Chapter 8
The Economics of Crime

The Economic Model of Law Enforcement

Let:

g = offender's dollar gain from committing a crime;
h = harm to society per crime;
p = probability of apprehension;
$k(p)$ = cost of apprehension, $k'>0$, $k''>0$;
f = fine upon conviction;
t = prison term upon conviction;
c = unit cost of prison to offenders;
α = unit cost of prison to society.

Assume that g is distributed across potential offenders according to the distribution function $Z(g)$, where $Z' \equiv z$ is the density function.

An offender will commit a crime, given g, if

$$g > p(f+ct). \tag{8.1}$$

Thus, for any set of policy variables, (p,f,t), the expected number of crimes (i.e., the crime rate) is $1 - Z(p(f+ct))$. It follows that the crime rate is decreasing in each of these variables, reflecting the deterrent effect of law enforcement.

The social problem is to choose the policy variables to maximize social welfare, given by the sum of the gains to offenders minus the costs of crime to victims and enforcement costs:

$$W = \int_{p(f+ct)}^{\infty} (g - h - p\alpha t)\, dZ(g) - k(p). \tag{8.2}$$

As in the text, we first consider optimal enforcement when p is fixed. Later, we allow p to vary.

Probability of Apprehension is Fixed

Fines only. First consider the case of fines only. Setting t=0 in (8.2) and taking the derivative with respect to f yields the first order condition

$$(pf - h)z(pf)p = 0. \tag{8.3}$$

It follows that

$$f^{*}=h/p, \tag{8.4}$$

as shown in the text. Intuitively, the offender should face a fine equal to the harm his action causes, inflated by the inverse of the probability that he will be caught.

Fines and prison. Now consider the use of both fines and imprisonment. Note first that, because prison is costly, fines should be imposed to the maximum extent before prison is used. Thus, letting w be the offender's wealth, if $h/p \geq w$, then the optimal fine is $f^{*}=h/p$ as specified in (8.4) and $t^{*}=0$. In this case, optimal deterrence is attainable by a fine alone. However, if $h/p>w$, it is optimal to set $f^{*}=w$ (i.e., the fine should be maximal). In this case, a positive prison term may also be desirable; it depends on whether the marginal social gain from the additional deterrence exceeds the marginal cost.

Formally, taking the derivative of W with respect to t with $f=w$ yields

$$\frac{\partial W}{\partial t} = [h+p\alpha t - p(w+ct)]z(p(w+ct))pc - p\alpha[1 - Z(p(w+ct))] \tag{8.5}$$

where the first term is the net deterrence benefit from increasing t, and the second term is the marginal punishment cost. If this expression is positive when evaluated at $t=0$, then some prison is optimal. In that case, the optimal prison term is found by setting (8.5) equal to zero. Note that in this case, it must be true that the first term in square brackets must be positive at the optimum, or

$$h + p\alpha t > p(w+ct) \tag{8.6}$$

where the term on the left-hand side is the social cost of a criminal act (the harm to society plus the expected punishment cost), while the right-hand side is the cost (=benefit) of the act to the marginal offender. Thus, there is "underdeterrence" at the optimum (i.e., some inefficient crimes are committed).

Probability of Apprehension is Variable

Fines only. Based on the above logic, the fine should be set maximally before p is increased. Thus, set $f^{*}=w$ and take the derivative of the welfare function with respect to p (setting $t=0$):

$$\frac{\partial W}{\partial p} = (h - pw)z(pw)w - k'(p) = 0,$$

which implies

$$(h - pw)z(pw)w = k'(p) \tag{8.7}$$

It follows that at the optimum level of enforcement, $h>pw$, or the harm exceeds the expected punishment. Thus, there again is some underdeterrence relative to the first-best solution.

Prison only. Here we consider the use of prison only (i.e., $f=0$) in order to prove that in this case, when p is a choice variable, the optimal policy involves setting t at its maximal level, denoted $\bar{t}$. To prove this claim, suppose that $t<\bar{t}$. Welfare is thus

$$W = \int_{pct}^{\infty}(g - h - p\alpha t)dZ(g) - k(p). \tag{8.8}$$

But note that if we lower p and raise t so as to hold pt (the expected prison term) fixed, the integral term remains unchanged (i.e., the crime rate is unaffected), but $k(p)$ falls, which implies that W could not have been maximized. Thus, $t<\bar{t}$ cannot be part of the optimal enforcement policy.

Fines and prison. The most general policy involves choosing f, t, and p optimally. The optimum in this case again involves a maximal fine, or $f^*=w$, based on the above logic. Then maximize W with respect to t and p. Assuming an interior solution for each, we obtain the first order conditions

$$\frac{\partial W}{\partial t} = -[p(w+ct)-h-p\alpha t]z(\bullet)pc - p\alpha[1-Z(\bullet)] = 0 \tag{8.9}$$

$$\frac{\partial W}{\partial p} = -[p(w+ct)-h-p\alpha t]z(\bullet)(w+ct) - \alpha t[1-Z(\bullet)] - k'(p) = 0. \tag{8.10}$$

In this case, t will *not* generally be maximal. To see why, suppose $t<\bar{t}$. Now raise t and lower p to hold pt constant. While this lowers $k(p)$, note that it is no longer the case that the crime rate remains unchanged because the expected fine, pw, falls. Thus, $t^*<\bar{t}$ is possible.