This work is distributed as a Discussion Paper by the

STANFORD INSTITUTE FOR ECONOMIC POLICY RESEARCH

Deterrence and the Optimality of Rewarding Prisoners

for Good Behavior

By

A. Mitchell Polinsky

Stanford Institute for Economic Policy Research
Stanford University
Stanford, CA 94305
(650) 725-1874

Deterrence and the Optimality of Rewarding
Prisoners for Good Behavior

A. Mitchell Polinsky*

Abstract: In this article I examine the social desirability of rewarding prisoners for good behavior, either by reducing their sentences (granting "time off"), converting part of their sentences to a period of parole, or providing them with privileges in prison. Rewarding good behavior reduces the state's cost of operating prisons. But rewarding good behavior also tends to lower the deterrence of crime because such rewards diminish the disutility of imprisonment. I demonstrate that, despite this countervailing consideration, it is always socially desirable to reward good behavior with either time off or parole. In essence, this is because the reward can be chosen so that it just offsets the burden borne by prisoners to meet the standard of good behavior — resulting in good behavior essentially without a reduction in deterrence. While employing privileges to reward good behavior might be preferable to no reward, the use of privileges is inferior to time off and parole.

Author email address: polinsky@stanford.edu

────────────────────────

1. Introduction

Controlling the misbehavior of prisoners is a significant challenge in any penal system. Such misbehavior includes using and marketing drugs, assaulting prison employees and other prisoners, and disrupting prison discipline during meals and other activities.[1]

Controlling prisoners is expensive, requiring a significant number of guards and costly physical features of prisons, such as solitary confinement cells. In 2008, approximately $75 billion was spent in the United States by federal, state, and local governments on corrections, mostly on incarceration.[2] The cost of controlling badly-behaved prisoners is much greater than the cost of controlling well-behaved ones — commonly fifty percent more, and sometimes two or three times more. In Ohio, for example, the average prisoner costs $63 a day to house, whereas a prisoner in a maximum-security prison costs $101 a day, and a prisoner in a "supermax" prison costs $149 a day.[3]

The cost of operating prisons could be reduced if prisoners would behave better, and the prison system provides incentives for prisoners to do so. In particular, good behavior is often

---

[1] Although systematic data on prisoner misbehavior is not widely available, consider the following. In a study of 3,000 inmates admitted by the California Department of Corrections in early 1994, 29 percent were subsequently reported for "some kind of serious violation" of prison rules. See Berk and de Leeuw (1999, p. 1047). In a one-year period beginning on March 1, 1997, 25.9 percent of male inmates in the custody of the Federal Bureau of Prisons engaged in some form of misconduct, including 5.1 percent in "violent misconduct," 5.4 percent in "drug misconduct," 6.6 percent in "property misconduct," and 4.8 percent in "security misconduct." See Gaes et al. (2002, pp. 364-366). Based on a survey of inmates in Federal correctional facilities published in 1991, 15.78 percent of inmates in maximum security prisons were found guilty of prison rule violations for possession of drugs, 9.53 percent for possession of alcohol, 7.66 percent for possession of a weapon, 9.38 percent for assaulting an inmate, and 5.94 percent for assaulting a correction officer. See Chen and Shapiro (2007, p. 8, Table 1).

[2] See Schmitt, Warner, and Gupta (2010, p. 10). In 2010, spending by states alone on corrections totaled $48.5 billion. See Kyckelhahn (2012, p. 1).

[3] See Mears (2006, p. 26). A supermax prison is a super-maximum-security prison. The $63 figure is the average for prisoners other than supermax prisoners. Mears also observes (pp. 20, 33) that in Maryland "it costs three times as much to house prisoners in the [supermax prison] as it does to house place them in a non-supermax facility" and that in Texas it costs 45 percent more to house prisoners in "ad seg" units (administrative segregation units similar in many respects to supermax prisons) than in the general population units. On the costs imposed by the bad behavior of prisoners, see generally Lovell and Jemelka (1996).

rewarded by (i) a sentence reduction, frequently referred to as "time off;" (ii) the partial conversion of a sentence to a period of parole, during which the offender is subject to restrictions and supervision outside of prison; or (iii) the provision of in-prison privileges, such as additional television-watching time or greater access to recreational facilities.[4]

In this article I examine the social desirability of rewarding prisoners for good behavior through these three methods. In doing so, I also consider individuals' incentives to commit crimes initially, which will increase, everything else equal, if the disutility of the sanction is reduced as a result of the granting of time off, parole, or privileges. It might appear, therefore, that whether it is desirable to reward prisoners for good behavior depends on whether the resulting savings in prison costs exceed the increased cost of crime.[5]

The main result of my analysis, however, is that it is *always* desirable to reward prisoners for good behavior through either positive time off or a positive period of parole. Why is rewarding prisoners for good behavior through time off or parole unequivocally better than not providing such rewards, given that the rewards lessen the disutility of the sanction and thus tend to increase crime?

Consider the time off policy. To obtain a reward of time off, prisoners must meet some minimum standard of behavior. Satisfying this standard imposes a burden on prisoners — such as from not using drugs or not engaging in violent behavior — and thereby increases the

---

[4] Conversely, prisoners can be punished for bad behavior by having their terms extended or losing privileges. See generally Clear, Cole, and Reisig (2013, Chs. 13 and 15) and Seiter (2013, Chs. 6 and 10). For some evidence that prisoners behave better in response to the prospect of parole, see Kuziemko (2013); there is no reason to believe that they would not also be responsive to time off and privileges.

[5] Although my focus in this article is on the desirability of rewards when imprisonment is used to deter crime, I also briefly consider the desirability of rewards when imprisonment is used to prevent crime through incapacitation. See comment (b) in section 7 below.

disutility per unit time in prison.[6] The state can choose the amount of time off so as to just offset

this increased burden, leaving the total disutility of the sanction (the higher disutility per year for

fewer years) unaffected. In other words, a time off policy can be designed so as to maintain

deterrence.[7] Thus, a time off policy can provide two benefits to the state without increasing

crime: the cost per unit time of imprisoning individuals declines because they behave better; and

the length of time they serve declines, further lowering prison costs.

The rationale for parole is similar to that described for time off, though the explanation is

more complicated because individuals suffer some disutility while on parole and the state incurs

some costs to supervise parolees. Whether parole is superior to time off depends on the

magnitudes of these variables. Specifically, which type of reward is preferred depends on the

cost of generating a specified level of deterrence by imprisonment compared to the cost of

generating that level of deterrence by parole (the latter requiring a longer period of supervision,

but one that is cheaper per unit time).

While a privileges policy can be superior to a policy of not rewarding good behavior, the

use of privileges is inferior to both time off and parole. Privileges are dominated by the other

policies not only because there is no reduction in the time served in prison under a privileges

policy, but also because the provision of privileges generally is costly.

Although the preceding discussion implicitly assumed that the burden to behave well was

the same for all prisoners, the desirability of rewarding prisoners for good behavior holds

---

[6] My analysis could instead be formulated in terms of discouraging bad behavior in prison rather than encouraging good behavior; then the benefits foregone from not acting badly would correspond to the burden incurred from behaving well. See also note 10 below.

[7] For example, suppose that the disutility of prison per year is 1,000 utils if a prisoner uses drugs and 1,200 utils if he does not use drugs. If his original sentence is six years, he would bear 6,000 utils of disutility if he uses drugs. If he is offered time off of one year if he does not use drugs, he will also bear 6,000 (= 5 x 1,200) utils of

regardless of heterogeneity among prisoners in this regard. The argument is more complicated because, if individuals differ in the burden to behave well, deterrence cannot be maintained for all of them when they are offered a reward for good behavior. In particular, individuals for whom the burden of behaving well is low — below some threshold — will be deterred less because the benefit to them of the reward will exceed the disutility incurred to obtain it. Nonetheless, for reasons that reflect the intuition already provided, rewarding prisoners for good behavior remains socially beneficial if the magnitude of the reward is chosen optimally.

The main result of this article — that it is desirable to reward prisoners for good behavior through either time off or parole — has not been noted previously. There are two articles that study parole as a mechanism to induce prisoners to behave well, but neither observes this result.[8]

Section 2 presents the basic model employed in the analysis when prisoners are not rewarded for good behavior. Sections 3, 4, and 5 derive the main results regarding the policies of time off, parole, and privileges, respectively. Section 6 reconsiders the analysis when individuals vary in the effort required to behave well. Section 7 concludes with some observations about different types of prisoner misconduct and the incapacitation rationale for imprisonment.

---

disutility. Obviously, he could be offered a slight amount more than a year of time off to make him affirmatively prefer to not use drugs, with a negligible effect on deterrence.

[8] See Miceli (1994) and Garoupa (1996). Their assumptions also differ significantly from mine. Notably, Miceli does not include in social welfare the disutility of individuals from being imprisoned or from their effort to behave well; and Garoupa assumes that the total effort required to comply with prison rules and regulations is

2. No Reward for Good Behavior

In this section I describe the model used throughout the analysis, initially assuming that there is no form of reward for good behavior.

Risk-neutral individuals contemplate committing a harmful act in order to obtain a benefit that varies among them. They are assumed to have no wealth, so that the only sanction that can be imposed on them is a prison sentence. Prisoners can choose how much effort to expend to behave well in prison. The more effort that they take to behave well, the lower the state's cost of operating prisons.

Let

h = harm caused if the offense is committed; $h > 0$;

b = benefit to an individual from committing the offense; $b \geq 0$;

$v(b)$ = density of b among individuals; $v(b) > 0$ for all $b \geq 0$;

p = probability of catching an offender; $p > 0$;

s = prison sentence for the offense; $s > 0$;

e = effort by a prisoner per unit time to behave well; $e \geq 0$;

$\bar{e}$ = maximum possible effort; and

$c(e)$ = cost to the state per unit time to imprison an individual; $c'(e) < 0$; $c''(e) \geq 0$.

Sentences are measured in units of time corresponding to one dollar of disutility.[9] I assume that there is an upper bound on prisoner effort to behave well in order to obtain determinate solutions under the time off and parole policies (see Propositions 2 and 4 below).[10]

---

independent of the length of the sentence and that good behavior in prison does not affect the public cost of imprisonment per unit time. See also note 23 below and accompanying text.

[9] Implicit in this construction is that the disutility of a sentence is proportional to its length.

Because my focus in this article is on whether it is desirable to reward prisoners for good behavior, I assume for simplicity that the probability p and the sentence s are exogenous. As will be seen, none of my results depends on this assumption.

In the absence of any policy to reward good behavior, prisoners will not expend effort to behave well, so the disutility of the prison sentence is s and the state's cost per unit time to imprison an individual is $c(0)$. An individual will commit an offense if his benefit b exceeds the expected disutility of the sentence ps.

Social welfare equals the benefits that individuals obtain from committing harmful acts, less the harms they cause, less the disutility that they bear from sanctions, and less the state's cost of imposing sanctions. Hence, social welfare in the absence of any reward for good behavior is

$$\int_{ps}^{\infty}[b - h - ps(1 + c(0))]v(b)db. \tag{1}$$

The cost of achieving the probability p is ignored because it is a fixed cost.

3. Time Off for Good Behavior

Now suppose that the state rewards prisoners for good behavior by reducing their sentences. Although in general the state could choose a schedule of sentence reductions as a function of the effort expended by prisoners, I consider a simple policy in which the state selects a single sentence reduction that will be granted if prisoners meet some minimum effort level. It

---

[10] The need to make this assumption could be avoided if the model were reformulated in terms of prisoners obtaining a benefit from acting badly (for example, extorting cigarettes from another prisoner in return for providing protection from prison gang members) rather than incurring an effort cost from behaving well. There would then be a natural lower bound on bad behavior — none. Aside from the fact that this alternative formulation would be somewhat more complicated notationally, it seems like a less natural framework within which to discuss the common practice of rewarding prisoners for good behavior.

will be clear that there would be no advantage in the model from employing the more general formulation.[11]

Let

r_T = sentence reduction under a time off policy; $0 \leq r_T < s$; and

$\hat{e}_T$ = minimum effort level to obtain the sentence reduction r_T;

$$0 \leq \hat{e}_T \leq \bar{e}.$$

Consider the decision of a prisoner whether to meet the state's minimum effort level. Clearly, he will either take zero effort or will just meet the standard $\hat{e}_T$. In the former case his disutility from the sentence is s, while in the latter case his disutility is $(s - r_T)(1 + \hat{e}_T)$. Thus, he will take effort level $\hat{e}_T$ if and only if

$$(s - r_T)(1 + \hat{e}_T) \leq s. \tag{2}$$

If r_T and $\hat{e}_T$ are such that (2) does not hold, the time off policy would be equivalent to not providing a reward for good behavior; accordingly, I will assume that r_T and $\hat{e}_T$ are such that (2) holds. Then, an individual will commit an offense if his benefit b exceeds the expected disutility from the time he would serve in prison, taking into account that he will expend effort to behave well, $p(s - r_T)(1 + \hat{e}_T)$.

Social welfare now is

$$\int_{p(s - r_T)(1 + \hat{e}_T)}^{\infty} [b - h - p(s - r_T)(1 + \hat{e}_T + c(\hat{e}_T))]v(b)db. \tag{3}$$

---

[11] See note 12 below.

The state's problem is to choose the sentence reduction r_T and the minimum effort level $\hat{e}_T$ so as to maximize social welfare, subject to the constraint (2). The socially optimal value of a policy instrument will be indicated with an asterisk.

Proposition 1. A policy of providing time off for good behavior is superior to a policy of not rewarding good behavior.

Proof: For any $\hat{e}_T \in (0, \bar{e}]$, pick $r_T > 0$ such that (2) holds with equality. Clearly such an r_T exists since the left-hand side of (2) is continuous in r_T and approaches 0 as r_T approaches s and approaches $s(1 + \hat{e}_T) > s$ as r_T approaches 0. Then social welfare under the time off policy (3) differs from social welfare under the no reward policy (1) only with respect to the cost to the state of imprisoning individuals. Such costs are lower under the time off policy, $(s - r_T)c(\hat{e}_T) < sc(0)$, because $r_T > 0$ and $c(\hat{e}_T) < c(0)$. ∎

Comments: (a) As explained in the introduction, awarding time off for good behavior does not necessarily lessen deterrence, because prisoners suffer greater disutility per unit time due to the effort required to obtain time off. Since the sentence served can be shortened just enough so that the total disutility of the sentence is unaffected, deterrence can be maintained. But the cost to the state of imprisoning individuals declines under a time off policy, both because of the shorter sentences served and because imprisonment costs per unit time are lower due to the better behavior of prisoners.

(b) Note that this logic applies regardless of the effort required to obtain the time off. Even if it were essentially costless for prisoners to behave well, in which case the time off reward would be miniscule, the time off policy would be desirable due to lower imprisonment costs per unit time.

Proposition 2. The optimal time off policy requires prisoners to take maximal effort to behave well, that is, $\hat{e}_T^* = \bar{e}$.

Proof: Suppose otherwise, that some $\hat{e}_T < \bar{e}$ and some r_T satisfying (2) are optimal. Then raise $\hat{e}_T$ to $\bar{e}$ and raise r_T to r_T' such that $(s - r_T')(1 + \bar{e}) = (s - r_T)(1 + \hat{e}_T)$, which also will satisfy (2). It is clear from (3) that social welfare with $(\bar{e}, r_T')$ exceeds that with $(\hat{e}_T, r_T)$ because the cost to the state of imprisoning individuals is lower; specifically, $(s - r_T')c(\bar{e}) < (s - r_T)c(\hat{e}_T))$ because $r_T' > r_T$ and $c(\bar{e}) < c(\hat{e}_T)$. ∎

Comment: Obviously, a time off policy that induces prisoners to take maximal effort to behave well will result in the lowest cost to the state per unit time to imprison individuals. Moreover, to achieve this outcome requires rewarding prisoners with more time off than would be necessary if the required effort level were lower. Thus, relative to a time off policy that does not require maximal effort, prison costs decline both because the cost per unit time is lower and because the length of time served is shorter.[12]

4. Parole for Good Behavior

Parole can be described as a sentence reduction during which an individual is monitored and subject to restrictions outside of prison. I assume that the disutility per unit time suffered by an individual on parole is less than that which he would suffer in prison, and that the cost to the state of supervising an individual on parole is less than the cost of keeping him in prison.

Let

---

[12] Social welfare could not be raised by employing a more general time off policy involving a schedule of sentence reductions as a function of the effort expended by prisoners. Such a policy could not result in lower prison costs per unit time or a greater sentence reduction, holding deterrence constant.

r_P = sentence reduction under a parole policy; $0 \le r_P < s$;[13]

$\hat{e}_P$ = minimum effort level to obtain the sentence reduction r_P;

$\quad 0 \le \hat{e}_P \le \bar{e}$;

$\quad \theta$ = disutility to an individual per unit time on parole; $0 < \theta < 1$; and

$\quad k$ = cost to the state per unit time to supervise an individual on parole; $0 < k < c(\bar{e})$.

Note that I assume that it is less costly to the state to supervise an individual on parole than to keep him in prison even if he were to take maximum effort to behave well in prison — an assumption that is both intuitively plausible and that has empirical support.[14]

If a prisoner takes no effort to behave well his disutility from the sentence is s, while if he takes effort $\hat{e}_P$ and obtains parole for period r_P his disutility is $(s - r_P)(1 + \hat{e}_P) + r_P\theta$. Thus, he will take effort level $\hat{e}_P$ if and only if

$$(s - r_P)(1 + \hat{e}_P) + r_P\theta \le s. \tag{4}$$

Assuming (4) holds, an individual will commit an offense if his benefit b exceeds the sum of his expected disutility from the prison time and the parole period, $p[(s - r_P)(1 + \hat{e}_P) + r_P\theta]$.

Social welfare then is

$$\int_{p[(s - r_P)(1 + \hat{e}_P) + r_P\theta]}^{\infty} [b - h - p[(s - r_P)(1 + \hat{e}_P + c(\hat{e}_P)) + r_P(\theta + k)]]v(b)db. \tag{5}$$

The state's problem is to choose r_P and $\hat{e}_P$ so as to maximize (5), subject to the constraint (4).

---

[13] If r_P equaled or exceeded s, the parole policy would in effect be converted into a probation policy, under which the offender would not serve any prison time, just time outside of prison under supervision. I do not consider probation in this article because it does not bear on the topic of interest here, inducing prisoners to behave well.

[14] See, for example, North Carolina Criminal Justice Analysis Center (2007, p. 12) ("For the same cost of housing one minimum security offender in prison, for a year, four offenders could be placed under intensive supervision [outside of prison] . . ."). See also note 18 below and accompanying text.

Proposition 3. A policy of providing parole for good behavior is superior to a policy of not rewarding good behavior.

Proof: For any $\hat{e}_P \, \varepsilon \, (0, \bar{e}]$, pick $r_P > 0$ such that (4) holds with equality. Such an r_P exists since the left-hand side of (4) is continuous in r_P and approaches $s\theta < s$ as r_P approaches s and approaches $s(1 + \hat{e}_P) > s$ as r_P approaches 0. Then social welfare under the parole policy (5) differs from social welfare under the no reward policy (1) only with respect to the cost to the state of sanctioning individuals. Such costs are lower under the parole policy, $(s - r_P)c(\hat{e}_P) + r_P k < sc(0)$, because $k < c(\bar{e}) \le c(\hat{e}_P) < c(0)$. ∎

Comment: The explanation of the superiority of parole to no reward for good behavior parallels that with respect to time off for good behavior. In essence, the parole period can be selected so that, given the effort level required of prisoners to obtain parole, there is no sacrifice of deterrence compared to the no reward policy. The cost to the state of sanctioning individuals declines because the cost of parole per unit time is less than the cost of prison per unit time, and the cost of prison per unit time declines due to the effort taken by prisoners to behave well.

Proposition 4. The optimal parole policy requires prisoners to take maximal effort to behave well, that is, $\hat{e}_P^* = \bar{e}$.

Proof: Suppose otherwise, that some $\hat{e}_P < \bar{e}$ and some r_P satisfying (4) are optimal. Then raise $\hat{e}_P$ to $\bar{e}$ and raise r_P to $r_P{}'$ such that $(s - r_P{}')(1 + \bar{e}) + r_P{}'\theta = (s - r_P)(1 + \hat{e}_P) + r_P\theta$, which also will satisfy (4). That such an $r_P{}'$ exists follows from the continuity of $(s - r_P)(1 + \bar{e}) + r_P\theta$ in r_P, that $(s - r_P)(1 + \bar{e}) + r_P\theta$ approaches $s\theta$ as r_P approaches s, and that $(s - r_P)(1 + \hat{e}_P) + r_P\theta > (s - r_P)\theta + r_P\theta = s\theta$. It is clear from (5) that social welfare with $(\bar{e}, r_P{}')$ exceeds that with $(\hat{e}_P, r_P)$

because the cost to the state of sanctioning individuals is lower: $(s - r_P')c(\bar{e}) + r_P'k < (s - r_P)c(\bar{e})$

$+ r_Pk < (s - r_P)c(\hat{e}_P) + r_Pk.$ ∎

Comment. The intuition behind this result is similar to that used to explain the analogous

result for the time off policy. The more effort that is required under the parole policy, the more

sanctioning costs decline, both because the cost to the state per unit time to imprison individuals

declines, and because more of the sentence is served on parole, which is less expensive than

prison.

Proposition 5. Either the optimal time off policy or the optimal parole policy could be

preferred. Specifically, if the cost per unit of deterrence achieved through imprisonment, $c(\bar{e})/(1$

$+ \bar{e})$, is less than the cost per unit of deterrence achieved through parole, k/θ, time off is superior,

and vice versa.

Proof: Let $(\bar{e}, r_T)$ and $(\bar{e}, r_P)$ be the optimal time off and parole policies that achieve the

same level of deterrence $\delta \, \varepsilon \, (s\theta, s].$[15]   Hence,

$$(s - r_T)(1 + \bar{e}) = (s - r_P)(1 + \bar{e}) + r_P\theta = \delta. \tag{6}$$

It is clear from the discussion in the proofs of Propositions 1 and 3 that such an r_T and an r_P exist.

Then the only welfare difference between time off and parole is the public cost of sanctions. The

sanctioning costs per prisoner under time off are $(s - r_T)c(\bar{e})$, while the comparable costs under

parole are $(s - r_P)c(\bar{e}) + r_Pk$. Thus, time off will be preferred if

$$(s - r_T)c(\bar{e}) < (s - r_P)c(\bar{e}) + r_Pk. \tag{7}$$

Solving for r_T from the first equality in (6) and substituting into (7) yields

$$c(\bar{e})/(1 + \bar{e}) < k/\theta, \tag{8}$$

the condition stated in the proposition. Obviously, if the inequality in (8) is reversed, parole will be superior. ∎

Comments: (a) Since both time off and parole can be used to induce prisoners to take any specified level of effort to behave well without sacrificing deterrence relative to the no reward policy, the key question is which can do so more cheaply. It might appear that time off should be favored because the state does not bear any costs during the time off period, whereas it does during the parole period. However, this observation does not recognize that time off imposes costs on the state in the following sense. Because an individual on parole still suffers some disutility, θ, per unit time, whereas an individual on time off does not, the time off period r_T must be shorter than the parole period r_P — that is, more prison time must be served under the time off policy — if both policies achieve the same level of deterrence.[16] Thus, the "cost" of the time off policy, relative to the parole policy, is that it imposes greater imprisonment costs on the state. These costs will be lower than the comparable parole costs if the cost per unit of deterrence achieved through imprisonment is lower than the cost per unit of deterrence achieved through parole, and vice versa.

(b) I am not aware of any data on the burden of parole on offenders relative to that of imprisonment, but there is some evidence concerning the relative costs to the state of parole and imprisonment. One source observes that the cost of parole is one-quarter that of imprisonment.[17]

---

[15] That this common level of deterrence must exceed $s\theta$ follows from the fact that the level of deterrence under the parole policy is bounded from below by $s\theta$. That this common level of deterrence cannot exceed s follows from (2) and (4).

[16] This result can be seen from (6). If $r_T = r_P$ in (6), the right-hand side of the first equality would exceed the left-hand side. It is clear, therefore, that for the first equality in (6) to hold, it must be that $r_T < r_P$.

[17] See note 14 above.

Another indicates that parole costs approximately one-tenth of imprisonment.[18] Thus, if the burden of imprisonment to offenders is more than ten times that of parole, then this evidence suggests that time off would be preferred to parole. Conversely, if the disutility from imprisonment is less than four times that of parole, it suggests that parole would be superior.

5. Privileges for Good Behavior

Another way prisoners can be rewarded for good behavior is by being given extra privileges inside prison, as was noted in the introduction. For example, a well-behaved prisoner could be granted greater access to athletic facilities, the library, or the commissary; more family visitation or phone privileges; more TV time, and so forth. Such privileges may be relatively inexpensive to provide, though there generally will be some cost, if only greater supervision by prison guards.

Let

a = expenditures by the state to provide privileges per unit time per prisoner; $a \geq 0$;

$\lambda(a)$ = fractional reduction in disutility from imprisonment given a; $\lambda(0) = 0$; $\lambda'(a) > 0$;

$\lambda''(a) \leq 0$; $\lambda(a) \leq \bar{\lambda}$, where $0 < \bar{\lambda} < 1$; and

$\hat{e}_I$ = minimum effort level to obtain the privileges a; $0 \leq \hat{e}_I \leq \bar{e}$.[19]

I assume that privileges reduce the disutility of imprisonment, but not the disutility of effort to behave well.[20]

---

[18] See Schmitt, Warner, and Gupta (2010, p. 11, Notes to Table 4).

[19] Because the subscript "P" has already been used to signify parole, I use the subscript "I" here to represent "in-house" rewards.

[20] For example, I am assuming that the loss of utility from refraining from the use of drugs is not affected by being given more time in the prison library.

If a prisoner takes effort $\hat{e}_I$ to behave well, the disutility he will suffer in prison is $s(1 + \hat{e}_I - \lambda(a))$. Hence, he will take effort $\hat{e}_I$ if and only if

$$s(1 + \hat{e}_I - \lambda(a)) \leq s \tag{9}$$

or, equivalently, if and only if

$$\hat{e}_I \leq \lambda(a). \tag{10}$$

In other words, a prisoner will take effort to behave well if the disutility of the effort does not exceed the utility of the privileges. Assuming (9) holds, an individual will commit an offense if his benefit b exceeds $ps(1 + \hat{e}_I - \lambda(a))$.

Social welfare under the privileges policy is

$$\int_{ps(1 + \hat{e}_I - \lambda(a))}^{\infty} [b - h - ps(1 + \hat{e}_I - \lambda(a) + c(\hat{e}_I) + a)]v(b)db. \tag{11}$$

The state's problem is to choose a and $\hat{e}_I$ so as to maximize (11), subject to the constraint (10).

Proposition 6. A policy of providing privileges for good behavior can be superior to a policy of not rewarding good behavior.

Proof: Under the privileges policy, set $\hat{e}_I = \lambda(a)$, in which case social welfare will be

$$\int_{ps}^{\infty} [b - h - ps(1 + c(\lambda(a)) + a)]v(b)db. \tag{12}$$

Then social welfare under the privileges policy (12) will exceed that under the no reward policy (1) if there exists an $a > 0$ such that

$$c(\lambda(a)) + a < c(0). \tag{13}$$

Let $\lambda(a) = \lambda a$, where λ is a positive constant, and let $c(e) = c/(\gamma + e)$, where c and γ are positive constants. Given these functional forms (which satisfy the assumptions about their first and second derivatives), (13) can be expressed as

$$\gamma a(\gamma + \lambda a) < \lambda ca. \tag{14}$$

Since $\lambda(a) \leq \bar{\lambda}$, a cannot exceed $\bar{\lambda}/\lambda$. For any $a \in (0, \bar{\lambda}/\lambda]$, (13) clearly will be satisfied if γ is sufficiently small. ∎

Comment: Spending on privileges will be socially desirable if the reduction in prison costs resulting from better prisoner behavior induced by the prospect of obtaining privileges exceeds the cost of the privileges. This clearly can be the case, depending on the degree to which privileges are valued by prisoners and the extent to which prison costs decline with better prisoner behavior.

Proposition 7. A policy of providing privileges for good behavior is inferior to a policy of providing time off for good behavior.

Proof: Let $(\hat{e}_I, a)$ be the privileges policy, with (9) satisfied. Let $(\hat{e}_I, r_T)$ be the time off policy that achieves the same effort level and deterrence level as with privileges, in which case

$$(s - r_T)(1 + \hat{e}_I) = s(1 + \hat{e}_I - \lambda(a)). \tag{15}$$

Such an r_T exists since the left-hand side of (15) is continuous in r_T and approaches 0 as r_T approaches s and approaches $s(1 + \hat{e}_I) > s(1 + \hat{e}_I - \lambda(a))$ as r_T approaches 0. Additionally, given (15) and the assumption that (9) is satisfied, (2) will be satisfied. Then the only welfare difference between using privileges and time off is the difference between the public costs under the two policies. The sanctioning and privileges costs per prisoner under the privileges policy are $s(c(\hat{e}_I) + a)$, whereas the sanctioning cost per prisoner under time off is $(s - r_T)c(\hat{e}_I)$, which obviously is lower. ∎

Comments: (a) Whatever level of prisoner effort to behave well is induced by offering privileges can be duplicated under the time off policy. Thus, there is no advantage from using privileges in terms of achieving desirable prisoner behavior. In terms of costs, however, using

privileges suffers from two disadvantages relative to using time off. A privileges policy does not

reduce the length of time served by a prisoner. And a privileges policy requires the state to

spend additional resources to provide the privileges. Note that even if privileges were costless to

provide, the time off policy still would be superior because it would reduce prison costs by

reducing the time served.

(b) There is another disadvantage of the privileges policy compared to the time off policy

that is not reflected in the proof of Proposition 7. Under the privileges policy, there is an upper

bound on how much effort prisoners can be induced to take — only up to the maximum utility

they can obtain from the privileges, $\bar{\lambda} < 1$ (see (10)). Under the time off policy, in contrast, any

level of effort can be induced by a sufficiently great time off reward.

Before comparing privileges and parole, I make the additional assumption that an

individual would prefer to be on parole rather than in prison even when he is provided the

maximum level of privileges in prison, that is,

$$\theta < 1 - \bar{\lambda}. \tag{16}$$

Proposition 8. A policy of providing privileges for good behavior is inferior to a policy of

providing parole for good behavior.

Proof: Let $(\hat{e}_I, a)$ be the privileges policy, with (9) satisfied. Let $(\hat{e}_I, r_P)$ be the parole

policy that achieves the same effort level and deterrence level as with privileges, in which case

$$(s - r_P)(1 + \hat{e}_I) + r_P\theta = s(1 + \hat{e}_I - \lambda(a)). \tag{17}$$

Such an r_P exists because the left-hand side of (17) is continuous in r_P and approaches $s\theta < s(1 -$

$\bar{\lambda}) \le s(1 + \hat{e}_I - \lambda(a))$ as r_P approaches s and approaches $s(1 + \hat{e}_I) > s(1 + \hat{e}_I - \lambda(a))$ as r_P

approaches 0, where the first inequality follows from (16). Moreover, given (17) and the

assumption that (9) is satisfied, (4) will be satisfied. Then the only difference between privileges

and parole concerns the public costs under the two policies. The public costs per prisoner under the privileges policy are $s(c(\hat{e}_I) + a)$, while the public costs per prisoner under parole are $(s - r_P)c(\hat{e}_I) + r_P k$, which are lower given that $k < c(\bar{e}) \le c(\hat{e}_I)$. ∎

Comment: The advantages of parole over privileges are similar to those of time off over privileges. In brief, a parole policy can duplicate any prisoner effort level and any deterrence level achievable under a privileges policy. Moreover, it can do so at lower cost because some portion of the original prison sentence s is served on parole, whereas the privileges policy results in the offender serving all of his original sentence in prison. This fact alone favors the parole policy, but the parole policy also avoids the costs of providing privileges. Note, too, that the parole policy can achieve any desired effort level, whereas the privileges policy is constrained in this regard.

6. Variation in the Effort Required to Behave Well

Consider a generalization of the model described in Section 2 to allow for variations among individuals in the effort required to behave well (for example, they might differ in the degree of their impulse control problems). Specifically, let

α = private effort-cost coefficient; $\alpha \ge 0$; and

$z(\alpha)$ = density of α among individuals; $z(\alpha) > 0$ for all $\alpha \ge 0$.

Thus, the cost to an α-type individual to take effort level e is αe. I assume that the densities of the benefit from committing the offense, b, and the effort cost coefficient, α, are distributed independently.

Under the time off policy $(\hat{e}_T, r_T)$, a prisoner will take effort level $\hat{e}_T$ if and only if

$$(s - r_T)(1 + \alpha\hat{e}_T) \le s. \tag{18}$$

Let

$\bar{\alpha}$ = critical value of α,

below (and at) which prisoners will take the required effort level $\hat{e}_T$ and above which they will

take zero effort. Hence,

$$(s - r_T)(1 + \bar{\alpha}\hat{e}_T) = s \tag{19}$$

or, equivalently,

$$\bar{\alpha} = r_T/(s - r_T)\hat{e}_T. \tag{20}$$

For an individual for whom $\alpha \leq \bar{\alpha}$, the disutility from the time he would serve in prison is

$(s - r_T)(1 + \alpha\hat{e}_T)$, so he will commit the offense if his benefit b exceeds $p(s - r_T)(1 + \alpha\hat{e}_T)$. An

individual for whom $\alpha > \bar{\alpha}$ will commit the offense if his benefit b exceeds ps.

Thus, treating $\bar{\alpha}$ as a function of r_T, social welfare is

$$\int_0^{\bar{\alpha}(r_T)} \int_{p(s - r_T)(1 + \alpha\hat{e}_T)}^{\infty} [b - h - p(s - r_T)(1 + \alpha\hat{e}_T + c(\hat{e}_T))]v(b)db\,z(\alpha)d\alpha$$

$$+ [1 - Z(\bar{\alpha}(r_T))] \int_{ps}^{\infty} [b - h - ps(1 + c(0))]v(b)db, \tag{21}$$

where $Z(\cdot)$ is the cumulative distribution function of α. The first term applies to individuals who

will take the required effort level $\hat{e}_T$ and be rewarded with time off, while the second term applies

to individuals who will not take any effort to behave well and who will not be rewarded with

time off.

Proposition 9. When individuals differ in the effort required to behave well, a policy of

providing time off for good behavior is superior to a policy of not rewarding good behavior.

Proof: This follows immediately from observing that the derivative of social welfare

(21) with respect to r_T is, at $r_T = 0$,

$$ps[c(0) - c(\hat{e}_T)][1 - V(ps)][dZ(0)/dr_T] > 0, \tag{22}$$

where $V(\cdot)$ is the cumulative distribution function of b. Hence, $r_T^* > 0$. ∎

Comments: (a) This result can be explained as follows. Obviously, raising time off for good behavior r_T has the beneficial effect of inducing more prisoners to behave well, thereby reducing the state's cost of operating prisons. In general, raising r_T also has the detrimental effect of increasing crime because prisoners who behave well will bear shorter sentences. Initially, however, when $r_T = 0$, all prisoners take zero effort to behave well, so there are no well-behaved prisoners whose sentences would decline if r_T is raised. Moreover, the marginal prisoners who switch from acting badly to acting well are, by definition, indifferent between good and bad behavior and consequently are not deterred less. Thus, the only marginal effect of raising r_T, starting at $r_T = 0$, is the beneficial savings of prison costs.

(b) Once r_T is positive, however, there will be some well-behaved prisoners whose sentences will decline further as r_T is raised, causing a reduction in deterrence. The optimal r_T balances the beneficial savings in prison costs against this detrimental increase in crime, but the key point is that this tradeoff always favors some reward of time off for good behavior.[21]

Similarly, when individuals differ in the effort required to behave well, it can be demonstrated that a policy of providing parole for good behavior is superior to a policy of not rewarding good behavior. The structure of the proof is identical to that of Proposition 9 and is

---

[21] The result that some time off for good behavior is optimal also would hold under two other generalizations. First, if individuals are risk averse or risk preferring with respect to the length of the prison term, the degree to which the term could be shortened if they behave well, without affecting deterrence, would be different from that when they are risk neutral, but there still would be a reduction in the sentence. Hence, the time off policy would remain socially desirable because it would result in a reduction of the public cost of imprisonment without affecting deterrence. Second, if the state observes the effort individuals undertake to behave well with a continuous random error, individuals would obtain the time off reward with a probability that increased with their actual level of effort to behave well. Clearly, if the minimum effort level to obtain the sentence reduction, $\hat{e}_T$, is set low enough, there will exist a time off reward that will induce individuals to take this level of effort without reducing deterrence. Thus, again, the time off policy would be desirable because it would lower the public cost of imprisonment.

not reproduced here. The intuition also closely parallels that with respect to the time off policy.

Raising the parole period r_P from zero has a marginal beneficial effect on prison costs, but no

first-order detrimental effect on crime or parole costs.

7. Conclusion

I conclude with two comments.

(a) *Behavior that benefits other prisoners.* My analysis implicitly assumed that when

prisoners behave better, they do not enhance the welfare of other prisoners by, for example,

generating a safer prison environment. Obviously, however, refraining from some types of

prisoner misconduct, such as physically assaulting other prisoners, would benefit other prisoners.

My conclusion that rewarding prisoners for good behavior raises social welfare would not

necessarily hold with respect to this type of misconduct. The reason is that if prisoners suffer

less disutility per unit time because many behave better, deterrence is reduced.

However, many types of prisoner misconduct do not directly affect the welfare of other

prisoners, including assaulting guards; attempting to escape; possessing drugs; interfering with

security devices; refusing to perform work tasks; and bribing prison staff members.[22] My

conclusion that rewarding prisoners for good behavior always is beneficial applies to misconduct

of this sort. Of course, it may also be desirable to reward prisoners with respect to conduct that

benefits other prisoners.

(b) *Incapacitation rather than deterrence as the objective of imprisonment.* Because my

focus in this article has been on deterrence, I did not consider the possibility that individuals

commit offenses during their time off or during their time on parole. Had I done so,

imprisonment would have served the dual function of deterring individuals from committing

offenses and preventing them from committing offenses, that is, incapacitating them.[23] If

incapacitation is the goal of imprisonment, the ranking of the alternative rewards for good

behavior may be reversed. The privileges policy then may be superior to the time off and parole

policies because there is no reduction in the time served under the original sentence. Whether

time off is preferred to parole is unclear. On one hand, holding the disutility of the sanctions

constant, the parole policy requires a greater sentence reduction to compensate for the fact that

the individual continues to bear some disutility while on parole, which makes parole less

desirable in terms of incapacitation. On the other hand, individuals who are on parole might

commit fewer offenses per unit time than they would if they were totally free, due to their being

monitored and subject to certain restrictions on their behavior.[24]

---

[22] For further examples, see the Appendix in Camp, Gaes, Langan, and Saylor (2003).

[23] Miceli (1994) allows for the possibility that individuals on parole commit new offenses at some fixed rate. Hence, his analysis implicitly reflects considerations of both deterrence and incapacitation.

[24] For some economic writing about parole when incapacitation is the objective of imprisonment, see, for example, Lewis (1979) and Bernhardt, Mongrain, and Roberts (2012).   See also Fabel and Meier (1999), who analyze parole taking both incapacitation and deterrence into account.

References

Berk, Richard A., and Jan de Leeuw, "An Evaluation of California's Inmate Classification System Using a Generalized Regression Discontinuity Design," *Journal of the American Statistical Association*, Vol. 94 (1999), pp. 1045-1052.

Bernhardt, Dan, Steeve Mongrain, and Joanne Roberts, "Rehabilitated or Not: An Informational Theory of Parole Decisions," *Journal of Law, Economics, and Organization*, Vol. 28 (2012), pp. 186-210.

Camp, Scott D., Gerald G. Gaes, Neal P. Langan, and William G. Saylor, "The Influence of Prisons on Inmate Misconduct: A Multilevel Investigation," *Justice Quarterly*, Vol. 20 (2003), pp. 501-533.

Chen, M. Keith, and Jesse M. Shapiro, "Do Harsher Prison Conditions Reduce Recidivism? A Discontinuity-based Approach," *American Law and Economics Review*, Vol. 9 (2007), pp. 1-29.

Clear, Todd R., George F. Cole, and Michael D. Reisig, *American Corrections* (Wadsworth, Tenth Edition, 2013).

Fabel, Oliver, and Volker Meier, "Optimal Parole Decisions," *International Review of Law and Economics*, Vol. 19 (1999), pp. 159-166.

Gaes, Gerald G., Susan Wallace, Evan Gilman, Jody Klein-Saffran, and Sharon Suppa, "The Influence of Prison Gang Affiliation on Violence and Other Prison Misconduct," *The Prison Journal*, Vol. 82 (2002), pp. 359-385.

Garoupa, Nuno, "Prison, Parole, and the Criminal Justice Act 1991," *Research in Law and Economics*, Vol. 18 (1996), pp. 125-142.

Kuziemko, Ilyana, "How Should Inmates be Released from Prison? An Assessment of Parole versus Fixed-Sentence Regimes," *Quarterly Journal of Economics*, Vol. 128 (2013), pp. 371-424.

Kyckelhahn, Tracey, "State Corrections Expenditures, FY 1982-2010," Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, Washington, D.C., December 2012, pp. 1-14.

Lewis, Donald E., "The Optimal Parole Period," *Economics Letters*, Vol. 2 (1979), pp. 381-386.

Lovell, David, and Ron Jemelka, "When Inmates Misbehave: The Costs of Discipline," *The Prison Journal*, Vol. 76 (1996), pp. 165-179.

Mears, Daniel P., *Evaluating the Effectiveness of Supermax Prisons* (Washington, D.C.: Urban Institute, 2006) (available at <http://www.urban.org/UploadedPDF/411326_supermax_prisons.pdf>).

Miceli, Thomas J., "Prison and Parole: Minimizing the Cost of Non-Monetary Sanctions as Deterrents," *Research in Law and Economics*, Vol. 16 (1994), pp. 197-211.

North Carolina Criminal Justice Analysis Center, "A Discussion of Incarceration and Its Alternatives in North Carolina," July 2007 (available at <https://www.ncdps.gov/div/gcc/pdfs/pubs/ncincarceration.pdf>).

Schmitt, John, Kris Warner, and Sarika Gupta, "The High Budgetary Cost of Incarceration," Center for Economic and Policy Research, Washington, D.C., June 2010 (available at <http://www.cepr.net/documents/publications/incarceration-2010-06.pdf>).

Seiter, Richard P., *Corrections: An Introduction* (Pearson, Fourth Edition, 2013).