeds the agent's wealth, she goes bankrupt and the government seizes the remaining assets. As a consequence, monetary fines  $s_i$ ,  $i=1, 2$  and  $z_i$ ,  $i=1, 2$  have to satisfy (assuming the interest rate being zero) the following "budget constraint":  $\sum_i [s_i + z_i] = W$  with  $i=1, 2$ .

In each period the agent maximizes its expected utility subject to the budget constraint which depends on the sanctions enforced by the government under a given probability of detection.

<sup>11</sup> We are here assuming that recidivism is defined as the behavior of an agent having record of previous offences of the same type  $x$  or  $y$ . An agent which commits  $x$  at  $t=1$  and then  $y$  at  $t=2$  is not considered a recidivist. That is assuming that from the legal perspective  $x$  and  $y$  are not correlated.

<sup>12</sup> Following Emons (2003), we assume that " $W$  is the value of the privately owned house or assets with a long maturity. The agents hold on to their wealth over both periods unless 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  $W$ ".

Under the general enforcement assumption the probability of detection  $p$  is independent of the specific action selected and of the specific time horizon considered.

The agent may choose one of the following strategies:

- i. She can choose not to commit the act at all. We call this strategy  $(0, 0)$  which gives rise to utility  $U(0, 0) = W$ .
- ii. She can choose to commit the act in period 1 and not in period 2 (and vice-versa). Call this strategy  $(1, 0)$  or  $(0,1)$ ; here we have  $U = W + b - ps1$  or  $U = W + c - pz1$  so the choice of the agent depends on  $U = \text{Max} [W + b - ps1; W + c - pz1]$
- iii. Moreover, the agent can commit the act in both periods<sup>13</sup> which we denote by  $(1, 1)$  and  $U(1, 1) = \text{Max}[W + b - ps1; W + c - pz1] + \text{Max}[b - p((1 - p)s1 + ps2); c - p((1 - p)s1 + pz1); c - p((1 - p)z1 + pz2)]$ .

We are interested in understanding what are the minimum levels of sanction which inhibit agents from engaging in illegal activities, under the four assumptions made above, thus focusing on case (ii) and on case (iii).

### **Case (ii)**

In case (ii), the minimum amount of sanctions which generates deterrence for each harmful act is given by:

$$(1) \quad s_1^* \geq \frac{b}{p} \quad \text{and} \quad z_1^* \geq \frac{c}{p}$$

The expression in (1) identifies the minimum value of sanctions in each period and for each harmful act which generates total dissipation of agents' wealth in case of apprehension, so that agents maintain the incentives not to engage in any illegal activity at any time. Since by assumption  $c > b$ , then  $z_1^* \geq s_1^*$ .

### **Proposition 1 – Choice of harmful act in $(1,0)$ or $(0,1)$**

When sanctions are below their minimal deterrence level, the choice of repeating the offence will depend on the proportion between the associated levels of sanction, given the private benefits by moving from  $x$  to  $y$ . The lower is the distance between the two

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<sup>13</sup> We assume that when repeating an illegal action the agent is repeating at least the same harmful act or a more serious.

sanctions  $s_1$  and  $z_1$ , the higher is the probability that agents will ‘jump’ to the more serious harm.

*Proof*

When the actual design of sanction are such that  $z_1^* \geq z_1$  and/or  $s_1^* \geq s_1$  the choice of the harmful act  $(x, y)$  depends on the value  $(z_1 - s_1)$ . Agents will select  $y$  when  $(z_1 - s_1) < \frac{(c - b)}{p}$  and  $x$  otherwise.

## **Proposition 2**

By decreasing the value of the sanction for the less harmful act, the government obtains under-deterrence for  $x$ , but deterrence against  $y$ .

*Proof*

When  $z_1 \leq z_1^*$ ,  $s_1 \leq s_1^*$  and  $z_1 \equiv s_1$ , in order to increase the expected value of  $x$ , and consequently inducing agents to choose  $x$  instead of  $y$ , it is sufficient for the public law enforcer to design a level of  $s_1 \leq s_1^o < s_1^*$  such that  $(z_1 - s_1^o) > \frac{(c - b)}{p}$ .

Proposition 2 is another way of clarifying the role played by marginal deterrence in reducing agents’ incentives to choose more serious harms in each period.

## **Case (iii)**

In case (iii), the agent is inhibited in engaging in any harmful act if the conditions of proposition 3 hold.

## **Proposition 3**

In order to deter agents it is sufficient to fix in each period a fine equal to the expected benefits.

*Proof*

The agents is induced not to engage in any harmful activity in each period if the following conditions hold:

$$(1) \quad s_1^* \geq \frac{b}{p} \quad \text{and} \quad z_1^* \geq \frac{c}{p}, \quad \text{with} \quad z_1^* \geq s_1^*.$$

or

$$(2) \quad s_2^* = s_1^* \quad \text{and} \quad z_2^* = z_1^*$$

Now, since the value of sanctions in proposition 3 implies general deterrence, it is interesting to investigate the cases in which sanctions in period 1 are lower than the deterrence level so as to imply some under-deterrence in period 1 and in period 2 for repeated offenders (as long as the sanction in period 1 does not ‘dissipate’ all the budget constraint  $W$ ). We focus here on a specific rationale for having in the first period under-deterrence at least for action  $x$ , i.e. on the policy maker implementing a *marginal deterrence policy* between action  $x$  and action  $y$ .

Since economic agents maximize utility, a sanction  $s_1^\circ < s_1^*$  will induce them to choose  $x$  instead of  $y$  as long as  $(z_1^* - s_1^\circ) > \frac{(c-b)}{p}$ . When this happens, however, agents also have a residual income to be ‘spent’ in period 2 for engaging in illegal activities. Proposition 4 outlines this case.

#### **Proposition 4**

In order to deter action  $x$  in period 2 it is necessary to increase penalties of an amount such as to compensate the under-deterrence effect of the first period.

*Proof*

When  $s_1^\circ < s_1^*$  and  $z_1^* \geq \frac{c}{p}$ , with  $z_1^* \geq s_1^*$  and  $s_1^* \geq \frac{b}{p}$ , and agents select  $x$  in  $t=1$ ,

the choice of  $x$  in  $t=2$  depends on the following conditions:

$$s_2 \leq s_1^* + \frac{b}{p} - s_1^\circ \quad \text{or} \quad s_2 \leq 2s_1^* - s_1^\circ$$

Proposition 4 shows how increasing penalties of an amount such as to compensate the under-deterrence effect of the first period. This outcome provides a rationale for having under-deterrence in the first period coupled with increasing penalties against repeated offences.

What happens in the above framework when both action  $x$  and  $y$  are under-deterred in the first period? Proposition 5 adds an argument to proposition 4, showing the conditions under which economic agents ‘jump’ in period 2 from  $x$  to  $y$ .

### Proposition 5

When the sanction against repeated offenders for the same type of offence is high enough, repeated offenders may maintain the incentive to jump to the more serious offence in period 2.

#### *Proof*

Let us assume that  $s_1^\circ < s_1^*$  and  $z_1^\circ < z_1^*$ , with  $z_1^\circ \geq s_1^\circ$  and  $(z_1^\circ - s_1^\circ) > \frac{(c-b)}{p}$  so

that economic agents choose  $x$  in the first period. If  $s_2 < z_1^\circ < s_2 + \frac{c-b}{p^2}$ , for every

value of  $s_2$  such that  $s_2 \leq s_1^* + \frac{b}{p} - s_1^\circ$ , then agents will always choose to ‘jump’ towards  $y$  in period 2.

Proposition 5 outlines an important consequence of our argument. There is a range of value for increased penalties such that:

- (i) repeated offenders are not deterred;
- and moreover

- (ii) marginal under-deterrence scheme between  $x$  and  $y$ , designed in period 1, does not work for repeated offenders in period 2.

The main consequence of our argument is thus that when a policy maker aims at pursuing both marginal deterrence and specific deterrence against repeated offenders, there could emerge an inconsistent enforcement design: the higher is marginal deterrence in the first period (low  $s_1$ ), the higher should be the penalty for increased offences of the same type in period 2 (high  $s_2$ ); however the lower is the gap between  $c$  and  $b$  the wider is the range of value  $(s_2 < z_1^\circ < s_2 + \frac{c-b}{p^2})$  for which the sanction for the more serious harm approaches the critical threshold which induces repeated offenders to jump towards the more serious harmful action ( $y$ ).

On the other side, in order to reduce this effect it is necessary to fix the fines in the first period equal to the maximum fine  $s^*$  and  $z^*$ .

However, if from one side that means assuring no repetition of the illegal act, from the other it implies renouncing to obtain any marginal deterrence: since any action is punished with a sanction high enough to cover the entire budget constraint of the economic agent, each agent is induced to select the most harmful act in period 1.

## 6. Concluding remarks

This paper analyzes the case of a public enforcer who pursues the aim of maximizing marginal and specific deterrence towards repeated offenders. What happens to marginal deterrence policy if we take into account the possibility that actual sanctions affect incentives to repeat violations in the future and/or the possibility that agents may select more than one harmful action? We try to answer these questions by extending traditional marginal deterrence approach in two respects: time and scope. While there is a literature on optimal sanctions against recidivism and repeated offenders, those results

are generally obtained in a framework that neglects reciprocal interdependence between recidivism and marginal deterrence.

We show that a trade-off between marginal deterrence and escalating points against recidivism occurs when a unique policy instrument based on monetary sanction is applied: increased sanctions for repeated offenders may decrease marginal deterrence at any time and vice-versa. In particular, we addressed an explanation for the meaning and the extent of penalty point systems as a solution of potential trade-offs between marginal deterrence (which we may denote as marginal deterrence in scope) and escalating penalties against recidivism (which we may denote as marginal deterrence in time).

One way of obtaining specific deterrence towards repeated offenders is to sanction recidivism by introducing a non-monetary sanction ( $x$ ) for repeated offences, aimed at generating some ‘incapacitation’ on offenders’ ability to repeat the violation. This conclusion would reverse some of the main results reached by standard literature (Polinsky and Shavell, 2000) on the optimal use of monetary and non-monetary sanctions. While standard approaches suggest that non-monetary sanctions should be implemented only once fines are exhausted and for more harmful acts, here we suggest that non-monetary sanctions should be activated also for less harmful, but repeated, together with monetary sanctions. This is left to further research.

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