Optimal Parole Decisions

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Abstract

This paper investigates parole decisions when the offender may commit a second crime after having been set free. A convicted person is discharged earlier if the costs of the crime decline or the costs of the imprisonment increase. More dangerous offenders will be dismissed later unless the second penalty has a stronger deterrence effect on them. Other results require an insignificant deterrence effect of the second punishment in order to overcome their general ambiguity. If this condition holds, the prison term actually served will increase with a more distant time horizon and a more severe original sentence length.

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1 Introduction

Parole rulings are quite usual in the enforcement of criminal laws. A convicted criminal is commonly set free before his regular term in prison ends. The remaining punishment will then be added to a new punishment should the convicted commit a second crime within a certain period. This paper addresses the question how the optimal parole ruling is determined.

In contrast to the mainstream logic in the economics of crime literature since Becker's (1968) seminal article, the criminal is not assumed to behave fully rational. While a punishment may have a deterrent effect, offenses mainly occur due to an urge to commit a crime. The strength of this urge is seen to decrease with age. This view seems appropriate for non-property offenses like rape or murder. In such cases it is not even unusual that the criminal turns himself over to the police - the offender himself thus recognizing the threat imposed on society. Hence, the costs of a prolonged imprisonment have to be balanced against the risk of an additional crime if the convicted is set free “too early”.

Avio (1973) and Lewis (1983) report that parole boards mainly base their decision to discharge a prisoner on an estimation of the probability that additional crimes will be committed by the paroled. Since the estimation of the probability of recidivism poses no problem in our model, we do not follow the argument of Avio (1973) that parole rulings are used to correct punishments which are excessive given the updated estimation of this probability. Contrasting further, parole rulings do not encourage the prisoner to behave in a manner which increases his opportunity costs of recidivism. When addressing the question of the optimal parole ruling, the length of the regular sentence is taken for granted. Thus, a realized first-time conviction constitutes the starting point of the current analysis. Effects of the parole ruling on the decision to commit the first crime, which have been discussed by Miceli (1994), are therefore also ignored in the following.

Upon receiving parole, the offender may either stay honest or commit a second crime. In the latter case he will be arrested and sentenced immediately, and there will be no third crime afterwards. The only decision to be taken determines the point of time when the criminal is discharged on parole. It is then shown that the criminal will be set free earlier if the cost of imprisonment rises or the social cost of crime decrease. These results are quite plausible and are in line with Miceli's being derived in a quite different
framework. While individuals with a higher propensity to commit a crime will usually be discharged later, the opposite may result if the deterrence by a second punishment is increasing with the risk imposed on society. Given an insignificant deterrence effect of the repeated punishment, both an increase in the time horizon and in the length of the prison term spelled out in the original sentence will also lead to a later discharge from prison. However, with strong deterrence these two latter results may be reversed.

2 The Model

A serious crime has been committed, and the criminal has been caught. Assume that the social cost of a crime is equal to $M$, and the social cost of imprisonment is $Z$ per period of time, i.e. a year. In contrast to Miceli (1994), the latter does not vary with the prisoner’s efforts. The criminal is initially sent to prison for $S$ years at time $t = 0$. He will be set free after $D$ years with $D \leq S$. If he commits a second crime after $D$, he will be caught, sentenced immediately and must serve $2S - D$ years. Upon being sent to prison for a second time, the criminal does not commit a third offense. No crime is committed after the time horizon $T$.

The point of time $t$ when the criminal sends out a signal concerning his urge to commit a second offense constitutes a random variable. If the signal occurs while the criminal is imprisoned or after $T$, it is meaningless and cannot be observed. Otherwise he commits a second crime at this very moment. Let $f(t; 2S - D, \theta)$ denote the density function of the random variable. Assume strictly positive density for $t \in [0, T]$. Then $f_1 < 0$ for $t \in [0, T]$ implies that the propensity to commit a crime decreases with age. While this assumption reflects that the urge to commit a crime declines with age, it can also be justified by increasing opportunity costs of committing a crime. Further, $f_2 \leq 0$ for $t \in [0, T]$ captures a possibly existing deterrence effect of the punishment associated with repeated conviction. Finally, $f_3 > 0$ for $t \in [0, T]$ holds where the shift parameter $\theta$ represents the criminal energy of the offender. The probability that he commits a second crime is given by

$$\Pi = F(T; 2S - D, \theta) - F(D; 2S - D, \theta)$$

$$= \int_{D}^{T} f(t; 2S - D, \theta) dt,$$
with $F$ denoting the distribution function of the random variable. It is assumed that $F(T; 2S - D, \theta) < 1$. This implies that there always exists a positive probability of never committing a second offense. Differentiating $\Pi$ with respect to $D$ yields

$$\frac{\partial \Pi}{\partial D} = -f(D; 2S - D, \theta) - \int_D^T f_2(t; 2S - D, \theta) \, dt,$$  
(2)

$$\frac{\partial^2 \Pi}{\partial D^2} = -f_1(D; 2S - D, \theta) + 2f_2(D; 2S - D, \theta)$$  
$$+ \int_D^T f_{22}(t; 2S - D, \theta) \, dt.$$  
(3)

A later date of discharge reduces the potential threat for society by simply precluding crime possibilities during this period. However, the decreased deterrence yields a counteracting effect on this probability. The judge minimizes expected social cost

$$V = ZD + \Pi[M + (2S - D)Z]$$

by choice of $D$. For simplicity, there is no discounting. While the first-order condition for an interior solution is

$$\frac{\partial V}{\partial D} = Z(1 - \Pi(D^*)) + [M + (2S - D^*)Z] \frac{\partial \Pi}{\partial D}(D^*) = 0,$$  
(4)

the sufficient second-order condition can be obtained as

$$\frac{\partial^2 V}{\partial D^2} = -2Z\frac{\partial \Pi}{\partial D}(D^*) + [M + (2S - D^*)Z] \frac{\partial^2 \Pi}{\partial D^2}(D^*) > 0.$$  
(5)

Increasing the first punishment implies a higher cost of the first imprisonment. At the same time, the expected costs of the second imprisonment decrease. Yet, the first effect always dominates since $\Pi < 1$. In addition, increasing the first punishment induces the two counteracting effects on the probability of a second crime mentioned above. If there exists an interior solution for the minimization problem, the net impact of an increase of the first punishment on the probability of a second crime must be negative at the optimum. Thus, the deterring effect of the second punishment must be relatively small.
The boundary solution $D^* = 0$ can occur if the probability of a second crime is close to zero and changes in the parole rule have no significant impact on the probability of a second crime. The second boundary solution $D^* = S$ may arise if the probability of a second crime is close to unity, the costs of the crime are high, and the second punishment has no significant deterring effect.

3 Comparative Statics

Assume now that there exists a unique interior solution $D^*$ which satisfies the sufficient second-order condition. Proposition 1 deals with the effects of changes in the relative prices on the optimal parole ruling:

Proposition 1 The criminal is discharged earlier if the costs of imprisonment increase or the costs of the crime decrease.

Proof: By the implicit function theorem, it follows that

$$
\frac{\partial D^*}{\partial M} = -\frac{V_{DM}}{V_{DD}}, \quad (6)
$$

$$
\frac{\partial D^*}{\partial Z} = -\frac{V_{DZ}}{V_{DD}}, \quad (7)
$$

where

$$
V_{DM} = \frac{\partial^2 V}{\partial D \partial M} = \frac{\partial \Pi}{\partial D}(D^*), \quad (8)
$$

$$
V_{DZ} = \frac{\partial^2 V}{\partial D \partial Z} = 1 - \Pi(D^*) + (2S - D^*) \frac{\partial \Pi}{\partial D}(D^*). \quad (9)
$$

Due to (5), $V_{DD} > 0$ holds. The first-order condition (4) implies that $\frac{\partial \Pi}{\partial D}(D^*) < 0$. Hence, $\frac{\partial D^*}{\partial M} > 0$. Moreover, dividing (4) by $Z$ yields

$$
1 - \Pi(D^*) + (2S - D^*) \frac{\partial \Pi}{\partial D}(D^*) + \frac{M}{Z} \frac{\partial \Pi}{\partial D}(D^*) = 0.
$$

Since $\frac{M}{Z} \frac{\partial \Pi}{\partial D}(D^*) < 0$, it follows that $V_{DZ} > 0$ and $\frac{\partial D^*}{\partial Z} < 0$. $\square$
Increasing the social costs of a second crime $M$ unambiguously leads to a higher level of the first punishment. This instrument, which reduces expected costs of crime, becomes more effective. Increasing $Z$ raises the present cost of imprisonment per year by more than the expected future cost of imprisonment per year. Yet, by raising the costs of a second crime, it also increases the benefit from crime reduction. Only the first effect provides a tendency towards earlier dismissal. However, the first effect always dominates the second. Hence, a higher level of $Z$ reduces $D^*$.

Proposition 1 shows that relative price variations affect the parole decision with the expected signs. Similar results are derived in Miceli (1994) assuming that the loss of deterrence of the first crime is compensated by conditioning an early discharge on costly good behavior of the prisoner.

Interestingly, the effects of increases in the threat potential associated with a particular offender or the time horizon do not simply confirm the obvious, however.

**Proposition 2** An increase in the propensity to commit a crime induces a later discharge date if the deterrence imposed by the second punishment is non-increasing with the individual's crime propensity. An increase in the time horizon unambiguously implies later dismissal if the deterrence effect is insignificant.

**Proof:** Note that

\[
\frac{\partial^2 V}{\partial D \partial \theta} = -Z \int_0^T f_3(t; 2S - D^*, \theta) dt - [M + (2S - D^*)Z] f_3(D^*, 2S - D^*, \theta) + \int_0^T f_2(t; 2S - D^*, \theta) dt, \tag{10}
\]

\[
\frac{\partial^2 V}{\partial D \partial T} = -Z f(T; 2S - D^*, \theta) - [M + (2S - D^*)Z] f_2(T; 2S - D^*, \theta). \tag{11}
\]

If the deterrence of the second penalty is non-increasing in $\theta$, i.e. $f_{23} \geq 0$, it follows that $V_{D\theta} < 0$ and $\frac{\partial D^*}{\partial \theta} > 0$. Assuming an insignificant deterrence effect of the second punishment is associated with $f_2 \approx 0$. This implies that $V_{DT} < 0$ and $\frac{\partial D^*}{\partial T} > 0$. \hfill \square
Increasing either the time horizon $T$ or the individual's propensity to commit a crime both raise the probability of a second crime. Since the gain in the expected costs of imprisonment associated with an earlier dismissal is reduced, a tendency to increase $D^*$ follows. However, a more distant time horizon also prolongs the deterring effect of the parole decision. This induces a counteracting negative impact on $D^*$. The ambiguity can be overcome by assuming an insignificant deterrence of the punishment. Focussing on an increase in the propensity to commit a crime, the impact of variations of the discharge date on the probability of a second crime needs to be additionally considered. While a higher $\theta$ strengthens the crime-precluding effect of a longer imprisonment, it also affects the deterrence effect of the second punishment. Since the impact of the latter on $D^*$ cannot be signed unambiguously, the plausible proposition that a more dangerous criminal will be discharged later does not hold generally. However, if an increase in the propensity to commit a crime is not accompanied by a stronger deterrence effect, this conclusion follows.

Hence, dismissal on parole will occur earlier if the probability of recidivism is lower and the second punishment has no significant deterrence effect. More distant time horizons should plausibly be associated with younger criminals. Also, recall that the urge to commit a crime decreases with age. Thus, both parts of Proposition 2 suggest that older criminals should be discharged earlier than younger offenders if the latter of these condition holds.

Since the initial sentence length may reflect politically induced, discrete changes in criminal law, while decisions on parole will rather be based on judicial experience, the following should also be noted:

**Proposition 3** An increase in the legal punishment level leads to a later discharge if the deterrence effect of the second punishment is insignificant.

**Proof:** In this case

\[
\frac{\partial^2 V}{\partial D \partial S} = 2Z \frac{\partial II}{\partial D}(D^*) - Z \frac{\partial II}{\partial S}(D^*) \\
+ [M + (2S - D^*)] \frac{\partial^2 II}{\partial S \partial D}(D^*) \\
= 2Z[-f(D^*, 2S - D^*, \theta) - 2 \int_{D^*}^{T} f_2(t, 2S - D^*, \theta) dt]
\]
\[
+ [M + (2S - D^*)Z] \\
- [\text{something}] \\
\text{If } f_2 \approx 0, \text{ then } f_{22} \approx 0. \text{ Therefore, } \frac{\partial^2 V}{\partial D \partial S} < 0 \text{ proves the claim.} \]

An increase in the sentence length \( S \) induces three different effects. First, it raises the costs of a second imprisonment. Thus, the cost saving of an early discharge is reduced. Second, it decreases the probability of a second crime since the higher punishment adds to the deterrence effect. This raises the cost saving of an early discharge and weakens the crime-precluding effect of the first punishment. Third, the impact on the deterrence effect of the second punishment is generally ambiguous. Hence, comparative static analysis alone cannot yield a clear-cut result with respect to \( \frac{\partial D^*}{\partial S} \). Yet, if the second punishment again does not deter crime \((f_2 = 0)\), the discharge must occur later. Although the threat to society does not change, a more severe sentence unambiguously leads to a later discharge on parole if the second punishment only provides a negligible deterrence. Moreover, if the regular sentence length should be positively correlated with the social costs of crime, Proposition 1 would also imply that more serious crime will normally be accompanied by a later discharge from prison.

4 Conclusion

Minimizing expected social cost implies that criminals are discharged earlier if the costs of the crime decline or the costs of imprisonment decrease. The dismissal will occur later if the criminal is more dangerous unless the higher propensity to commit a crime is not associated with a stronger deterrence of the second punishment. If the threat of a punishment does not deter crime, both a more distant time horizon and an increase in the original sentence prolong the term in prison. However, these two results need not hold accounting for a significant deterrence effect of the second punishment. With a more distant time horizon, the prolonged deterrence by an earlier discharge can overcompensate the reduced saving in expected cost of imprisonment. Similarly, the increased deterrence by the second penalty may justify a decrease in the term served if the original prison term sentence rises.
Obviously some important determinants of the parole decision have been neglected. For example, the current approach did not discuss parole rulings during a second prison term served in the case of repeated conviction. This would generally be subject to a time inconsistency problem. Given that the crime has already been committed, the second sentence no longer induces a deterrence effect. Therefore, the optimal second penalty is ex post equal to zero. However, following Boadway, Marceau and Marchand (1994), even a punishment which solely increases social costs from an ex post point of view may be enforced in order to earn reputation in the judicial system. Also, the model does not allow for series of crimes before the offender is arrested. Moreover, repercussions of the parole ruling on the decision to commit the initial crime have not been analyzed. Finally, the possibility of convicting innocent individuals - as in Ehrlich (1975) and Andreoni (1991), or similarly in Rubinstein (1979) - does not enter the current analysis. An integration of the latter argument can be guessed to imply more liberal parole rulings, while accounting for the two former aspects should support a more restrictive regime.
References


