What is Crime?

by

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This article asks which wrong doings should be considered criminal and which should be handled in some different manner. The answer is that when the state's commitment power is needed to provide deterrence, a wrong doing should be considered criminal. When, however, private parties can take actions that help them commit, such as write contracts or take precautions, then it could be better to have the resolution of wrong doings pursued privately. (JEL: K 13, K 14)

1 Introduction

What makes an act criminal? A simple answer is that society declares it a crime and, moreover, commits to a level of enforcement and punishment. But this begs the question of what acts get criminalized. Certainly not all wrong doings are criminal. Nor is it clear that those that are criminalized are always the worst wrong doings. If I steal a $50 bottle of wine from you, I've committed a crime. But if I do $5000 worth of damage to your car in an accident, this could very well not be treated as a crime. And if I cost your company $5,000,000 by breaching a contract, then this will almost surely not be treated as a crime.

In this paper, I seek to answer the question using the insights of law and economics. Specifically, if society wants to have an efficient means of deterring wrong doing, what are the wrong doings to which it should commit the state's enforcement and punishment powers? Which wrong doings should be left to private parties to resolve?[1] To some extent, this is returning to an old debate, which pit BECKER AND STIGLER [1974] against LANDES AND POSNER [1975], a point I will return to shortly.

Following the standard definition of crime, I take a crime to be a wrong doing in which enforcement is entrusted to the state (public enforcement).[2] Other wrong doings, in which enforcement is left to the victim, such as torts or contract enforcement, are considered not to be crimes.[3]

Although there are a number of potential differences between civil and criminal actions, the one I focus on here is the superior commitment ability of the state relative to the individual. Consider the incentives of an individual who is the victim of a wrong doing. Ignoring, for the moment, a revenge motive, her decision is how much to expend in the hopes of gaining some measure of restitution from the wrong doer. Rationally, if the wrong doer cannot provide any restitution, the victim would have no incentive to pursue the wrong doer. And even if the wrong doer can pay some restitution, a rational victim would not pay to inflict punishment, such as incarceration, on the wrong doer that is not remunerative. Anticipating this, a potential wrong doer would be less deterred than if the potential victim could commit to expend resources on apprehension and punishment.

In contrast, the state is typically seen as possessing commitment ability. That is, the state can typically commit to a level of enforcement and to a punishment. And even when the state may not be able to fully commit, constraints on its ability to renegotiate mean that it has stronger commitment powers than does a private citizen.

Because state commitment to a level of enforcement and punishment can

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[1]Resolution could involve using the courts as part of a civil action.

[2]Of course, the state is sometimes a party to civil actions, such as when it suffers a tort or from breach of contract. In that role, the state can be seen as another private party. A more subtle issue arises when the state brings civil actions under antitrust or regulatory policy; see discussion *infra*.

[3]Of course, some wrong doings can be both (*e.g.,* a murder that leads to a wrongful death suit). However, wrongs that are pursued both criminally and civilly are relatively rare [see, *e.g.,* LANDES AND POSNER, 1975, on this point]. Moreover, in the model developed below, there is still scope for private recovery—restitution—even following criminal prosecution.

provide an efficient deterrent, it will make sense to criminalize those wrong doings for which private enforcement will provide inefficient enforcement.

In addition, because private enforcement is essentially rent seeking, there is no reason to expect that, even when an effective deterrent, private enforcement will be efficient relative to public enforcement [a point also made by LANDES AND POSNER, 1975].

There are, however, conditions under which private enforcement does as well or better than public enforcement. First, if potential victim and wrong doer can contract, then there is no value to criminalization. Second, it is possible that, if the victim can take precautionary actions (*e.g.,* install better locks) and restitution will be sufficiently big, private enforcement dominates public enforcement. The intuition behind the first exception is that contracting can provide sufficient deterrence and is less costly than *ex post* enforcement. The intuition behind the second exception is that, knowing she is responsible for *ex post* enforcement, the potential victim has stronger incentives to invest in precautions than she would if she could rely on the state for enforcement. The general idea behind both of these exceptions is that the necessary incentives for the potential victim to take appropriate *ex ante* actions (contract properly or take precautions) can be undermined by public enforcement.[4]

As remarked upon earlier, there is an old debate between BECKER AND STIGLER and LANDES AND POSNER on the question of private enforcement.[5] Both pairs of authors were, however, concerned with somewhat different questions than I address here. BECKER AND STIGLER were concerned about who enforced the law and argued for the advantages of private enforcement as a means of overcoming the agency problem involved in enforcement (essentially the ability of criminals to bribe police). To provide enforcers with appropriate incentives to enforce the law, BECKER AND STIGLER suggested making the enforcers private agents, who collect the wrong-doing-deterring fines levied on the wrong doers they apprehended. In response, LANDES AND POSNER observed that because collecting fines is, essentially, rent seeking, there is no guarantee that the private market will provide the appropriate level of enforcement.

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[4]An earlier version of this article also examined conditions on the enforcement technology such that private and public objectives coincided, in which case private enforcement would be no worse than public enforcement. Details available from the author upon request.

[5]See also FRIEDMAN [1984].

The BECKER AND STIGLER model can be faulted on two grounds. First, it assumes that private enforcement eliminates agency problems. While it is true that stronger incentives for the police would make them less susceptible to bribes, it must also be remembered that a police force is not a single decision maker. Rather it is an organization and privatization will not miraculously cure internal agency problems. Second, like LANDES AND POSNER, the level of analysis is at the economy level, rather than at the level of individual victims and wrong doers. Consequently, it is difficult to explore fully the scope of responses available to the parties.

In contrast, the level of analysis here is the victim–wrong-doer level. Furthermore, unlike those articles, it is assumed that the victim is the one to pursue private enforcement (possibly by hiring detectives and attorneys). It is assumed that her agency problem *vis-à-vis* her agents is no better or worse than that faced by the state with its agents. Indeed, it assumed that neither the state nor the victim have access to a superior technology for enforcement or punishment. The victim is even allowed to punish the wrong doer if she wishes (but she won't in equilibrium).

A few objections to the analysis below can be anticipated. First, the assumption that the victim is rational (*i.e.,* is not motivated by vengeance). No doubt this is unrealistic. However, a vengeance motive is partially captured in the analysis that follows if one thinks of the restitution term, R, as representing the psychic gain the victim receives from revenge.

A second potential objection is that the state and victim have access to the same technology. One can certainly imagine, for instance, that the state enjoys some economy of scale. In particular, the state's personnel's experience could make it cheaper for them to operate than an inexperienced victim. But because the victim can employ outsiders, who do possess experience, one presumes any cost difference is relatively minor.

A third potential objection is that this is a model of the determinants of public vs. private enforcement rather than of crime *per se* because some public enforcement activities (*e.g.,* antitrust or regulatory) are not typically considered criminal. From an economic perspective—although admittedly not a legal perspective—this is just a semantic difference.

2   A Model

Consider a situation in which there is a population of $2N$ individuals. Individuals are randomly, but evenly, assigned to one of two groups: potential

malefactors and innocent folk. *Prior* to assignment, the individuals can collectively put in place whatever laws they want to govern their society and assess whatever taxes they wish to pay for the enforcement of those laws.

After assignment, a one-to-one matching is imposed between the groups, such that any individual of either group is exogenously matched to precisely one member of the other group. Endogenizing matching could potentially enrich the analysis, but is unlikely to alter significantly the conclusions reached here. The assumptions on matching made here simplify the analysis and allow me to focus on the issues in which I am interested.

An innocent's payoff depends on the action of the potential malefactor with whom she is matched. If he is "good," then her payoff is G (gross of any transfers). If he is "bad," then her payoff is $-L$, $L > 0$ (gross of any transfers). The potential malefactor's payoff if he is good is 0. If he is bad, it is $B > 0$.

Assume that, should the potential malefactor be bad, there is a technology to detect, catch, and prosecute him. Specifically, by expending $k(\pi)$, there is a probability π of detecting, apprehending, and convicting him. I will refer to these various stages as *enforcement*; that is, with probability π enforcement is *successful* and with probability $1 - \pi$ enforcement is *unsuccessful*. Assume $k'(\cdot) > 0$ and $k''(\cdot) > 0$ for $\pi > 0$. If enforcement is successful, then the malefactor can be made to make restitution of $R \geq 0$ to the innocent. Assume there is also a punishment technology such that, upon successful enforcement, an expenditure of p lowers a malefactor's utility by $\lambda(p)$; that is, the punishment is equivalent to a negative transfer of $\lambda(p)$ to the malefactor. Assume $\lambda'(\cdot) > 0$ and that $\lambda(0) = 0$.

In addition to *ex post* actions, it may be possible for the innocent to invest in precaution, s. The effect of precaution is to lessen the benefit to the potential malefactor of the bad action (*e.g.,* bolting classroom projectors to make the return from breaking and entering into a classroom less).[6] The cost of s to the innocent is $\zeta(s)$, where $\zeta'(s) > 0$ for $s > 0$ and $\zeta''(\cdot) > 0$.

The *ex post* utility of a potential malefactor who is good is 0, while the expected *ex post* utility of a potential malefactor who is bad is

$$(1) \qquad\qquad B - s - \pi\big(R + \lambda(p)\big).$$

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[6]One could also imagine precautionary actions taken to enhance the probability of apprehension (*e.g.,* installing surveillance equipment or recording serial numbers). The question of such precautionary activities is left for future research.

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After society has set π and p (if it does), the citizens have been paired, and the innocent have chosen precaution s (if they do), assume the potential malefactor chooses an action $\sigma \in [0,1]$. Interpret σ as the probability that the potential malefactor is good (and, thus, $1-\sigma$ is the probability he is bad). Such an interpretation is natural if we view σ as representing efforts made to avoid accidents or other involuntarily harmful events. Such an interpretation is arguably less natural when it comes to volitional wrong-doing, such as theft, but even for volitional acts there is considerable justification for this interpretation: A massive sociological literature documents that early actions, such as choice of neighborhood, associates, and schooling, are strongly correlated with later propensity to commit criminal or deviant acts.[7] Similarly, the "choice" to become a junkie could affect the likelihood of committing later burglaries.

An alternative formulation, not pursued here, would be to make the (relative) benefit of the bad deed, B, a decreasing function of σ (*e.g.,* the less severe one's addiction, the smaller is the benefit from stealing). This formulation would yield similar conclusions.

Let the potential malefactor also incur a cost, $C(\sigma)$, that depends on his choice of σ. For instance, the opportunity cost of time makes driving slowly costly; or weaning oneself from a drug habit is painful; or staying in school is costly. Assume that $C'(0) = 0$, $C'(\sigma) > 0$ for all $\sigma > 0$ and that $C''(\cdot) > 0$.

The potential malefactor's expected utility is, thus,

$$\sigma I + (1 - \sigma)(B - D) - C(\sigma),$$

where I is any incentive offered to be good and D is the (expected) deterrent (*i.e.,* $D = s + \pi\big(R + \lambda(p)\big)$). Assume I is a transfer from the innocent.

3   Analysis

Consider expected surplus on a per matched pair basis with no enforcement activity (total surplus is N times this amount):

(2) $$\sigma G + (1 - \sigma)(B - L) - C(\sigma).$$

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[7]See, *e.g.,* BOARDMAN, FINCH, ELLISON, WILLIAMS, AND JACKSON [2001], OSBORN [1980], SAMPSON AND LAUB [1990], FARRINGTON, GALLAGHER, MORLEY, ST. LEDGER, AND WEST [1986].

To keep the analysis interesting, assume

(C1) $$C'(0) \equiv 0 < G + L - B < C'(1).$$

Condition (C1) rules out (i) the possibility that the social optimum is $\sigma = 0$; that is, a situation in which it is welfare maximizing for the potential malefactor to be bad rather than good; (ii) it also rules out perfect deterrence, $\sigma = 1$, as being socially optimal.

Suppose the objective is for the potential malefactor to pick $\sigma = \hat{\sigma}$. This means that

(3) $$I - B + \underbrace{s + \pi\big(R + \lambda(p)\big)}_{D} - C'(\hat{\sigma}) = 0$$

if $0 < \hat{\sigma} < 1$ and

(4) $$I - B + s + \pi\big(R + \lambda(p)\big) - C'(\hat{\sigma}) \geq 0$$

if $\hat{\sigma} = 1$. The case of a strict inequality in expression (4) can, however, be dispensed with.

Lemma 1 If there is an equilibrium in which expression (4) holds as a strict inequality for $\hat{\sigma} = 1$, then there is one in which $\hat{\sigma} = 1$ and (4) holds as an equality.

Proof: Because s, π, and p are costly, were they positive in expression (4), then social welfare or the innocent's utility or both could be improved, at least weakly, by reducing them until (4) were just an equality.[8] If $s = \pi = p = 0$ and (4) holds, then I is necessarily positive (*i.e.*, a contract must exist between innocent and potential malefactor). In the case where (4) is a strict inequality, then the welfare of each pair is

$$G - C(1) < \max_{\sigma} \sigma G + (1 - \sigma)(B - L) - C(\sigma)$$

by (C1). Because this contract, thus, does not maximize the contracting pair's surplus and bargaining takes place under symmetric information, the parties would not agree to this contract in equilibrium [see HERMALIN AND KATZ, 1993]. Q.E.D.

In light of Lemma 1, we can restrict attention to expression (3).

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[8]This is true regardless of whether there is private enforcement or public enforcement.

3.1 Contract Law vs. Criminal Law

The expected social cost of inducing $\hat{\sigma}$ (on a per-pair basis) is

$$(5) \qquad (1 - \hat{\sigma})\big(s + \pi(\lambda(p) + p) + k(\pi)\big) + \zeta(s)$$

Because I doesn't enter into expression (5)—it's a transfer—it follows that if contracting is possible, then the optimal way of inducing $\hat{\sigma}$ is for innocent and potential malefactor to sign a contract that promises the potential malefactor

$$(6) \qquad I = B + C'(\hat{\sigma})$$

if the good action occurs.

We can now establish

Proposition 1 (Optimality of Contracting) Suppose the innocent and potential malefactor are risk neutral. If contracts are feasible between the parties, then the first best is attainable without precautionary or enforcement expenditures (i.e., with $s = \pi = p = 0$).

Proof: The first best is inducing the σ that maximizes expression (2) without incurring any social cost. Let σ^* maximize (2). Because $C(\cdot)$ is convex, σ^* is unique. It is defined by

$$G + L - B = C'(\sigma^*).$$

Set $I^* = B + C'(\sigma^*)$ and $s = \pi = p = 0$. By construction, (3) is satisfied when $I = I^*$, $s = \pi = p = 0$, and $\hat{\sigma} = \sigma^*$. So I^* induces σ^*. Because the first best is attained, no contract can do better; hence, the innocent and potential malefactor will bargain to $I = I^*$ (using upfront sidepayments, as necessary, to split the expected surplus). Q.E.D.

In other words, Proposition 1 states that there is no need for public enforcement of bad behavior—and, thus, no need to criminalize such behavior—when the parties can contract. As such, it can be seen as an extension of the common suspicion in law and economics that judicial intervention in private contracting is unnecessary, at least when the parties to the contract bargain under symmetric information.[9]

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[9]See HERMALIN AND KATZ [2005] for a discussion of the literature. HERMALIN AND KATZ [1993] provides one formal justification for this conclusion.

3.2 Analysis in the Absence of Contracting and Precaution

Henceforth, I consider the situation in which contracting is not possible; that is, $I \equiv 0$. For the time being, assume that there is no scope for the innocent to invest in precaution; that is, $s \equiv 0$.

3.2.1 Full-Commitment Public Enforcement

If society can fully commit to a π and p, what would it choose?

Every time a potential malefactor is bad, the state incurs an expected cost of $\pi p + k(\pi)$, where p and π are set *ex ante*. Since the state is supported by society, this cost can be seen as borne by the citizens proportionally; that is, each citizen loses $\frac{1}{2N}\big(\pi p + k(\pi)\big)$. This can be viewed as an increase in his or her taxes or the loss he or she suffers if the state reallocates state funds from other uses to law enforcement.[10] At the beginning of the game, when p and π are set, the expected welfare of any citizen pair is

(7) $\quad \hat{\sigma}(\pi, p)G + \big(1 - \hat{\sigma}(\pi, p)\big)\big(B - L - k(\pi) - \pi(\lambda(p) + p)\big) - C\big(\hat{\sigma}(\pi, p)\big),$

where $\hat{\sigma}(\pi, p)$ is the value of σ that solves the first-order condition (3) (with $I = s = 0$). Society sets π and p to maximize (7).

To solve this optimization program, observe that the level of deterrence, D, determines σ. In particular, if $D < B$, then $\sigma = 0$ and if $D \geq B$, then σ is increasing monotonically in D. Let $\sigma(D)$ be this function. Consider the cost-minimization program, in which society chooses π and p to minimize

(8) $$\pi(\lambda(p) + p) + k(\pi)$$

subject to

(9) $$\pi(\lambda(p) + R) = D$$

(note $D = 0$ if $\pi = 0$). Let $W(D)$ be the resulting cost function. We can thus rewrite society's objective function as

(10) $\quad \sigma(D)G + \big(1 - \sigma(D)\big)\big(B - L - W(D)\big) - C\big(\sigma(D)\big),$

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[10]It is assumed here that taxation is non-distortionary. If taxation were heavily distorting, then this could be an argument in favor of private enforcement.

The first-order condition is

$$\sigma'(D)\underbrace{\Big(G + L - B - C'\big(\sigma(D)\big)\Big)}_{\text{social margin}}$$

(11)

$$-\underbrace{\Big(W'(D)\big(1 - \sigma(D)\big) - \sigma'(D)W(D)\Big)}_{\text{effective MC}} = 0$$

if the optimal $D \geq B$. If (11) is negative for all $D \geq B$, then the optimal $D = 0$.

When $D = B$, $\sigma(D) = 0$, so the social margin is positive by condition (C1). The function $\sigma'(D)$ is also positive. Hence, whether an interior solution exists depends on the size of the effective marginal cost. Note that the effective marginal cost contains a $-\sigma'(D)W(D)$ term, reflecting that the greater the deterrence, the less likely it is that the cost of the deterrence need actually be paid. Indeed, it is possible that if $\sigma(D)$ is large enough, the effective marginal cost is negative. Finally, observe that unless the effective marginal cost is zero at the optimum, the equilibrium level of deterrence will not match the first-best level of deterrence (which occurs when the social margin is zero).

Without assuming functional forms, little more can be said about the solution to (10) (equivalently, (7)).

3.2.2 Private Enforcement

Consider an innocent who has been the victim of a bad act by a malefactor. Assume she has access to the same technology as the state (*e.g.,* she can hire a detective and a lawyer). Her problem is to choose π and p to maximize:

(12)
$$\pi(R - p) - k(\pi).$$

From (12), the optimal *private* punishment level is $p = 0$. Consequently,

Lemma 2 If $B \geq R$, then private enforcement yields zero deterrence (i.e., $\sigma = 0$) in equilibrium.

Proof: From (3), $\sigma = 0$ unless $D > B$. But $D = \pi R \leq B$ when $p = 0$ and $B \geq R$. Q.E.D.

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Even if $B < R$, then private enforcement will fail to deter bad behavior if $\pi^{**}R \leq B$, where π^{**} is the solution to (12). We have established the first half of the following proposition:

Proposition 2 Let π^{**} be the solution to (12). If $\pi^{**}R \leq B$ (which must hold if $R \leq B$), then private enforcement cannot deter bad behavior. Hence, if $\pi^{**}R \leq B$, then social welfare is less under private enforcement than under no enforcement ("no vigilantism").

Proof: If private enforcement fails to deter bad behavior, then expected social welfare per capita is

$$(13) \qquad\qquad \frac{1}{2}\left(B - L - k(\pi^{**})\right).$$

If there were no enforcement, then expected per capita social welfare is $(B - L)/2$, which exceeds (13).   Q.E.D.

The no vigilantism result arises because *ex post* private enforcement is non-productive rent-seeking.

Because public enforcement achieves the second-best optimum, it follows that it must always dominate private enforcement, at least weakly. Under the conditions of Proposition 2, it must therefore strictly dominate private enforcement because private enforcement is worse than a feasible level of enforcement given public enforcement.

Corollary 1 If $\pi^{**}R < B$, then private enforcement is strictly welfare inferior relative to public enforcement.

In fact, it follows that

Proposition 3 When deterrence relies on ex post actions (i.e., π and p), private enforcement never dominates public enforcement and is strictly dominated by public enforcement generically.

3.2.3   Is Commitment Credible with Public Enforcement?

The difference between public and private enforcement has so far relied on the ability of a society to commit *ex ante*, whereas a private citizen must play a subgame-perfect strategy. In other words, while a private citizen could wish

to commit to a particular (π, p) pair *ex ante*, she can't: Such commitment is an incredible threat—given the decision of how much to pursue and punish a malefactor, she will maximize expression (12).

As KREPS [1990] observes, there are a number of reasons to think that a long-lived institution, such as a society, can develop a reputation for commitment that individuals cannot. In particular, the fact that a given individual is finitely lived, may have difficultly *publicly* following through on her commitments, and may play infrequently, all make it difficult for her to establish a reputation. In contrast, the state is infinitely lived, its enforcement of laws public, and its interaction with malefactors more frequent.

Nevertheless, there could be some gain from considering the question of what happens if the state's commitment power is more limited than has heretofore been assumed. To that end, treat the initial stated policy, $(\hat{\pi}, \hat{p})$ as being like a contract between the state and an innocent. Should an innocent suffer a bad deed from a malefactor, the innocent has the right to insist that the state follow through with $(\hat{\pi}, \hat{p})$. The state, however, is now allowed to renegotiate with the innocent.[11] In this renegotiation, two restrictions are imposed on the state. First, it cannot agree to a new policy $(\tilde{\pi}, \tilde{p})$ that costs more than the current policy; that is,

$$\tilde{\pi}\tilde{p} + k(\tilde{\pi}) \leq \hat{\pi}\hat{p} + k(\hat{\pi}) \,.$$

The rationale for this restriction is that the state cannot increase taxes beyond those to which society originally agreed. Second, any cost saving, c, from adopting $(\tilde{\pi}, \tilde{p})$ over $(\hat{\pi}, \hat{p})$ must be rebated to citizens on equal basis; that is, each citizen is returned $\frac{c}{2N}$. Rationales for this restriction include equal-protection provisions in the constitution, an inability to target reallocated funds to a specific citizen, or a refusal by the other citizens to approve a transfer of their taxes to a specific individual.

The innocent victim will okay a new policy if

(14) $$\tilde{\pi}R + \frac{1}{2N}\left(\hat{\pi}\hat{p} + k(\hat{\pi}) - \tilde{\pi}\tilde{p} - k(\tilde{\pi})\right) \geq \hat{\pi}R \,.$$

The state will propose a new policy that maximizes *ex post* social welfare subject to (14). *Ex post*, punishing a malefactor is Pareto inferior, hence

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[11]This assumption should be contrasted to the one in BECKER AND STIGLER [1974], in which the state (or rather its agent) is essentially allowed to renegotiate with the malefactor.

$\tilde{p} = 0$. Utilizing the renegotiation-proofness principle, there is, thus, no loss in restricting attention to initial policies that set $\hat{p} = 0$.[12] Hence, (14) can be rewritten as

$$\tilde{\pi} R + \frac{1}{2N}\big(k(\hat{\pi}) - k(\tilde{\pi})\big) \geq \hat{\pi} R \,,$$

which is equivalent to

(15) $$\tilde{\pi} R - \frac{1}{2N} k(\tilde{\pi}) \geq \hat{\pi} R - \frac{1}{2N} k(\hat{\pi}) \,.$$

Because restitution is a zero-sum transfer, the state will want to make $\tilde{\pi}$ as small as possible. This insight yields:

Lemma 3 Let $\tilde{\pi}^*$ be the solution to[13]

(16) $$\max_{\pi} \pi R - \frac{1}{2N} k(\pi) \,.$$

Then the set of renegotiation-proof policies $\{(\pi, p)\}$ satisfies $p = 0$ and $\pi \leq \tilde{\pi}^*$.

Proof: That $p = 0$ if the policy is renegotiation proof was established above.

A $\hat{\pi}$ is renegotiation proof if and only if there is no $\tilde{\pi} < \hat{\pi}$ that satisfies condition (15). Because program (16) is globally concave, if $\tilde{\pi} < \hat{\pi} \leq \tilde{\pi}^*$, then $\tilde{\pi}$ does not satisfy (15). Hence every $\hat{\pi} \leq \tilde{\pi}^*$ is renegotiation proof. If, however, $\hat{\pi} > \tilde{\pi}^*$, then, by renegotiating to $\tilde{\pi} = \tilde{\pi}^*$, at least, both society and the victim are better off; hence, $\hat{\pi} > \tilde{\pi}^*$ cannot be renegotiation proof.
Q.E.D.

In light of Lemma 3, if $B \geq \tilde{\pi}^* R$, then it is not possible to deter bad behavior utilizing a renegotiation-proof policy. In that case, because restitution is zero sum, the optimal renegotiation-proof policy must be $(0, 0)$ (and a prohibition on private enforcement):

Proposition 4 If $B \geq \tilde{\pi}^* R$ and the state cannot commit not to renegotiate, then the optimal feasible policy is no enforcement effort (i.e., $\pi = 0$), no punishment (i.e., $p = 0$), and a prohibition on private enforcement.

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[12]The renegotiation-proofness principle states that there is no loss of generality in restricting attention to initial contracts or policies that will *not* be renegotiated in equilibrium. Since any policy with $p > 0$ will be, the renegotiation-proofness principle allows us to restrict attention to $\hat{p} = 0$. See, for instance, FUDENBERG AND TIROLE [1991, Chapter 5] for details.

[13]The convexity of $k(\cdot)$ ensures $\tilde{\pi}^*$ exists and is unique.

Proof: Follows from Lemma 3 and Proposition 2.   Q.E.D.

If, in contrast, $B < \tilde{\pi}^* R$, then it is possible to deter bad behavior.

We next want to compare welfare under public enforcement with limited commitment to welfare under private enforcement. Observe that the effective marginal cost of π in program (16) is $\frac{1}{2N} k'(\pi)$, which is less than the marginal cost in program (12), $k'(\pi)$. The marginal benefit in both programs is the same, R. Hence, by the usual comparative statics, $\tilde{\pi}^* > \pi^{**}$. That is, the equilibrium level of π given private enforcement (*i.e.,* π^{**}) is feasible given public enforcement with limited commitment. Because the set of feasible π under the latter contains the equilibrium π under the former, it must be that public enforcement, even with limited commitment, dominates private enforcement.

Proposition 5 *Assume the state cannot commit not to renegotiate. Nonetheless, optimal feasible public enforcement never does worse than private enforcement.*

3.3   Analysis when the Innocent Can Take Precaution

Now suppose the innocent can take precaution (*i.e., s* can be greater than zero). Continue, however, to assume that no contracting between innocent and potential malefactor is feasible.

3.3.1   Choice of σ

Expression (3), the first-order condition that defines the potential malefactor's choice of σ, is

$$(17) \qquad D - B - C'(\sigma) = s + \pi\big(R + \lambda(p)\big) - B - C'(\sigma) = 0\,.$$

3.3.2   Choice of s

There are two cases to consider when the innocent chooses s: public enforcement versus private enforcement. In the former, π and p are fixed from her perspective.[14] In the latter, they are also essentially fixed, as she can predict

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[14]Recall, from the renegotiation-proofness principle, there is no loss of generality in restricting attention to renegotiation-proof choices of π and p when the state cannot fully commit.

her later choices, which, moreover, don't depend on her choice of s. However, in the latter case she does bear the cost of enforcement, $k(\pi^{**})$.

Under public enforcement, her maximization problem is

$$(18) \qquad \max_{\{s,\sigma\}} \sigma G + (1-\sigma)(\pi R - L) - \zeta(s)$$

subject to (17).

Under private enforcement, her maximization problem is

$$(19) \qquad \max_{\{s,\sigma\}} \sigma G + (1-\sigma)(\pi^{**} R - k(\pi^{**}) - L) - \zeta(s)$$

Proposition 6 Fix $\pi = \pi^{**}$ and $p = 0$, then precautionary activity, s, is greater under private enforcement than under public enforcement. However, an increase in p holding π fixed has an ambiguous effect on s under public enforcement; the sign of ds/dp is minus one times $C'''(\sigma)$.

Proof: Consider the first part of the proposition. Let s_{pri} be the optimal s under private enforcement and s_{pub} be the optimal s under public enforcement. Let $\sigma(s)$ denote the σ that solves (17) as a function of s. Observe, that $\partial\sigma/\partial s = 1/C''(\sigma) > 0$. Hence, it cannot be that $s_{\text{pri}} = s_{\text{pub}}$. If they were equal to the same $\tilde{s}$, then we would have

$$(20) \qquad \frac{G + L - \pi^{**}R}{C''\big(\sigma(\tilde{s})\big)} - \zeta'(\tilde{s}) = 0 = \frac{G + L + k(\pi^{**}) - \pi^{**}R}{C''\big(\sigma(\tilde{s})\big)} - \zeta'(\tilde{s}),$$

which is not possible. Revealed preference implies:

$$(21) \qquad \begin{aligned} \sigma(s_{\text{pri}})G + \big(1 - \sigma(s_{\text{pri}})\big)\big(\pi^{**}R - k(\pi^{**}) - L\big) - \zeta(s_{\text{pri}}) \geq \\ \sigma(s_{\text{pub}})G + \big(1 - \sigma(s_{\text{pub}})\big)\big(\pi^{**}R - k(\pi^{**}) - L\big) - \zeta(s_{\text{pub}}) \end{aligned}$$

and

$$(22) \qquad \begin{aligned} \sigma(s_{\text{pub}})G + \big(1 - \sigma(s_{\text{pub}})\big)\big(\pi^{**}R - L\big) - \zeta(s_{\text{pub}}) \geq \\ \sigma(s_{\text{pri}})G + \big(1 - \sigma(s_{\text{pri}})\big)\big(\pi^{**}R - L\big) - \zeta(s_{\text{pri}}). \end{aligned}$$

Combining expressions (21) and (22) yields

$$0 \geq \big(\sigma(s_{\text{pub}}) - \sigma(s_{\text{pri}})\big)k(\pi^{**}).$$

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Hence, $\sigma(s_{\mathrm{pri}}) \geq \sigma(s_{\mathrm{pub}})$, which entails $s_{\mathrm{pri}} \geq s_{\mathrm{pub}}$. Because, as established previously, $s_{\mathrm{pri}} \neq s_{\mathrm{pub}}$, we can conclude $s_{\mathrm{pri}} > s_{\mathrm{pub}}$ as was to be shown.

Consider the second part of the proposition. Write $\sigma(D)$ for the σ that solves (17) as a function of total deterrence D. The marginal return to precaution under public enforcement is

$$MR(s) \equiv \frac{G + L - \pi R}{C''\big(\sigma(D)\big)}.$$

Hence,

$$(23) \qquad \frac{dMR(s)}{dp} = \big(G + L - \pi R\big) \left(\frac{-C'''\big(\sigma(D)\big)}{C''\big(\sigma(D)\big)^2} \right) \sigma'(D)\lambda'(p).$$

Because $\sigma'(D) = 1/C''\big(\sigma(D)\big) > 0$, the sign of (23) is the same as the sign of $-C'''\big(\sigma(D)\big)$. From the usual comparative statics, the sign of ds/dp is the same as the sign of $dMR(s)/dp$ and, thus, the same as the sign of $-C'''\big(\sigma(D)\big)$ as was to be shown. Q.E.D.

The first part of Proposition 6 is not surprising. A switch from public to private enforcement raises the cost to the innocent of the bad act—she now bears the cost of *ex post* enforcement—thereby increasing her incentives to deter it *ex ante* (assuming no change in *ex post* deterrence).

The second part is somewhat more surprising. One might have seen *ex ante* and *ex post* deterrence as substitutes. So, if the state raises the penalty for the bad act, the innocent might be inclined to take less precautions. What this intuition ignores is that it is the *marginal* effect on deterrence that influences the innocent's decision. If, for instance, greater penalties make the potential malefactor more sensitive to further deterrence, then the innocent should increase her precautions in response to an increase in penalties. In this vein, it could be worth noting that during the same period that the US has increased the length of prison sentences, there has also been rapid growth in private precautions, such as alarm systems [see FORST, 2000, for evidence]. Of course there are many factors influencing both the political economy of longer prison sentences and private consumption of security systems,[15] so this is, at best, weakly supportive of the idea that greater *ex post* deterrence does not have a clear cut implication for *ex ante* expenditures on deterrence.

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[15]See FORST [2000] for a discussion of some of these.

3.3.3 Crime and Punishment

Society's objective is to solve (on a matched pair-basis):

$$(24) \quad \max_{\{\pi,p,s,\sigma\}} \sigma G + (1-\sigma)\left(B - s - L - \pi\big(\lambda(p) + p\big) - k(\pi)\right) - \zeta(s) - C(\sigma)$$

subject to (17) and

$$(25) \qquad (G + L - \theta)\sigma'(s) - \zeta'(s) = \frac{G + L - \theta}{C''(\sigma)} - \zeta'(s) = 0 \,,$$

where

$$\theta = \begin{cases} \pi R \text{ if public enforcement} \\ \pi^{**}R - k(\pi^{**}) \text{ if private enforcement} \end{cases} .$$

Observe that if society elects to have private enforcement, then $\pi = \pi^{**}$, $p = 0$, and the constraints (17) and (25) fully determine s and σ.

It is difficult to derive general results from such a complicated optimization problem; a point underscored by Proposition 6.

A general result is the following:

Proposition 7 Regardless of the state's commitment ability, if there is no restitution (i.e., $R = 0$), then public enforcement dominates private enforcement.

Proof: If $R = 0$, then, under private enforcement, $\pi = p = 0$ and (17) and (25) fully define s and σ. Under public enforcement, society could replicate that outcome by setting $\pi = p = 0$. Observe $\pi = p = 0$ is renegotiation proof, so the commitment power of the state is irrelevant. But because society is not obliged to set $\pi = p = 0$, it follows that society is no worse off with public enforcement than private enforcement. Q.E.D.

If both restitution and prevention are feasible, then it is no longer possible to replicate the private enforcement outcome under public enforcement (recall Proposition 6, particularly expression (20) in the proof).[16] Consequently,

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[16]Building on an idea in LANDES AND POSNER [1975], it would be possible to replicate the private enforcement outcome if the state could tax the restitution received by the innocent at a rate

$$\tau = \frac{k(\pi^{**})}{\pi^{**}R} \,.$$

See expression (20).

there can be no assurance that public enforcement dominates private enforcement. In particular, because of the added incentives that private enforcement provides for precaution when $R > 0$, it is conceivable that the benefit of those added incentives outweigh the consequent distortions in π and p. If the state doesn't have full commitment power, then the relevant standing of private enforcement *vis-à-vis* public enforcement will be even greater.

4   Conclusion

A brief summary of this paper's conclusions is

- When the innocent can take no *ex ante* actions (*e.g.,* precautions or enter into contracts), then public enforcement (*i.e.,* criminalization) dominates private enforcement (*i.e.,* torts) at least weakly.

- If the innocent can contract *ex ante* with the potential malefactor, then contracting as a means of regulating potential wrong doing is superior to criminalization.

- If the innocent can take precautions and restitution is feasible, then it is possible that private enforcement dominates public enforcement.

- It is possible that social welfare is greater under no enforcement than under private enforcement.

- It is possible that an increase in punishment (*i.e.,* p) causes innocents to invest more in precautions (*i.e.,* ds/dp can be positive).

The reason public enforcement tends to dominate private enforcement is the state is better able than the individual to commit *ex ante* to carry out costly enforcement activities *ex post*. When the individual can make *ex ante* commitments (*e.g.,* sign contracts or take precautions), then the dominance of public enforcement is no longer assured.

While this paper's results are insightful, it is also true, as has been noted throughout, that a number of simplifying assumptions have been made. Although I doubt any of these assumptions are so critical as to overturn the results, it is nevertheless worth reviewing some of them and speculating on what future research could find as it relaxes these assumptions.

Asymmetric information at the time of bargaining can generate a motive for state intervention in private contracting [see Hermalin and Katz, 2005,

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for a general discussion]. Many fraud standards have to do with misrepresentation, a wrong doing that is only feasible under asymmetric information. Hence, an interesting extension would be to consider whether there is scope for criminalizing certain behavior related to contracting given asymmetric information.

Another issue is the political economy of crime. Here, it has simply been assumed that the society puts in place efficient laws. This view rests, in part, on the supposition that, when laws are made, the members of society are uncertain of the role they will later play. In reality, different members of society have a sense of their ultimate role. Furthermore, different innocents will have differing views about the level of deterrence. For instance, as her loss, L, increases, an innocent's marginal utility from an increase in the effectiveness of deterrence, σ, increases. Hence, high-L innocents will have a greater willingness to pay taxes to support more deterrence than low-L innocents. Consequently, it will matter who in the society has the power to set the standards of enforcement and who in the society pays the taxes.[17]

By exploring the value of the state's ability to commit *ex ante* to *ex post* enforcement in combination with issues such as these and others, it should be possible to shed more light on what gets criminalized and what doesn't.

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[17]For instance, the American Civil Liberties Union (ACLU) maintains that American drug laws are unduly tough on the poor because the majority who determine the laws through their voting for legislatures do not fully account for the interests of the poor in their decision making. Source: ACLU web page.

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