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PLEA BARGAINING AND PROSECUTORIAL DISCRETION

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ABSTRACT

A model of plea bargaining with asymmetric information is presented. The prosecutor's private information consists of the strength of the case, while the defendant's private information is his or her own guilt or innocence. A sequential equilibrium is computed, in which a fraction of cases are dismissed because they are too likely to involve an innocent defendant; in the remaining cases, the prosecutor's offer of a sentence in exchange for a plea of guilty signals the strength of the case. I then ask whether the prosecutor (and society) might be better off if constrained to make the same offer to all defendants, regardless of the strength of the case. It is shown that, depending upon other features of the criminal justice system and upon the preferences of society, either of these regimes may be preferred to the other. In particular, it is possible that unlimited discretion is disadvantageous for the prosecution (since it carries with it the requirement of sequential rationality).

PLEA BARGAINING AND PROSECUTORIAL DISCRETION

Jennifer F. Reinganum*

1. INTRODUCTION

Plea bargaining is a prominent feature of the criminal justice system. According to Alschuler (1981, p. 652), "it is commonly estimated that 90% of all criminal convictions are the result of guilty pleas." Moreover, a large fraction of cases are simply dismissed; based upon a sample of 1,382 felony arrests in New York City in 1971, the Vera Institute of Justice (1977, p. 7) estimates that "Forty-three percent of the felony arrests were disposed of by dismissal."

Under current practice, prosecutors have essentially unlimited discretion to dismiss a case, or to negotiate a guilty plea to a lesser crime, thereby guaranteeing a lighter sentence. Much controversy surrounds the exercise of prosecutorial discretion. While it is acknowledged that guilty pleas save resources which would otherwise be devoted to trials, one major concern of opponents to plea bargaining is that the prosecutor is in an unfairly strong bargaining position. "The most common and most powerful market-failure argument is that plea bargains are not voluntary sales by defendants of their rights but are instead coerced responses to threats by prosecutors and judges" (Easterbrook, 1983, p. 311). One source of bargaining strength for the prosecutor is simply the fact that the defendant is required to deal with him or her, and cannot "shop" for a better deal.

Another asymmetry between the bargaining positions of the prosecutor and the defendant stems from the fact that the prosecutor typically has better information about the strength of the case than does the defendant. The prosecution has presumably interviewed witnesses (including the defendant) and gathered evidence (which might or might not subsequently be found admissible). In the modal criminal case, the time and investigative resources available to the defense are a fraction of those available to the prosecution. Thus although in principle the defense may have equal access to evidence and witnesses,[1] in practice they rely on summary data from the prosecution. It seems likely that in this case there will remain some uncertainty on the part of the defense regarding the strength of the prosecution's case.

In this paper, a model of the plea bargaining process in the presence of asymmetric information is developed.[2] While the issue of the desirability of prosecutorial discretion is not resolved in complete generality, two regimes of varying extents of discretion are compared. In the first, the prosecutor has discretion to offer an arbitrary sentence in exchange for a plea of guilty, with a sentence of length 0 interpreted as a dismissal. In the second, plea bargaining is still permitted, but all defendants must be offered the same sentence.[3] It is shown that, depending upon other features of the criminal justice system and upon the preferences of society, either of these regimes may be preferred to the other. In particular, it is possible that unlimited discretion is disadvantageous for the

Assumption 2. $f'(\pi) > 0$ for all $\pi \in [0,1]$; that is, the better the case against the defendant, the greater is the likelihood of guilt.

Define $E_t(\pi \mid \delta)$ to be the defendant of type t's expectation of π, given that π belongs to the set $\delta \subseteq [0,1]$.

Assumption 3. $E_g(\pi \mid \delta) \geq E_i(\pi \mid \delta)$ for all δ; that is, the distribution of (t,π) is such that, given $\pi \in \delta$, a guilty defendant faces a stronger case (in expectation) than does an innocent defendant.

In the Appendix, it is shown that the distribution $G(\pi,i) = \eta[1 - e^{-h_i \pi}]/[1 - e^{-h_i}]$ and $G(\pi,g) = (1-\eta)[1 - e^{-h_g \pi}]/[1 - e^{-h_g}]$, with $h_i > h_g$, satisfies Assumptions 1, 2 and 3 for subsets δ of the form $[a,b]$.

Suppose s is the sentence offered in a plea bargain, and x is the sentence anticipated upon conviction in court; s and x are nonnegative and represented in terms of utility. Let k denote the disutility of trial for the defendant. A *strategy* for the defendant of type t is a function $\rho = p_t(s)$ specifying the probability that the defendant rejects a sentence offer of s. We can write the expected utility to a type t defendant who is offered the sentence s and rejects it with probability ρ as:

$$DU_t(s,\rho;\delta(s)) = -\rho[E_t(\pi \mid \delta(s))x + k] - (1-\rho)s, \tag{1}$$

where $\delta(s)$ describes the defendant's *beliefs* upon observing s; that is, $\delta(s)$ is the set of types π which the defendant believes would offer s; note that this is not subscripted, because there is no reason for different defendants to have different conjectures about this set of types. However, the expectation is subscripted because the innocent and guilty may assign different distributions over the set $\delta(s)$ because (π,t) are jointly distributed. However, if the plea bargain s reveals π, then the guilty and innocent will have identical (degenerate) expectations about π given an offer of s. In this case, they might as well use the same strategy $\rho = p(s)$.[4] When the sentence offer does not reveal π, then the two types of defendants will use different strategies: $p_t(s)$, for $t = g,i$.

Assumption 4. When both defendant types are indifferent about accepting or rejecting a sentence offer s, they use the same strategy $p(s)$.

The objective function of the prosecutor is assumed to coincide with that of society at large, and involves three goals: appropriate punishment of the guilty, avoidance of punishment of the innocent and the conservation of resources spent on trials. The first two of these three goals are made explicit in the following excerpt from the Supreme Court opinion in Berger *v.* U.S. (quoted in Jackson, 1984, p. 143).

Proposition 1. A sequential equilibrium for this model is for the prosecutor to offer $s^* = 0$ (i.e., dismiss the case) if $\pi < \pi_0$; otherwise offer $s^* = \pi x + k$. Let $\underline{s} = \pi_0 x + k$ and $\bar{s} = x + k$. Then the defendant (whether guilty or innocent) rejects the offer s with probability $p^*(s) = 1$ if $s > \bar{s}$, with probability $p^*(s) = 1 - \exp\{[A(\underline{s}) - A(s)]/c\}$ for $s \in [\underline{s}, \bar{s}]$, and with probability $p^*(s) = 0$ if $s < \underline{s}$. Finally, the defendants' conjectures are $\delta^*(s) = 1$ for $s \geq \bar{s}$, $\delta^*(s) = (s - k)/x$ for $s \in [\underline{s}, \bar{s}]$, $\delta^*(s) = \pi_0$ for $s \in (0, \underline{s})$, and $\delta^*(s) = [\pi_\alpha, \pi_0)$ for $s = 0$.

PROOF. Given $\delta^*(s)$, is $p^*(s)$ optimal? For $s > \bar{s}$, $\delta^*(s) = 1$ and $DU_t = -\rho(x + k) - (1 - \rho)s$, so $p^* = 1$ is optimal. For $s \in [\underline{s}, \bar{s}]$, $\delta^*(s) = (s - k)/x$ and $DU_t = -\rho s - (1 - \rho)s$, so any ρ works. Thus $p^*(s) = 1 - \exp\{[A(\underline{s}) - A(s)]/c\}$ is optimal for $s \in [\underline{s}, \bar{s}]$. For $s \in (0, \underline{s})$, $\delta^*(s) = \pi_0$ and $DU_t = -\rho(\pi_0 x + k) - (1 - \rho)s$, so $p^* = 0$ is optimal for $s \in (0, \underline{s})$. Finally, for $s = 0$, $\delta^*(s) = [\pi_\alpha, \pi_0)$; since $E_t(\pi \mid [\pi_\alpha, \pi_0)) \geq \pi_\alpha$, $DU_t = -\rho[E_t(\pi \mid [\pi_\alpha, \pi_0))x + k] - (1 - \rho)s$ implies that $p^* = 0$ is optimal.

Given $p^*(s)$, is $s^*(\pi)$ optimal? Since $p^*(s)$ is the same for both defendant types, we can use the prosecutor's payoff as described in equation (3). For $\pi < \pi_0$, $PU(\pi, s; p^*(s)) < 0$ for all positive values of s while $PU(\pi, 0; p^*(0)) = 0$, so $s^*(\pi) = 0$ is optimal for $\pi < \pi_o$. For $\pi \geq \pi_0$, $PU(\pi, \bar{s}; p^*(\bar{s})) > PU(\pi, s; p^*(s))$ for $s > \bar{s}$ and $PU(\pi, \underline{s}; p^*(\underline{s})) > PU(\pi, s; p^*(s))$ for $s < \underline{s}$. So $s^*(\pi) \in [\underline{s}, \bar{s}]$ for $\pi \geq \pi_0$. Differentiating $PU(\pi, s; p^*(s))$ with respect to s and equating to zero yields

$$dPU/ds = \exp\{[A(\underline{s}) - A(s)]/c\}\{[A'(s)/c][-c + a(\pi)(\pi x + k - s)] + a(\pi)\} = 0.$$

Upon noting that $\exp\{\cdot\}$is never zero, and that $A'(s) = a((s - k)/x)$, this simplifies to

$$a(\pi)(\pi x + k - s) = c[a((s - k)/x) - a(\pi)].$$

Since $a(\cdot)$ is an increasing function, whenever the left-hand side is positive, the right-hand side is negative, and vice versa. Thus the only solution is $s = \pi x + k$. That is, the function $PU(\pi, s; p^*(s))$ has a unique stationary point at $s^* = \pi x + k$. Moreover, the second derivative of $PU(\pi, s; p^*(s))$ with respect to s is negative at s^*. Thus s^* provides a local maximum. But it is also a global maximum because otherwise there would have to be an interior local minimum between the local maxima, but there are no other stationary points of $PU(\pi, s, p^*(s))$.

Finally, we need to check consistency: $\delta^*(s) \subseteq [\pi_a, 1]$ for all s. Moreover, $\delta^*(s^*(\pi)) = \pi$ for $\pi \in [\pi_0, 1]$ and $\delta^*(0) = [\pi_\alpha, \pi_0)$, which is exactly the set of cases dismissed by the prosecutor (i.e., offered $s^* = 0$).

Notice that the equilibrium consists of two portions. One involves complete pooling for prosecutor types $\pi < \pi_0$ while the other involves complete separation for types $\pi \geq \pi_0$. Under the assumption that when the sentence offer reveals the strength of the case, both types of defendant use the same strategy $p(s)$, the uniqueness proof in Reinganum and Wilde (1986) can be adapted to show that the separating portion of the equilibrium is unique. If this symmetry assumption is relaxed, I have been unable to rule out the possibility of a separating equilibrium in which the two defendant

Alschuler (1981, p. 708) remarks that "... when a prosecutor does entertain serious doubts concerning a defendant's factual guilty, he is likely to decline to prosecute ..." and Silberman (1980, p. 367) concludes that "Most prosecutors believe that they should not press charges unless they are convinced of the defendant's guilt." In addition, when a case is not dismissed, the likelihood that it will be resolved by a guilty plea is greater the weaker is the case, which is one plausible interpretation of Alschuler's (1968, p. 60) statement: "... the greatest pressures to plead guilty are brought to bear on defendants who may be innocent. The universal rule is that the sentence differential between guilty-plea and trial defendants increases in direct proportion to the likelihood of acquittal."

3. THE MODEL WITH RESTRICTED DISCRETION

The model of Section 2 involved considerable discretion upon the part of the prosecutor. Alternatively, prosecutors might be constrained to offer the same sentence to all defendants; or they might be constrained to go to trial in all cases. When the former interpretation is taken, then the prosecutor must make a "pooling" offer, and this can result in self-selection by the defendant types (because they have different expected values of π though they share the same support). Let E_t denote type t's prior expectation over π (conditional on arrest): $E_t = \int_{\pi_\alpha}^{1} \pi d\Phi(\pi \mid t)/[1-\Phi(\pi_\alpha \mid t)]$. By Assumption 3, $E_g - E_i > 0$; the guilty defendant expects a greater likelihood of conviction than does the innocent defendant.

If a pooled offer s is made, it is the expectation E_t which governs the defendant's decision.

$$DU_t(s,\rho;[\pi_\alpha,1]) = -\rho(k + E_t x) - (1-\rho)s.$$

The innocent defendant rejects s if and only if $s > s_0 = E_i x + k$, while the guilty defendant rejects s if and only if $s > s^0 = E_g x + k$. Thus any offer $s \in (s_0, s^0]$ will be rejected by the innocent and accepted by the guilty.

Is it possible that an ex ante restriction requiring the prosecutor to make the same offer to all parties could improve the prosecutor's welfare?

If an offer of $s \in (s_0, s^0]$ is made, it is accepted by the guilty and rejected by the innocent; thus the best such offer is $s = s^0$, which yields expected prosecutor utility of

$$U_1 = q\gamma s^0 - (1-q)[c + \lambda(E_i x + k)]. \tag{5}$$

Any offer $s > s^0$ is rejected by all defendants, yielding expected prosecutor utility of

$$U_2 = -c + q\gamma(E_g x + k) - (1-q)\lambda(E_i x + k). \tag{6}$$

Finally, any offer $s \le s_0$ is accepted by all defendants, yielding expected prosecutor utility of

$$U_3(s) = [q\gamma - (1-q)\lambda]s. \tag{7}$$

Rewriting U_1 in these same terms yields

$$U_1 = \int_{\pi_\alpha}^{1} \gamma[\pi x + k] q d\Phi(\pi \mid g)/[1 - \Phi(\pi_\alpha \mid g)]$$
$$- \int_{\pi_\alpha}^{1} [c + \lambda(\pi x + k)](1 - q) d\Phi(\pi \mid i)/[1 - \Phi(\pi_\alpha \mid i)].$$

Comparing the coefficients of $(1 - q)d\Phi(\pi \mid i)/[1 - \Phi(\pi_\alpha \mid i)]$, we see that restricting discretion results in a loss for each innocent defendant, since $PU^*(\pi) \geq 0 > -[c + \lambda(\pi x + k)]$ for all $\pi \in [\pi_\alpha, 1]$. However, restricting discretion results in a gain for each guilty defendant. Comparing the coefficients of $qd\Phi(\pi \mid g)/[1 - \Phi(\pi_\alpha \mid g)]$ above yields $\lambda[\pi x + k] > PU^*(\pi) = 0$ for $\pi < \pi_0$; and $PU^*(\pi) = a(\pi)(\pi x + k) - \hat{p}(\pi)c$, where $a(\pi) = f(\pi)\gamma - [1 - f(\pi)]\lambda > 0$ for $\pi > \pi_0$. Thus $PU^*(\pi) < \gamma[\pi x + k]$ if and only if $(a(\pi) - \gamma)(\pi x + k) - \hat{p}(\pi)c < 0$. Since $a(\pi) - \gamma = -[1 - f(\pi)](\gamma + \lambda)$, this inequality holds for all $\pi \geq \pi_0$. Thus if the proportion of guilty defendants (q) is sufficiently high, these gains outweigh the losses suffered on the innocent defendants.

Such an ex ante restriction on discretion can enhance the payoff to society because in sequential equilibrium the prosecutor must behave optimally given its private information (if it has discretion). It may be better to be constrained to ignore this information rather than to act optimally upon it, because of strategic considerations (i.e., the response of the strategic defendants).

It is also interesting to note that the defendants' preferences are the opposite of society's in the two cases described above. The ex ante expected utility to the defendant of type t under discretion is $EDU_t^* = EDU_t(\hat{p}(\pi), s^*(\pi); \delta^*(s^*(\pi)))$, or

$$EDU_t^* = -\int_{\pi_0}^{1} (\pi x + k) d\Phi(\pi \mid t)/[1 - \Phi(\pi_\alpha \mid t)].$$

When $s = 0$ is the optimum with restricted discretion, expected utility for the type t defendant is $EDU_t^r = 0$, so both types of defendant prefer restricted discretion. On the other hand, when $s = s^0$ is the optimum with restricted discretion,

$$EDU_t^r = -\int_{\pi_\alpha}^{1} (\pi x + k) d\Phi(\pi \mid t)/[1 - \Phi(\pi_\alpha \mid t)].$$

Thus both types of defendant weakly prefer discretion, with this preference being strict if $\pi_0 > \pi_\alpha$. It is possible for all defendants to have one preference and society the opposite because society's preferences depend inversely on the welfare of guilty defendants (at least up to the maximum penalty $x + k$) and directly on the welfare of innocent defendants.

5. CONCLUSIONS

The finding that an ex ante restriction upon prosecutorial discretion can be welfare-improving suggests that arrest standards are important determinants of the institutional forms of related aspects of the criminal justice system. That is, low arrest standards make discretion optimal since bad cases (cases likely to involve innocents) must be weeded out. On the other hand, high arrest standards make a lack of discretion optimal since one can extract higher penalties from guilty

APPENDIX

Example. Let $G(\pi,i) = \eta[1 - e^{-h_i \pi}]/[1 - e^{-h_i}]$ and $G(\pi,g) = (1-\eta)[1 - e^{-h_g \pi}]/[1 - e^{-h_g}]$, where $h_i > h_g$ and $\pi \in [0,1]$. We wish to verify that Assumptions 1, 2 and 3 (for δ of the form $[a,b]$) are satisfied.

Assumption 1. The fraction of guilty among those arrested is $q(\pi_\alpha) = [G(1,g) - G(\pi_\alpha,g)]$ $/[G(1,g) - G(\pi_\alpha,g) + G(1,i) - G(\pi_\alpha,i)]$. Then $q'(\pi_\alpha) > 0$ if and only if $dG(\pi_\alpha,i)[G(1,g)$ $- G(\pi_\alpha,g)] > dG(\pi_\alpha,g)[G(1,i) - G(\pi_\alpha,i)]$. For our example, this inequality is equivalent to $h_i/[1 - e^{-h_i(1-\pi_\alpha)}] > h_g/[1 - e^{-h_g(1-\pi_\alpha)}]$. Let $y(h) = h/[1 - e^{-h(1-\pi_\alpha)}]$; since $y'(h) > 0$ for $\pi_\alpha \in [0,1)$ and since $h_i > h_g$, it follows that $q'(\pi_\alpha) > 0$ for all $\pi_\alpha \in [0,1)$.

Assumption 2. The probability of guilt conditional upon π is $f(\pi) = dG(\pi,g)/[dG(\pi,g) + dG(\pi,i)]$. Differentiating and collecting terms implies that $f'(\pi) > 0$ if and only if $dG(\pi,i)/d^2G(\pi,i)$ $> dG(\pi,g)/d^2G(\pi,g)$. For our example, this inequality becomes $-1/h_i > -1/h_g$ or $h_i > h_g$.

Assumption 3. The conditional expectation of π, given the defendant's type and given that $\pi \in [a,b]$ is

$$E_t(\pi \mid [a,b]) = \int_a^b \pi d\Phi(\pi \mid t)/[\Phi(b \mid t) - \Phi(a \mid t)]$$
$$= a + \int_a^b [\Phi(b \mid t) - \Phi(\pi \mid t)]/[\Phi(b \mid t) - \Phi(a \mid t)] d\pi.$$

For our example, $[\Phi(b \mid t) - \Phi(\pi \mid t)]/[\Phi(b \mid t) - \Phi(a \mid t)] = [e^{-h_t \pi} - e^{-h_t b}]/[e^{-h_t a} - e^{-h_t b}]$. Since $w(h) = [e^{-h\pi} - e^{-hb}]/[e^{-ha} - e^{-hb}]$ is non-increasing in h for $\pi \in [a,b]$, $h_i > h_g$ implies $w(h_i) \le w(h_g)$ for $\pi \in [a,b]$. Thus $E_i(\pi \mid [a,b]) \le E_g(\pi \mid [a,b])$.

Alternative out-of-equilibrium beliefs. We claim that a sufficient condition for the equilibrium strategies of Proposition 1 to be robust to out-of-equilibrium beliefs is: $\pi_o \le c/\lambda x$. To see this, recall that since $E_g(\pi \mid \delta(s)) \ge E_i(\pi \mid \delta(s))$ for all $\delta(s)$, if the type i defendant strictly prefers to accept s, then so does the type g defendant. Thus (assuming identical behavior when both defendant types are indifferent), only three types of asymmetric behavior can arise: (1) g accepts s and i rejects s; (2) g randomizes due to indifference and i rejects s; and (3) g accepts s and i randomizes due to indifference.

Consider first the case of identical behavior. For $s \notin 0 \cup [\underline{s},\overline{s}]$,

$$PU(\pi,s;p(s)) = p(s)[-c + a(\pi)(\pi x + k)] + [1 - p(s)]a(\pi)s$$

for some $p(s) \in [0,1]$. Note that any $s > \overline{s}$ is optimally rejected by both defendant types regardless of their beliefs. Let $PU^*(\pi) = PU(\pi,s^*(\pi);p^*(s^*(\pi)))$. Since $PU^*(\pi) = a(\pi)(\pi x + k) - \hat{p}(\pi)c$ $> a(\pi)(\pi x + k) - c$ for all $\pi \ge \pi_o$, no such π would offer $s > \overline{s}$. Similarly, $PU^*(\pi) = 0$

Proof of Proposition 2. (a) Recall that $p^*(s) = 1 - \exp\{[A(\underline{s}) - A(s)]/c\}$. Note that $A(\cdot)$ also depends upon the parameters k, x, γ and λ: $A(s; k, x, \gamma, \lambda) = \int a((s-k)/x)ds$, where $a(\cdot) = f(\cdot)\gamma - (1 - f(\cdot))\lambda$. The results that $p^{*\prime}(s) > 0$ and $\partial p^*(s)/\partial c < 0$ are immediate. Differentiation of $p^*(s)$ with respect to any other parameter m yields the following formula:

$$\partial p^*(s)/\partial m = -(1/c)\exp\{[A(\underline{s}) - A(s)]/c\}[A'(\underline{s})(d\underline{s}/dm) + \partial A(\underline{s})/\partial m - \partial A(s)/\partial m].$$

Since $A'(\underline{s}) = a(\pi_0) = 0$, $sgn\, \partial p^*(s)/\partial m = sgn[\partial A(s)/\partial m - \partial A(\underline{s})/\partial m] = sgn\, \partial^2 A(s)/\partial m\, \partial s$ $= sgn\, \partial a((s-k)/x)/\partial m$.

The claims of Theorem 2(a) then follow from the facts that $\partial a((s-k)/x)/\partial k$ $= a'((s-k)/x)(-1/x) < 0$, $\partial a((s-k)/x)/\partial x = a'((s-k)(-1/x^2) < 0$, $\partial a((s-k)/x)/\partial\gamma$ $= f((s-k)/x) > 0$ and $\partial a((s-k)/x)/\partial\lambda = -(1 - f((s-k)/x)) < 0$.

(b) Recall that $s^* = \pi x + k$; the claimed results are immediate.

(c) For $\hat{p}(\pi) = 1 - \exp\{[A(\underline{s}) - A(s^*(\pi))]/c\}$, the results that $\hat{p}'(\pi) > 0$ and $\partial\hat{p}(\pi)/\partial c < 0$ are immediate. Differentiating with respect to any other parameter m yields

$$\partial\hat{p}(\pi)/\partial m = -(1/c)\exp\{[A(\underline{s}) - A(s^*(\pi))]/c\}\{A'(\underline{s})(d\underline{s}/dm)$$
$$- A'(s^*)(ds^*/dm) + \partial A(\underline{s})/\partial m - \partial A(s^*)/\partial m\}.$$

Again, $A'(\underline{s}) = a(\pi_0) = 0$, and $ds^*/dm = 0$ for γ and λ, so $sgn\; \partial\hat{p}(\pi)/\partial m$ $= sgn\; \partial^2 A(s)/\partial m\, \partial s = sgn\; \partial a((s-k)/x)/\partial m$ for $m = \gamma$ and λ. The results that $\partial\hat{p}(\pi)/\partial\gamma > 0$ and $\partial\hat{p}(\pi)/\partial\lambda < 0$ then follow from the facts that $\partial a((s-k)/x)/\partial\gamma = f((s-k)/x) > 0$ and $\partial a((s-k)/x)/\partial\lambda = -(1 - f((s-k)/x)) < 0$. For $m = k, x$ there are two conflicting effects; $sgnA'(s^*)(\partial s^*/\partial m) > 0$, while $sgn\, \partial a((s-k)/x)/\partial m < 0$. Thus the signs of $\partial\hat{p}(\pi)/\partial k$ and $\partial\hat{p}(\pi)/\partial x$ are indeterminate at this level of generality.

Proof of Proposition 3. Substituting for s^0 in equation (5), it is clear that $U_1 \geq U_2$; it is never optimal to take all cases to trial. Comparing U_1 and U_3 gives the following four cases:

Case 1. For $q \geq \max\{\lambda/(\gamma+\lambda),\, c/(\gamma x(E_g - E_i) + c)\}$, $s = s^0$ is optimal and the payoff is given by U_1.

Case 2. For $q \in [\lambda/(\gamma+\lambda),\, c/(\gamma x(E_g - E_i) + c)]$, $s = s_0$ is optimal and the payoff is given by U_3.

Case 3. For $q \in [(c + \lambda[E_i x + k])/(\gamma[E_g x + k] + \lambda[E_i x + k] + c),\, \lambda/(\gamma+\lambda)]$, $s = s^0$ is optimal and the payoff is given by U_1.

Case 4. For $q \leq \min\{(c + \lambda[E_i x + k])/(\gamma[E_g x + k] + \lambda[E_i x + k] + c),\, \lambda/(\gamma+\lambda)\}$, $s = 0$ is optimal and the payoff is given by U_3.

Actually, when the interval in Case 2 is non-empty, the interval in Case 3 is empty and vice versa. This allows the simplification in Proposition 3.

FOOTNOTES

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1. In a related paper, Grossman and Katz (1983, p. 752) assume the probability of conviction differs for guilty and innocent defendants, and that these probabilities are common knowledge, arguing that the prosecutor is constitutionally required to provide to the defendant all of the state's evidence against him or her, as well as a summary of what is necessary for conviction (Brady v. Maryland, 1963). By contrast, Alschuler (1968, p. 66) claims that "the discovery privileges of the defense are highly restricted, and even the limited right of discovery that the law affords may be frustrated until plea negotiations are concluded."
2. Reinganum and Wilde (1986) examined the problem of the settlement and litigation of civil suits using a signalling model. Because this paper also addresses legal bargaining with private information, it is important to distinguish this paper from the previous one. In that paper, the plaintiff had private information about the extent of damages suffered, and made a settlement demand which was either accepted or rejected by the defendant. Aside from the costs of trial, the interests of the plaintiff and defendant were always opposed, since the amount of the settlement was a transfer between the parties. The issue of primary interest was how the likelihood and the amount of the settlement was affected by various litigation cost allocation systems. In this paper, the prosecutor has private information about the strength of the case, and the defendant has private information about his or her guilt or innocence. The interests of the prosecutor and the defendant are not always opposed, since the prosecutor is assumed to suffer along with innocent defendants. Finally, I ask whether an ex ante restriction on the prosecutor's discretion in offering plea bargains can improve social welfare. Thus the nature of the private information, the forms of the objective functions and the questions addressed by the two papers are quite different, although there are some obvious formal similarities. Previous analyses which are primarily relevant to the case of civil litigation include Bebchuk (1984), Gould (1973), Landes (1971), P'ng (1983), Salant (1984), Samuelson (1983) and Shavell (1982).
3. This paper is similar (but not identical) to that of Grossman and Katz (1983) in its treatment of the prosecutor's (and society's) objective function. They assume that only the defendant has private information (about his or her guilt or innocence), and show that plea bargaining may be preferred to a system of trial for all because it serves an insurance and (possibly) a screening function. Because the private information is one-sided, a single offer is made to all defendants; thus selective dismissals are not possible. In our model both parties have private information (which is correlated); thus offers can be individualized and cases can be selectively dismissed. However, the regime with restricted discretion is quite similar to their model because a single offer is made to all defendants.
4. One reason to expect both types of defendant to use the same function $p(s)$ is that defense attorneys are responsible for "decoding" the sentence offer and advising the defendant about its acceptability. Since the defense attorney is also unaware of the guilt or innocence of his client,

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