

Sentencing guidelines, judicial discretion and plea bargaining

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The United States Sentencing Commission was created to develop federal sentencing guidelines, which restrict judicial discretion and were found to increase the average sentence length while leaving unchanged the likelihood of resolution through plea bargaining. A game theoretic model is developed in which a sentencing commission may impose guidelines or defer to judicial discretion; then a defendant and a prosecutor engage in plea bargaining; finally, those cases that fail to settle go to trial, where a sentence is determined according to the guidelines, if imposed, or, if not, according to judicial discretion. Equilibrium behavior is consistent with the aforementioned findings.

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1. Introduction

When one level of a hierarchy devises rules for a sub-level, conflict can arise even if both levels are in full agreement about the goals of the hierarchy. The source of this conflict is the timing of the decisions that the rules affect and the availability of information that the timing implies. A good example of this conflict is the one which arose between the United States Sentencing Commission (hereafter USSC) and the federal judiciary concerning sentencing guidelines which restrict the exercise of judicial discretion¹ in sentencing.

In this paper, the USSC and the federal sentencing guidelines are described. Empirical characterizations of the impact of the guidelines on sentence length and plea bargaining, as assessed by the USSC, are presented. A hierarchical model of sentencing is then developed in which a sentencing commission, prosecutors, defendants and judges all interact. Although the sentencing commission and the judges agree about the goal being pursued, differences in timing and information lead them to make different decisions regarding sentencing. The equilibrium implications of the model are consistent with the aforementioned empirical characterizations.

The Sentencing Reform Act of 1984 delegated to the USSC (an independent agency in the judicial branch of government) the authority to review and “rationalize” the federal sentencing process and, in particular, to develop detailed guidelines specifying appropriate sentences for offenders convicted of federal crimes. These guidelines prescribe a range of sentences based on characteristics of the offense and the offender, leaving a narrow margin of judicial discretion within the prescribed sentence range.² If the court wishes to sentence outside this range, it must detail its reasons, and such deviations (referred to by the USSC as “departures”) can be appealed by either side. The Act also abolishes parole, so that the sentence given is the sentence served (with small reductions for good behavior).

According to Freed (1992, p. 1719), groups such as the Judicial Conference of the United States and the American Bar Association favored delaying the imposition of guidelines until legislative hearings could be held. However, Congress did not take this advice, and the guidelines went into effect in 1987. Lawsuits challenging the constitutionality of the guidelines followed, but the Supreme Court upheld the constitutionality of the guidelines by an eight-to-one vote in the case of *Mistretta v. United States* in 1989. The USSC was given the on-going task of monitoring federal sentencing practices and revising the guidelines as the need arises.

The motivation for such guidelines included at least the following arguments. First, the then-current system of indeterminate sentencing with parole made it difficult for either the offender or the state to form a reasonable estimate of the actual sentence; definitive sentencing guidelines were believed to provide honesty in sentencing. Second, the sentencing guidelines were intended to reduce observed disparity in sentencing across apparently similar cases. Finally, the sentencing guidelines would build in proportionality in sentencing by conditioning the prescribed sentence on offense and offender characteristics. The USSC asserted that these desiderata could be supported either by reference to the principle of “just deserts” or to the principle of deterrence, so it did not take a particular philosophical approach to enforcement.

In an attempt to provide continuity while reducing disparity, for most offenses the guideline range was centered on the previous average sentence. This mechanical procedure does not guarantee that the average sentences before and after the guidelines will be equal, even ignoring the potential impact of guidelines on the selection of cases coming to trial. For some offenses, notably those involving drugs and guns, the guidelines incorporated many mandatory minimum sentences³ contained in laws enacted by Congress. For some property crimes, there was a deliberate move to reduce the use of probation in favor of shorter, but more certain, periods of incarceration. Finally, some penalties were raised to maintain consistency; for instance, Jeffrey S. Parker and Michael K. Block, a former member of the USSC (1989,

p. 315), say that “increases in antitrust sentences were intended to rationalize antitrust offenses with fraud offenses, on the premise that many criminal antitrust offenses, which predominantly involve bid-rigging, are a form of fraud.”

The guidelines are widely perceived to provide harsher penalties than would occur under judicial discretion, in part because of the aforementioned structural changes and in part due to extremely negative initial judicial reaction (see Freed, 1992, for examples). If this perception that the guidelines provide harsher sentences than had previously occurred (or would occur) under judicial discretion is correct, then it should be the case that average sentence lengths have increased under the guidelines. The increase in mean sentence length since the adoption of the guidelines is documented in USSC Table D-13 (1991, p. D-13). Using monthly data from July 1984 to June 1990, the USSC regressed mean sentence on dummy variables for four interventions which might be expected to affect sentence lengths: the Anti-Drug Abuse Act of 1986 (ADAA86), the Anti-Drug Abuse Act of 1988 (ADAA88), the implementation of the guidelines (in 1987) and the *Mistretta* decision (in 1989). They found that all but ADAA88 had a positive and significant effect on mean sentence length, and an increase in average sentence length of 8.19 months was attributed to the combined effects of guideline implementation and the *Mistretta* decision (USSC Table 137, 1991, p. 372). Separate analyses were conducted for drug offenses (Table D-15) and for robbery (Table D-17), with similar results: both the guidelines and the *Mistretta* decision had positive and significant effects on mean sentence length (with a combined increase of 7.7 months for drug offenses and 14.78 months for robbery; see Table 137). Mean sentence lengths for economic crimes⁴ (taken as a group) were found to be stable over this time period (the coefficients were positive but insignificant).

Further evidence that the guidelines impose higher sentences than would occur under judicial discretion involves an assessment of sentence placement within the guideline range and the direction and extent of departures from the guideline range. USSC Table 32 (1995a) reports that during the time period October 1, 1994 - September 30, 1995, 91.9% of all federal criminal convictions involved a guilty plea

and 66.1% of all federal sentences fell within the guideline range. The range is divided into quarters, with 44.1% of all sentences falling into the first quarter of the guideline range, 9.2% falling into the second quarter, 3.5% falling into the third quarter and 9.3% falling into the fourth quarter. Of course, there is substantial variation across different offenses, but the pattern is distinctly “clumped” toward the lower end of the range (even for economic crimes such as larceny, fraud, embezzlement, counterfeiting, tax evasion and money laundering), which is consistent with a desire to give a lower sentence in some cases but being constrained to sentence within the guideline range.

The remaining cases represent departures from the guidelines, with 23% of cases involving a downward departure based on the offender having provided “substantial assistance” to the prosecutor (such departures are authorized by the sentencing guidelines) and 9.8% of cases involving a downward departure for other reasons; only 1.1% of cases involved an upward departure. Moreover, since plea bargaining can result in conviction on a lesser charge (with a correspondingly lower guideline sentencing range), some of the sentences that fell within the guideline range are likely to represent informal downward departures.

The same report documenting the positive impact of the guidelines on sentence length finds no impact of the guidelines or *Mistretta* on the likelihood of trial (USSC 1991, p. 410). “Of particular interest is the lack of an effect associated with the guidelines on the number and proportion of guilty pleas among filed cases. This finding stands in stark contrast to the prediction by some that the guidelines would cause (or have caused) an increase in the rate of defendants going to trial. To the contrary, the data analyses support the conclusion that this has not happened. If the number of trials has increased, it is due to the fact that more cases are being filed; the rate of defendants’ choosing to enter guilty pleas or stand trial has not changed appreciably as a result of guideline implementation.”

Several different measures are reported as reflecting the plea rate. First, the ratio of guilty pleas to cases resolved (either by plea or by trial) can be found from data reported in USSC Table 138 (1991, p. 397) for the years 1984 through 1989. This series is: 88.2%, 88.2%, 85.5%, 86.2%, 85.3% and 87.3%,

where the first three numbers refer to the pre-guidelines regime and the last three numbers refer to the post-guidelines regime. There does not appear to be any perceptible impact in this brief series. Second, the ratio of guilty pleas to cases filed is used in a time series analysis using monthly data from October 1986 through March 1990, reported in USSC Table E-12 (1991, p. E-12). Neither the guidelines implementation nor the *Mistretta* decision had a statistically significant impact on the plea rate. Finally, the ratio of guilty pleas to convictions (usually referred to as the “mode of conviction”) is depicted in USSC Figures 24-26 (1991, pp. 407-409) for drug cases, robbery cases and all cases, respectively, over the same time period using monthly observations. Again there is no discernible impact of either the guidelines implementation or the *Mistretta* decision.⁵

The USSC recognized (the discussion in this paragraph is based on USSC 1995b, p. 5.) that prosecutorial discretion could be problematical, especially since prosecutors’ behavior is difficult to observe. The charge offense system that was adopted, in which the guidelines specify a sentence based on the offense for which the offender is indicted and convicted (rather than his actual behavior⁶) gives prosecutors the ability to influence sentencing by increasing or decreasing the seriousness and/or number of charges in the indictment. Although there is a limit to how much the prosecutor can increase the sentence (since the charges must ultimately be proved), the prosecutor’s ability to decrease the sentence in exchange for a guilty plea does not appear to be substantially limited, especially since charge bargaining may be used very early in the process. The sentencing court must verify that the proposed sentence is within the guidelines for the offense charged, but prosecutorial discretion⁷ is otherwise largely unaffected. The prosecutor and the defense attorney can jointly determine the charges, and sometimes even the facts (e.g., the weight or type of drug involved, whether or not a gun was used), thus determining the guideline sentencing range within which the court will operate.

In this paper, a model of criminal sentencing is developed which compares judicial discretion with sentencing guidelines. It will be assumed that the court and the sentencing commission are in agreement

regarding the desirability of honesty and proportionality in sentencing. Thus, assume that there is a single offense of variable severity (where severity may depend upon offense and offender characteristics). For each level of severity, there is an ideal sentence, about which the court and the sentencing commission are in complete agreement. Moreover, assume that both the court and the sentencing commission are motivated by the desire to minimize the expected squared error between the ideal and the actual sentence imposed in any given case: that is, both the court and the sentencing commission are interested in case-by-case justice.⁸ Thus, if perfect information about the offense and the offender were available at the time of sentencing, the court and the sentencing commission would have no disagreement regarding the optimal sentence. However, if perfect information about the offense or the offender is not available at the time of sentencing, then the sentence can be determined either (a) by judicial discretion, in which case the optimal sentence is that which minimizes the expected squared error, conditional on all information available to the court; or (b) by reference to the sentencing guidelines, which specify a sentence to apply under these circumstances. These two regimes are compared and it is shown that the resulting sentences will differ.⁹

Disagreement between the court and the sentencing commission arises because of plea bargaining, which occurs before trial and sentencing. Plea bargaining results in a biased selection of cases going to trial, and it is this selection of cases that the court observes and decides. When perfect information about the offense or the offender in a given case is unavailable at the time of sentencing, it is this posterior distribution¹⁰ that the court uses to compute its “best guess” about the appropriate sentence. While expectations about this sentence affect the plea bargaining phase (since it is the alternative to which any plea bargain will be compared), the court does not have control over the sentence in cases that settle through a plea bargain.¹¹ On the other hand, the sentencing commission acts not at the time of sentencing, but before any plea agreements are made. Thus, its objective function reflects not only errors in sentencing which may occur at trial due to imperfect information, but also those that occur routinely as a result of plea bargaining. The sentencing commission can commit to a sentence at trial (to be applied in the event of

imperfect information regarding the ideal sentence for a given case) which would be suboptimal *ex post* of trial, but which provides better incentives to the prosecutor *ex ante* of trial, resulting in more appropriate plea bargains.¹² Thus, while it is assumed that the court and the sentencing commission agree in principle about the ideal sentence for a given offense and offender, they act at different times and with different information.

Suppose that the defendant has private information about the true severity of his crime (as measured by his behavior during the offense and his prior criminal history and other characteristics), which allows him to anticipate the sentence which will be imposed if trial reveals this information perfectly (e.g., through the actual trial or the pre-sentencing report). At the time of plea bargaining, the prosecutor knows only the prior distribution over the offense and offender characteristics, and hence only the prior distribution over the sentence in the event of trial. The court is assumed to observe a verifiable public signal (i.e., the trial or pre-sentence report), which is either perfectly informative or perfectly uninformative. If the signal is informative, then true severity is revealed and the court imposes the ideal sentence. In theory, the sentencing commission could also specify a sentence which differs from the ideal sentence in the event that the trial is informative. An unconstrained sentencing commission might choose to do this to further manipulate the downstream plea bargaining stage. However, the sentencing commission is not unconstrained; if there is general agreement about the ideal sentence for a crime of given severity and the trial verifiably reveals that severity, we assume that the commission cannot impose a different sentence (e.g., because the sentence will certainly be modified on appeal given the facts established at trial). Judicial discretion or the sentencing commission's default sentence can only be exercised if the facts of the case remain ambiguous following trial.

If the signal is uninformative, then in a regime of sentencing guidelines the court will impose the specified sentence, which is denoted x^G (although the actual guidelines specify an interval, or sentence range, if they are binding then it is only the binding endpoint that matters). If the signal is uninformative,

then in a regime of judicial discretion the court will impose its “best guess” about the ideal sentence, which is denoted x^J . The prosecutor and the defendant will have common knowledge of x^G in a regime of sentencing guidelines, but in the case of judicial discretion, the prosecutor and defendant will need to form a conjecture about what sentence the court will impose. This common conjecture is denoted x^C ; in equilibrium, this conjecture must be correct: $x^C = x^J$. It will prove economical to define the expression x^T to be the anticipated sentence following trial in the event the public signal (the trial) is uninformative. Then T takes on the index G (in a regime of sentencing guidelines), C (in a regime of judicial discretion prior to the court’s decision) or J (in a regime of judicial discretion after the court’s decision). Notice that judicial discretion only comes into play when the trial itself is not decisive; even then, the court is minimizing its expected squared sentencing error. Thus, judicial discretion in this model does not assume arbitrary, biased or self-interested behavior on the part of the court.

A signaling game is considered in which the informed defendant makes a plea offer, which is accepted or rejected by the prosecutor. Thus, the bargaining power lies with the defendant, who can take advantage of the prosecutor’s desire to avoid trial costs to obtain a reduced sentence relative to what he would receive at trial. In this case, the following results are obtained:

- (1) the defendant’s plea offer is an increasing function of true severity and x^T ; that is, defendants anticipating a higher sentence at trial make higher plea offers.
- (2) the equilibrium probability of trial is a decreasing function of true severity and is independent of x^T ; that is, cases involving greater severity are more likely to be resolved by plea bargain.
- (3) $x^G > x^J$; that is, the optimal sentence as specified by the sentencing guidelines exceeds the court’s optimal sentence under judicial discretion.

It is interesting to compare the implications of these results with the USSC's (1991) findings. Result (3) implies that convicted offenders anticipate a longer expected sentence at trial under sentencing guidelines than under judicial discretion. Result (1) implies that, as a consequence of result (3), defendants make higher plea offers. Thus, regardless of the mode of conviction, the model predicts that the expected sentence will be longer under sentencing guidelines, which is consistent with the data reported earlier on the positive impact of sentencing guidelines on average sentence length. Finally, notice that result (2) implies that the probability of trial is independent of the sentencing regime (guidelines versus judicial discretion) for any given defendant, and thus the *ex ante* expected probability of trial among all defendants is also independent of the sentencing regime. This is consistent with the USSC's finding that the guidelines did not have any discernible impact on the rate of defendants going to trial.

Next the intervening plea bargaining model is extended to a collection of crimes, each of variable severity, but ordered in terms of "seriousness" in that crime j is more serious than crime i if the range of severity for crime j is upward-shifted relative to that of crime i . Thus, murder is more serious than assault because the maximum ideal sentence for murder exceeds that for assault. A further result is:

(4) the equilibrium probability of trial is an increasing function of the seriousness of the crime; that is, cases involving more serious crimes are more likely to go to trial.

This is consistent with the intuition that more serious categories of crimes are less likely to be resolved through a plea bargain, and the intuition itself is correct. In USSC Table 17 (1995a, p. 56), the mode of conviction is broken down by primary offense category. Crimes in which conviction by plea bargain is least likely are murder (67.9%), kidnapping/hostage-taking (79%) and assault (80.2); those in which conviction by plea bargain is most likely are immigration (98.1%), embezzlement (98%) and gambling/lottery violations (97.7%).

Finally, a number of robustness issues are discussed, including the impact of reversing the order of play (i.e., a screening game in which the uninformed prosecutor makes the plea offer and the informed defendant accepts or rejects the offer). Results (1) and (2) above continue to hold, but now examples can be constructed to show that either $x^G > x^J$ or $x^G < x^J$ may hold. The latter outcome can arise in the screening game because the prosecutor has the bargaining power; this can, but need not, result in the sentencing commission constraining judicial discretion by specifying $x^G < x^J$.

In a technical appendix (available from the author upon request), a comparison is also made with the case of imperfect, rather than asymmetric, information. In this case it is shown that the sentencing commission still prefers to restrict judicial discretion, imposing $x^G > x^J$ when the defendant makes the plea offer and $x^G < x^J$ when the prosecutor makes the offer. Alternative prosecutorial objective functions which are more closely aligned with the sentencing commission's objectives are also considered. Even when the prosecutor is assumed to minimize the expected squared sentencing error, the incentive for the sentencing commission to constrain the court remains. This occurs because the more severe cases remain more likely to settle by plea bargain, inducing a difference between the prior distribution of cases and the posterior distribution of cases handled by the court.

2. The basic model

We begin by assuming a particular offense, which is considered to vary in its severity based on differences in the offender's behavior and characteristics. For any given case, the severity of the offense, indexed by the corresponding ideal sentence, is a random variable denoted X . The defendant is assumed to know x , his realized value of X . The prosecutor knows only that X is distributed according to the cumulative distribution function $F(\cdot)$, with density $f(\cdot)$, on the support $[\underline{x}, \bar{x}]$. Finally, if a case goes to

trial, the court receives a verifiable public signal which is either perfectly informative (reveals x) or perfectly uninformative.¹³ The probability that the public signal is uninformative is denoted $\epsilon \in (0,1]$, and is assumed to be independent of the realized value of x .

The model is divided into three stages: commission decision-making, plea negotiations and sentencing. In the first stage, the sentencing commission may determine a sentence, denoted x^G , which applies in those cases which come to trial and for which the public signal is uninformative, or it may leave sentence determination in this event to judicial discretion; that is, the sentencing commission first chooses the regime. Under judicial discretion, the sentence in the event that trial is uninformative will be based upon all information available to the court at that time. This information consists of the prior distribution $F(\cdot)$, the fact that the case came to trial rather than settling, and any inferences that may be drawn from the latter observation. This information is also available to both the prosecutor and the defendant (and the defendant's private information does not give him any "edge" over the prosecutor in predicting the court's choice¹⁴), so it is assumed that they have a common conjecture x^C about what sentence will be imposed by the court in the event that the trial is uninformative.

In the second stage, the defendant and the prosecutor engage in plea negotiations. The model assumes that all defendants are in fact guilty, so that any potential false accusations have already been eliminated (see Reinganum, 1988, for a model in which prosecutors optimally drop cases against defendants for whom the prosecutor's prior probability of guilt is sufficiently low). For the moment, conviction is assumed to be certain, but later we will consider an exogenous probability of conviction $\mu < 1$. In this section, we assume that the defendant makes a plea offer S to the prosecutor, who accepts or rejects it; the alternative order of moves will be examined in Section 4. The defendant's anticipated sentence at trial in the event the public signal is uninformative is denoted x^T . If the sentencing commission has specified a sentence x^G , then $x^T = x^G$. On the other hand, if sentencing in the event of an uninformative signal has been left to judicial discretion, then $x^T = x^C$. The defendant would like to minimize his total loss,

which consists of the expected sentence plus expenditures on trial. Let k^D denote the costs of trial to the defendant (measured in sentence-equivalent terms; this may be very small in the case of an indigent defendant represented by a public defender). If the defendant settles, his loss is simply S . But if he goes to trial, his expected loss is given by $(1 - \epsilon)x + \epsilon x^T + k^D$. Thus, the defendant's strategy consists of a plea offer which may depend on x and x^T , and is denoted $S(x; x^T)$.

Assume that the prosecutor, who considers each case on an individual basis, is motivated to obtain long sentences and to hold down public expenditures on trial costs. For instance, an elected prosecutor may maximize his chances of re-election by being "tough on crime" and "saving the taxpayers' money." Although a federal prosecutor is not elected, he may have aspirations of holding elected (or appointed) office in the future, or may gain other career advancement by being perceived to have done a good job as a prosecutor, and so likewise wants to establish a similar record.

Thus, the prosecutor who settles for a sentence of S receives simply S , while a prosecutor who goes to trial can expect $(1 - \epsilon)b(S; x^T) + \epsilon x^T - k^P$, where k^P is the cost of trial for the prosecutor (measured in sentence-equivalent terms; in the case of an indigent defendant, k^P might also include the cost of the public defender) and $b(S; x^T)$ denotes the prosecutor's beliefs: upon observing S , the prosecutor believes¹⁵ that he is facing a defendant of type $b(S; x^T)$. A strategy for the prosecutor is a function $r(S; x^T)$, denoting the prosecutor's probability of rejecting the plea S . Given an equilibrium plea offer function $S^*(x; x^T)$ and an equilibrium probability of rejection function $r^*(S; x^T)$, the equilibrium probability of trial as a function of x and x^T is $\rho(x; x^T) = r^*(S^*(x; x^T); x^T)$.

Notice that, whether x^T is the conjectured sentence to be determined by the court at the time of sentencing (judicial discretion) or whether it has already been specified by the sentencing commission (sentencing guidelines), it is taken as exogenous by the prosecutor and the defendant. However, in the case of judicial discretion it is the parties' conjectured sentence at trial which is relevant to the plea bargaining (and hence the court's actual choice of this sentence, which occurs later, cannot influence the negotiation

stage) while in the case of sentencing guidelines it is the sentence specified in the first stage which is relevant to the plea bargaining (and hence the specified sentence can influence the negotiation stage).

In the third stage, sentencing occurs. Sentences arising out of plea bargains are assumed to be accepted by the court (with the prosecutor adjusting the charge, if necessary, to achieve consistency with the guidelines by which the court is bound). Any case that has not settled goes to trial, generating a public signal (which may or may not be informative) about its severity. If no discretion remains for the court (i.e., in the case of sentencing guidelines), then if the public signal is informative, x (the ideal sentence) is revealed and the actual sentence is set equal to this ideal sentence, while if the public signal is uninformative, then the court imposes the sentence x^G as specified by the guidelines. Alternatively, in a regime of judicial discretion, the court chooses a sentence so as to minimize the expected squared difference between the ideal sentence and the actual sentence. Thus, if the public signal is perfectly informative, then x is revealed and the actual sentence is set equal to this ideal sentence, while if the public signal is uninformative, then the court chooses x^T to minimize its payoff, denoted $E\Pi^J$, which is taken to be the expected squared sentencing error $E^J[(X - x^T)^2 | \text{trial}]$, where the superscript J on the expectation operator indicates that the court uses its posterior beliefs about the distribution of X given that a case has come to trial.

3. Analysis and results

The court's problem

The problem will be analyzed in reverse order of the stages to assure subgame perfection. If the court has any real choice at the time of sentencing, it is because the sentencing regime involves judicial

discretion. In this case, the behavior of the defendant and the prosecutor is contingent on x^C , their common conjecture about the sentence the court will impose if the public signal is uninformative. Let $H(x; x^C)$ be the court's beliefs, or posterior cumulative distribution function over X , given that trial has occurred. Note that the court's utility function is based only on the outcome in those cases in which it actually plays an active role.¹⁶ This is for two reasons: first, these are the only cases in which the court's decision can have an impact, given its place in the hierarchy; second, it is plausible that these are the cases for which the court feels directly responsible, and which would form the basis for any external evaluation of the court's performance (settled cases being the purview of the prosecutor). Then the court chooses x^T to minimize

$$E\Pi^J(x^T; x^C) \equiv E^J[(X - x^T)^2 | \text{trial}] = \int (x - x^T)^2 h(x; x^C) dx,$$

where $h(x; x^C)$ is the density function for $H(x; x^C)$ and the integral is taken over the domain $[\underline{x}, \bar{x}]$. In the remainder of the analysis, whenever the domain of integration is not specified, it should be understood to be $[\underline{x}, \bar{x}]$. Notice that x^C denotes the common conjecture on the part of the prosecutor and the defendant regarding the sentence that will be imposed (in the event that the public signal is uninformative), while x^J is the actual sentence chosen by the court at the time of sentencing. Thus the best-response value of x^T (given the prosecutor and defendant's common conjecture x^C) is given by

$$BR^J(x^C) = \int x h(x; x^C) dx.$$

In equilibrium, all parties' conjectures and beliefs must be correct. In particular, $h(x; x^C) = \rho(x; x^C)f(x)/\int \rho(y; x^C)f(y)dy$ and $x^C = x^J$. Thus the equilibrium value x^J satisfies

$$x^J = \int x \rho(x; x^J)f(x)dx / \int \rho(y; x^J)f(y)dy. \quad (1)$$

Although the equilibrium court sentence under judicial discretion is related to the equilibrium behavior of the prosecutor and the defendant as described in equation (1), all parties take the others' strategies as given (since the prosecutor is choosing a best response to the defendant's offer and to his conjecture about the sentence the court will impose, the defendant is choosing a best response to the

prosecutor's rejection strategy and to his conjecture about the sentence the court will impose, and the court is choosing a best response to its beliefs about the distribution of cases coming to trial).

Plea negotiations

Now consider the second, or plea negotiations, stage. In this subsection, the summary notation x^T will be used throughout, since the analysis of this stage is the same whether x^T has already been chosen by the sentencing commission or whether it will be chosen later by the court. The unique revealing equilibrium¹⁷ for this game will be characterized. Let $\Pi^P(r, S; b(S; x^T))$ denote the expected utility to the prosecutor when he rejects the plea offer of S with probability r , based on his beliefs $b(S; x^T)$. Then

$$\Pi^P(r, S; b(S; x^T)) = (1 - r)S + r[(1 - \epsilon)b(S; x^T) + \epsilon x^T - k^P].$$

Let $\Pi^D(S, x; r(S; x^T))$ denote the expected disutility to the defendant of type x when he offers a plea of S , given the prosecutor's probability of rejection function $r(S; x^T)$. Then

$$\Pi^D(S, x; r(S; x^T)) = (1 - r(S; x^T))S + r(S; x^T)[(1 - \epsilon)x + \epsilon x^T + k^D].$$

In a revealing equilibrium, each defendant type makes a distinct plea offer. Moreover, $r(S; x^T)$ must be a decreasing function of S ; that is, higher offers must be more likely to result in settlement rather than trial. For if this were not the case, then two defendant types who are supposed to make the distinct offers S_1 and S_2 would both pool at the lower offer, because it involves both a lower sentence and a lower probability of rejection. This contradicts the hypothesis of revelation.

Since $r(S; x^T)$ must be a decreasing function of S , it is interior to the interval $[0,1]$ for almost all values of S . The prosecutor will be indifferent between accepting the plea offer S or going to trial if and only if $S = (1 - \epsilon)b(S; x^T) + \epsilon x^T - k^P$. Furthermore, by definition, a revealing equilibrium requires that $b(S^*(x; x^T); x^T) = x$. This further implies that $S^*(x; x^T) = (1 - \epsilon)x + \epsilon x^T - k^P$.

Finally, $S^*(x; x^T)$ must minimize $\Pi^D(S, x; r^*(S; x^T))$. Differentiating with respect to S yields

$$\partial \Pi^D(S, x; r^*(S; x^T)) / \partial S = 1 - r^*(S; x^T) + [\partial r^*(S; x^T) / \partial S] [(1 - \epsilon)x + \epsilon x^T + k^D - S] = 0.$$

Substituting $S^*(x; x^T) = (1 - \epsilon)x + \epsilon x^T - k^D$ and simplifying gives the following first-order differential equation defining $r^*(S; x^T)$.

$$1 - r^*(S; x^T) + K[\partial r^*(S; x^T) / \partial S] = 0, \quad (2)$$

where $K \equiv k^D + k^P$. There is a unique solution to this equation through any given boundary condition. In this case, the appropriate boundary condition is $r^*(\bar{S}; x^T) = 0$; that is, the highest offer observed in equilibrium must be accepted with certainty. This is because it is a dominant strategy to accept any $S > \bar{S}$, since this is more than the prosecutor could ever expect at trial. Were the offer \bar{S} not accepted with certainty, the defendant type making it would offer just a little more, ensuring acceptance but violating the hypothesis that \bar{S} is an equilibrium offer. Thus $r^*(\bar{S}; x^T) = 0$ in equilibrium. The unique solution to equation (2) through this boundary condition is given by $r^*(S; x^T) = 1 - \exp\{-(\bar{S} - S)/K\}$. Combining the equilibrium plea offer function¹⁸ $S^*(x; x^T)$ and the equilibrium probability of rejection function $r^*(S; x^T)$ yields the equilibrium probability of trial function $\rho(x; x^T) = 1 - \exp\{-(1 - \epsilon)(\bar{x} - x)/K\}$.

Proposition 1. (a) The equilibrium plea offer is increasing in x and x^T ; that is, defendants anticipating a higher sentence at trial make higher plea offers; (b) The probability that a defendant of type x goes to trial is a decreasing function of x and is independent of x^T .

The fact that $\rho(x; x^T)$ is independent of x^T allows us to write the equilibrium probability of trial for a defendant of type x as simply $\rho(x)$ and the *ex ante* equilibrium probability of trial among all defendants as $\int \rho(y)f(y)dy$. Thus the equilibrium sentence under judicial discretion is

$$x^J = \int x\rho(x)f(x)dx / \int \rho(y)f(y)dy. \quad (3)$$

That is, x^J is just the conditional mean of X among those cases that come to trial. Let $\hat{x} = \int xf(x)dx$ denote the unconditional mean of X . The proof of the following proposition can be found in the Appendix.

Proposition 2. The conditional mean among those cases that come to trial is less than the unconditional mean; that is, $x^J < \hat{x}$.

Thus, since more severe cases are more likely to settle through a plea bargain, the distribution of cases facing the court¹⁹ is downward-biased relative to the prior.

Now consider a collection of crimes which are ordered in terms of “seriousness.” We will say that crime j is more serious than crime i if $\bar{x}_j > \bar{x}_i$. For instance, murder and assault are two categories of crimes. In general, murder is considered more serious than assault, though actual crimes within each category can be of variable severity and the range of ideal sentences can involve a substantial overlap. However, most would agree that the maximum ideal sentence for murder exceeds that for assault.

Differentiating $\rho(x) = 1 - \exp\{-(1 - \epsilon)(\bar{x} - x)/K\}$ with respect to \bar{x} yields $\partial\rho(x)/\partial\bar{x} = \exp\{-(1 - \epsilon)(\bar{x} - x)/K\}(1 - \epsilon)/K > 0$. That is, for a given true severity x , the equilibrium probability of trial is higher for defendants who have committed a more serious crime.

Finally, suppose that conviction is not guaranteed,²⁰ but occurs with an exogenous probability denoted μ . It is straightforward to show that the equilibrium plea offer becomes $S^*(x; x^T) = \mu(1 - \epsilon)x + \mu\epsilon x^T - k^p$ and the equilibrium probability of trial becomes $\rho(x; x^T) = 1 - \exp\{-\mu(1 - \epsilon)(\bar{x} - x)/K\}$. Thus the equilibrium probability of trial remains independent of x^T , though it increases with the likelihood of conviction μ ; that is, cases which the prosecutor is more likely to win are more likely to go to trial.

The sentencing commission's problem

Finally, consider the first stage, in which the sentencing commission chooses the regime; that is, it can specify x^T or delegate that decision to the court. It is assumed that the sentencing commission cares about sentencing error (i.e., discrepancies between ideal and actual sentences) and about conserving trial costs. However, since the probability of trial is independent of x^T , the aggregate resources spent on trials, $K \int \rho(y)f(y)dy$, will not be affected by whether x^T is specified or delegated. Thus, consideration of trial costs can be omitted without loss of generality.

The model will allow for different weights to be placed on sentencing errors introduced by plea bargaining and sentencing errors introduced at trial by specifying the social loss function as a convex combination of these errors (of course, the weights may be the same). The expected social loss arising from sentencing errors at trial is the product of two terms: the expected number of trials and the expected sentencing error conditional upon trial, denoted $ESE^T(x^T)$. The first of these terms is given by $\int \rho(y)f(y)dy$, while the second is the same as the court's payoff function in the same circumstances.

$$ESE^T(x^T) = E\Pi^J(x^T) = \int (x - x^T)^2 \rho(x)f(x)dx / \int \rho(y)f(y)dy. \quad (4)$$

Notice that this function is minimized at $x^T = x^J$, and recall that $x^J < \hat{x}$.

The expected social loss due to sentencing errors in cases settled by plea bargaining is also the product of two terms: the number of cases settled and the expected sentencing error conditional on settlement. The expected number of cases settled by plea is $\int (1 - \rho(y))f(y)dy$ and the expected sentencing error conditional on settlement by plea bargain, denoted $ESE^B(x^T)$, is

$$\begin{aligned} ESE^B(x^T) &= \int (x - S^*(x; x^T))^2 (1 - \rho(x))f(x)dx / \int (1 - \rho(y))f(y)dy \\ &= \int (\epsilon(x - x^T) + k^T)^2 (1 - \rho(x))f(x)dx / \int (1 - \rho(y))f(y)dy. \end{aligned} \quad (5)$$

This function is minimized at x^B such that

$$x^B = \int x(1 - \rho(x))f(x)dx / \int (1 - \rho(y))f(y)dy + k^P/\epsilon. \quad (6)$$

The first term is the mean severity, conditional on the case having settled through plea negotiations. By an argument analogous to the proof of Proposition 2, the following proposition can be proved.

Proposition 3. The conditional mean among those cases settling by plea is greater than the unconditional mean; thus, by equation (6), $x^B > \hat{x} + k^P/\epsilon$.

The aggregate *ex ante* expected social loss, denoted $ESL(x^T)$, can be written as follows:

$$ESL(x^T) = \alpha[\int (1 - \rho(y))f(y)dy]ESE^B(x^T) + (1 - \alpha)[\int \rho(y)f(y)dy]ESE^T(x^T). \quad (7)$$

This is a weighted average of two quadratic functions of x^T ; hence its minimum will occur at a value of x^T between those values of x^T that minimize $ESE^B(x^T)$ and $ESE^T(x^T)$, respectively. Let x^G denote the optimal guideline sentence to be imposed following a trial at which the public signal was uninformative.

Proposition 4. For $\alpha = 0$, $x^G = x^J$; for $\alpha = 1$, $x^G = x^B$; for $\alpha \in (0, 1)$, $x^G \in (x^J, x^B)$.

Although the court and the sentencing commission agree in their evaluation of errors in sentencing following trials (and thus the sentencing commission would make the same decision as the court were their roles in the hierarchy reversed), the sentencing commission can improve its objective by increasing the sentences that arise out of plea bargains. It does this by setting a longer sentence at trial (in the event of an uninformative public signal) than the court would choose were it given discretion.

Notice that there is no real “agency” problem between the court and society (as represented by the sentencing commission); rather, there is a commitment value (from the perspective of minimizing social loss) to having guidelines which specify “tougher” sentences than would be optimal from the court’s (or

society's) perspective if chosen at the time of sentencing. The existence of plea bargaining²¹ and its equilibrium properties (i.e., that defendants anticipating longer sentences are more likely to settle) explain why society might feel the need to constrain judicial discretion even though judges are acting in good faith (trying to minimize the expected social loss from sentencing errors following trial), and suggest the likely nature of the distortion: judges “know” that x^G is too harsh for the population of offenders they see at trial and would prefer to impose the lower sentence x^J .

In order to examine the robustness of these conclusions, variations of the extensive form of the game are considered in the next section and in a technical appendix (available from the author upon request). In particular, the roles of proposer and responder in the plea bargaining stage are reversed, and imperfect rather than asymmetric information is considered. A final variation considers alternative prosecutorial objective functions.

4. Variations on the basic model

A screening model

Thus far, it has been assumed that the informed defendant makes a plea offer. In this case, the sentencing commission's optimal sentence exceeds that of the court, and setting $x^T = x^G$ raises the expected sentence obtained in plea bargains. If instead the prosecutor makes the plea offer,²² then his increased bargaining power may substitute for the sentencing commission's commitment. Again, since both the prosecutor and the defendant take x^T as given (whether it is to be chosen later by the court or has already been specified by the sentencing guidelines), we can focus on the impact this change in the identity of the proposer will have on the plea negotiation stage.

A lower-case s will be used to distinguish the screening model from the signaling model, in which an offer was denoted S . Similarly, a lower-case π is used to denote payoffs (all unnecessary notation will be suppressed rather than carried over in analogous form). If the prosecutor makes a plea offer of s , the defendant of type x will accept s if and only if $s \leq (1 - \epsilon)x + \epsilon x^T + k^D$. That is, if and only if $x \geq [s - \epsilon x^T - k^D]/(1 - \epsilon) \equiv \tilde{x}(s)$. Thus the prosecutor chooses s to maximize his expected utility

$$E\pi^P(s; x^T) = s(1 - F(\tilde{x}(s))) + \int_{\tilde{x}(s)}^{\infty} [(1 - \epsilon)x + \epsilon x^T - k^D]f(x)dx.$$

Differentiating and collecting terms implies that the optimal offer, s^* , satisfies

$$\begin{aligned} 1 - F(\tilde{x}(s^*)) &= f(\tilde{x}(s^*))\tilde{x}'(s^*)[s^* - (1 - \epsilon)\tilde{x}(s^*) - \epsilon x^T + k^D] \\ &= f(\tilde{x}(s^*))K/(1 - \epsilon), \end{aligned} \tag{8}$$

since $\tilde{x}(s) = [s - \epsilon x^T - k^D]/(1 - \epsilon)$ and $\tilde{x}'(s) = 1/(1 - \epsilon)$. The expression $f(x)/[1 - F(x)]$ is the hazard rate for the distribution function $F(\cdot)$. Assuming that the hazard rate is a monotone increasing function which starts out below $(1 - \epsilon)/K$ and ends up above $(1 - \epsilon)/K$, equation (8) defines a unique value of x , denoted x^* , such that $f(x^*)/[1 - F(x^*)] = (1 - \epsilon)/K$. Defendants with types $x \geq x^*$ accept the plea offer of s^* , while those with $x < x^*$ go to trial. To find $s^*(x^T)$, simply use $x^* = \tilde{x}(s^*) = [s^* - \epsilon x^T - k^D]/(1 - \epsilon)$ to find $s^*(x^T) = (1 - \epsilon)x^* + \epsilon x^T + k^D$. Notice that x^* is independent of x^T , and thus the equilibrium probability of trial for a defendant of type x , which is 1 if $x < x^*$ and 0 if $x \geq x^*$, is (weakly) decreasing in x and independent of x^T . Thus, although the equilibrium plea offer is no longer a function of x , most of the results from Proposition 1 are robust to the change in the order of moves.

Proposition 1. (a) The equilibrium plea offer is increasing in x^T ; that is, prosecutors anticipating a higher sentence at trial make higher plea offers; (b) The probability that a defendant of type x goes to trial is a (weakly) decreasing function of x and is independent of x^T .

Again, the selection of cases going to trial is downward-biased relative to the prior. The posterior distribution simply reflects the truncated domain $[\underline{x}, x^*]$, so the posterior density function is $f(x)/F(x^*)$. In this case, the court's optimal sentence under judicial discretion is again the conditional mean of those cases coming to trial. That is, $x^J = \int x f(x) dx / F(x^*)$, where the integration is over the domain $[\underline{x}, x^*]$. Thus, x^J is clearly less than x^* ; in addition, Proposition 2 is robust to the change in the order of play.

Proposition 2 . The conditional mean among those cases coming to trial is less than the unconditional mean; that is, $x^J < \hat{x}$.

Next consider the optimal determination of x^T by the sentencing commission. Since the expected number of trials $F(x^*)$ is still independent of x^T , the expected social cost of trials $KF(x^*)$ can still be omitted from the social loss function without affecting the choice of x^T .

Thus the expected social loss from errors in sentencing is a weighted average of the expected social loss from errors in sentencing arising following trial and the expected social loss from errors in sentencing arising in plea bargains. The expected social loss associated with sentences awarded following trial is the product of the *ex ante* probability of trial $F(x^*)$ and the expected sentencing error conditional on trial, which is given by

$$ESE^T(x^T) = E\Pi^J(x^T) = \int_{\underline{x}}^{x^*} (x - x^T)^2 f(x) dx / F(x^*).$$

Again, this function is minimized at $x^T = x^J < \hat{x}$.

On the other hand, the expected social loss associated with plea-bargained sentences is the product of the number of cases settled by plea and the expected sentencing error conditional on settlement by plea bargain. The expected number of cases settled by plea is $1 - F(x^*)$ and the expected sentencing error

conditional on settlement is given by

$$\begin{aligned} ESE^B(x^T) &= \int_{x^*}^{\bar{x}} (x - s^*(x^T))^2 f(x) dx / [1 - F(x^*)] \\ &= \int_{x^*}^{\bar{x}} (x - (1 - \epsilon)x^* - \epsilon x^T - k^D)^2 f(x) dx / [1 - F(x^*)]. \end{aligned}$$

This function is minimized at x^B such that

$$x^B = (1/\epsilon) \int_{x^*}^{\bar{x}} x f(x) dx / [1 - F(x^*)] - [(1 - \epsilon)/\epsilon] x^* - k^D/\epsilon.$$

Since the first term is certainly greater than x^*/ϵ , it follows that $x^B > x^* - k^D/\epsilon$.

The overall objective of the sentencing commission is to choose x^T so as to minimize the expected social loss

$$ESL(x^T) = \alpha[1 - F(x^*)]ESE^B(x^T) + (1 - \alpha)[F(x^*)]ESE^T(x^T).$$

By the same argument as given in Section 3, the optimal value of x^T , denoted x^G , will lie between x^B and x^J . From above, we know that $x^J < x^*$ and $x^B > x^* - k^D/\epsilon$. However, these inequalities leave open the possibility that $x^B < x^J$.

An example is computed in the Appendix using the uniform distribution. In this case, it is shown that $x^B > x^J$ and $x^B < x^J$ are both possible, depending on the parameters. Thus, while there will still be incentives for the imposition of sentencing guidelines, the direction in which judicial discretion is constrained is ambiguous. It is possible that allocating the bargaining power to the prosecutor results in plea bargain sentences which are too harsh. Imposing a more lenient sentence at trial (when the public signal is uninformative) than would be chosen under judicial discretion reduces the sentence which will obtain in equilibrium plea bargains.

Imperfect information, alternative prosecutorial objectives

The details of these further variations can be found in a technical appendix (available from the author upon request); the results are briefly summarized here. First consider the case in which information is merely imperfect rather than asymmetric. That is, suppose that the defendant and the prosecutor both know only the prior distribution $F(\cdot)$ of the random variable X . In this model with symmetric but imperfect information, the defendant and the prosecutor should always settle. In a regime of imperfect (but symmetric) information, the sentencing commission can induce the prosecutor to achieve the *ex ante* efficient outcome (i.e., all cases settle at \hat{x}) despite his private incentives to settle for too little (when the defendant makes the offer) or to demand too much (when the prosecutor makes the offer). This is not possible under asymmetric information. Although the sentences arising from both modes of conviction (plea bargains and trials) can be affected by x^T , reducing the expected social loss from sentencing error arising from one mode increases the expected social loss from sentencing error arising from the other mode. Since both modes occur with positive probability in equilibrium, a compromise must occur in the case of asymmetric information.

Another interesting potential extension of the basic model would be to modify the prosecutor's objective function in order to examine alternative motivations and their impact on the relationship between the sentencing commission and the judiciary. For instance, one could assume that the prosecutor was more motivated by expected sentences and less concerned about conserving trial costs. Formally, this would be equivalent to lowering k^P . This results in a higher equilibrium plea offer function, since $S^*(x; x^T) = (1 - \epsilon)x + \epsilon x^T - k^P$. Moreover, lowering k^P also raises the equilibrium probability of trial, since $\rho(x) = 1 - \exp\{-(1 - \epsilon)(\bar{x} - x)/K\}$. Consequently, both x^J and x^B will be affected, but x^G will still lie between them as long as $\alpha \in (0,1)$, and hence the incentive to constrain judicial discretion (from below) will still exist.

This is true even in the limiting case wherein the prosecutor doesn't care at all about saving trial costs (i.e., when $k^P = 0$). In this case, plea-bargained outcomes “overcharge” some defendants (those with $x < x^T$) and “undercharge” some defendants (those with $x > x^T$) but since a greater proportion of the more severe cases settle, prosecutors settle for too little on average.

An alternative modification would be to assume greater alignment between the objectives of the prosecutor and the sentencing commission; of particular interest is the case in which the prosecutor is concerned about expected squared sentencing error and trial costs. Although the analysis becomes more complex (in particular, the equilibrium probability of trial is now a decreasing function of x^T), a robust finding is that defendants anticipating a higher sentence at trial make higher plea offers and are less likely to go to trial. Thus, since the posterior will be different from the prior, it follows that the sentencing commission will find it optimal to constrain judicial discretion in one direction or the other.

5. Conclusion

A model of hierarchical decision-making in the administration of justice was developed, and the equilibrium implications of the model were shown to be consistent with several empirical findings regarding the impact of the federal sentencing guidelines on sentence length and the plea rate. The model's outcome suggests that conflict between the sentencing commission and the judiciary is to be expected, even if they agree on ideal sentences and share the same goal of minimizing expected squared error. This conflict arises because the sentencing commission acts prior to any plea bargaining, with an eye toward influencing all sentences, including those which arise through guilty pleas. The court, on the other hand, acts after plea bargaining has been concluded (successfully or otherwise), and makes a judgment only in those cases which have not settled through guilty pleas.

There are several potential sources for this conflict, even under the heroic assumption that the sentencing commission and the courts pursue the same social goal. One source of conflict is that it is very likely that prosecutors pursue private objectives which include benefits from obtaining longer expected sentences and from expending lower amounts on trial costs. In order to reach the less accessible (i.e., more difficult to observe and to control) prosecutor, the sentencing commission must use an indirect control. By directly constraining judicial discretion, the sentencing commission can indirectly alter prosecutorial incentives in a way that improves the *ex ante* social loss function. This suggests a reason why judges would object to guidelines, even if (contrary to my model) one assumed that judges took the “long view.” While, overall, guidelines may achieve more appropriate sentences, the use of constraints on judges’ discretion suggests malfeasance on their part, whereas the true “culprit” is the plea bargaining stage. Guidelines make judges look bad, while enhancing the bargaining position of prosecutors, who are thereby able to obtain higher negotiated sentences (and payoffs).

A second source of conflict is the problem of asymmetric information. Although the sentencing commission can induce the prosecutor to obtain the *ex ante* efficient plea bargain when information is merely imperfect, this cannot be achieved when information is asymmetric. When information is asymmetric, different actors are making decisions at different times with different information and a single instrument such as x^T cannot hope to reconcile these decisions.

Many of the results of the basic model are robust to reversing the timing of moves (i.e., the identity of the proposer) in the plea bargaining stage. For instance, the equilibrium plea offer is an increasing function of x^T , and the equilibrium probability of trial is independent of x^T and (at least weakly) a decreasing function of x . Under both extensive forms, the sentencing commission has an incentive to constrain judicial discretion.

However, the direction in which the sentencing commission wishes to constrain judicial discretion can depend on the identity of the proposer. If a privately informed defendant makes a plea offer, then $x^G >$

x^J ; that is, the optimal sentence as specified by the guidelines exceeds the court's equilibrium sentence under judicial discretion. On the other hand, any relationship between x^G and x^J is possible if an uninformed prosecutor makes the plea offer. In the case of symmetric but imperfect information, if the defendant makes a plea offer, then $x^G > x^J$, while the reverse is true if the prosecutor makes the offer. The empirical finding that guidelines constrain sentences from below leaves open a variety of possible models for the plea bargaining stage, at least for the case of asymmetric information. This finding can be consistent with either a signaling (i.e., the defendant proposes) or a screening (i.e., the prosecutor proposes) model, and thus it seems likely that this finding could be consistent with more realistic (e.g., alternating offers) bargaining models as well.

While a complete analysis of the model using an alternative objective function for the prosecutor (in particular, one which is more aligned with those of the sentencing commission and the court) is too formidable to be included, some results emerge from analyzing the plea bargaining stage alone. In this case, x^T will influence the equilibrium probability of trial, which necessitates an explicit consideration of expected trial costs as well as expected sentencing error when formulating the sentencing commission's loss function. Moreover, independent of the prosecutor's objectives, so long as some cases settle and some go to trial, there will be a divergence between the beliefs of the sentencing commission and the court, and a corresponding divergence between x^G and x^J .

In summary, the court acts after plea bargaining has occurred, facing the posterior distribution of defendants. The sentencing commission acts before plea bargaining has occurred, facing the prior distribution of defendants and using direct controls on the court to indirectly influence equilibrium plea bargains. Consequently, conflict between the sentencing commission and the judiciary over the desirability of sentencing guidelines need not imply a fundamental conflict in values. Rather, it may be generated by a combination of differences in the timing and the information available when each party acts.

Appendix

This appendix provides the proof of Proposition 2 and computes an example of a screening equilibrium, using the uniform distribution, in order to show that it is possible to obtain $x^G < x^J$.

Proof of Proposition 2. Define $w(x) = \rho(x) / \int \rho(y)f(y)dy$. Note that $w(x)$ is strictly decreasing in x , $w(\bar{x}) = 0$, $w(\underline{x}) > 1$ and $\int w(x)f(x)dx = 1$. Thus there exists a unique $x' \in (\underline{x}, \bar{x})$ such that $w(x) (> , = , <) 1$ as $x (< , = , >) x'$. Then

$$\int_{\underline{x}}^{x'} (x - x')(w(x) - 1)f(x)dx < 0 < \int_{x'}^{\bar{x}} (x - x')(1 - w(x))f(x)dx.$$

Expanding both sides and collecting terms yields:

$$\int xw(x)f(x)dx - \int xf(x)dx < \int x'w(x)f(x)dx - \int x'f(x)dx = 0,$$

where all integrals are taken over $[\underline{x}, \bar{x}]$. Since the l.h.s. is just $x^J - \hat{x}$, the proof is complete. Q.E.D.

Screening Example Using the Uniform Distribution: Suppose that X is distributed uniformly on $[\underline{x}, \bar{x}]$; that

is, suppose that $F(x) = (x - \underline{x}) / (\bar{x} - \underline{x})$. Then the hazard rate is $1 / (\bar{x} - x)$ and x^* is given by $1 / (\bar{x} - x^*) =$

$(1 - \epsilon) / K$, or $x^* = \bar{x} - K / (1 - \epsilon)$. In order to ensure that x^* is interior, we will maintain the assumption

that $\bar{x} - \underline{x} > K / (1 - \epsilon)$. It follows immediately that $x^J = (\underline{x} + x^*) / 2$ and $x^B = (1 / \epsilon) \{ (\bar{x} + x^*) / 2 - (1 - \epsilon)x^* -$

$k^D \}$. Substituting for x^* and simplifying yields $x^J = \hat{x} - K / 2(1 - \epsilon)$ and $x^B = \bar{x} - K / 2\epsilon(1 - \epsilon) + k^P / \epsilon$. Thus

for the uniform distribution, $x^B < x^J$ (and hence $x^G < x^J$) if and only if $\bar{x} - \underline{x} < [k^D - k^P] / \epsilon$. Since $\bar{x} - \underline{x}$ is

bounded below by $K / (1 - \epsilon)$, this will be possible if and only if $K / (1 - \epsilon) < [k^D - k^P] / \epsilon$; that is, if and only if

$k^P < k^D(1 - 2\epsilon)$. Thus, there is a non-empty set of parameters such that $x^G < x^J$. In this case, the court is

constrained to award shorter sentences than it would choose under judicial discretion.

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Footnotes

1. Related analyses include Rogoff (1985), Spulber and Besanko (1992), and Besanko and Spulber (1993), who show (respectively) that a president may prefer to appoint a more conservative central banker, or a more activist regulatory agency head. Federal judges have life tenure and are intentionally insulated from outside influences; changing their tastes may be more difficult than restricting their discretion.
2. In the federal guidelines, the maximum sentence cannot exceed the minimum by more than 25% or six months, whichever is greater. Twenty-two states also have sentencing guidelines, though they typically involve more judicial discretion and less prison time than for similar federal crimes (Biskupic and Flaherty, 1996, p.9).
3. According to Freed (1992, p. 1690), there are approximately 100 federal mandatory minimum penalties contained in 60 different criminal statutes. Many of these involve drugs and/or the use of a gun.
4. In 1991, the Federal Sentencing Guidelines Governing Organizations were implemented to deal with corporations convicted of a federal crime. Alexander, Arlen and Cohen (1999) find that total sanctions increased as a consequence of these guidelines.
5. USSC Figure D (1995a, p. 52) reports an increase in the plea rate from 1991 to 1995. They (1995a, p. 51) attribute this to a composition effect, whereby the mix of offenses included more with typically low trial rates (e.g., immigration) and fewer with typically high trial rates (e.g., drug trafficking).

6. It is not a pure charge offense system; “relevant conduct” (e.g., the amount of money in a fraud case, the type and amount of drugs, or the use of a gun) can be considered in determining the applicable sentencing range, independent of whether it was charged and proved.

7. A model examining prosecutorial discretion is developed in Reinganum (1988). Studies of post-guidelines practice among prosecutors, focusing on guideline circumvention, have been conducted by Nagel and Schulhofer (1992, 1997). They find that sentence bargaining has been largely replaced by bargaining over the charge or guideline factors (mitigating or aggravating circumstances).

8. There is a voluminous literature on judicial objectives; for example, Ashenfelter, Eisenberg and Schwab (1995) (political ideology); Cohen (1991, 1992) and Higgins and Rubin (1980) (potential for promotion); Miceli and Cosgel (1994), O’Hara (1993) and Rasmusen (1994) (reputation); and Posner (1993) (all of the above). Objectives of federal judges, who have life tenure, are particularly difficult to pin down.

9. Rubin and Schrag (1996) find that, even if appeals court and trial court judges have the same preferences about enforcing a single contract, they make different decisions due to their different places in the hierarchy because appeals court decisions affect more people, whose interests must also be considered.

10. Although the court can infer that negotiations failed if a case comes to trial, the details of plea negotiations (what was offered, and any incriminating statements made during the failed negotiations) are inadmissible as evidence under Federal Rule of Evidence 410 (Mueller and Kirkpatrick, 1996, p. 93).

11. As noted above, the court must verify that the sentence involved in the plea agreement falls within the guidelines for the crime as charged, but the prosecutor determines the charge and is thereby able to make an

effective commitment to the ultimate sentence.

12. Miceli (1996) provides a model in which a legislature sets penalties to maximize deterrence, anticipating that plea bargaining may dilute the deterrence effect. In my paper, both the sentencing commission and the court maximize case-by-case justice, while the prosecutor pursues more prosaic objectives.

13. This model of the court receiving an imperfectly informative public signal was introduced in Daughety and Reinganum (1995) to examine the desirability of making currently inadmissible plea negotiations admissible as evidence. When the public signal is uninformative, the court relies on all admissible evidence in order to make a decision.

14. If there were a noisy (rather than completely uninformative) signal of x at trial, or if ϵ were a function of x , then D 's private information would bear on additional aspects of the problem besides the sentence following an informative signal; both modifications complicate the existence of a revealing equilibrium.

15. In general, beliefs are a cumulative distribution function over the set of defendant types who would use the strategy S with positive probability. Since we will always be dealing with revealing equilibria in this stage, we can restrict attention to point beliefs, in which each such set is a singleton.

16. An alternative "reputation" model might assume that a judge trades off the disutility from imposing a harsher sentence in one case for improved future plea outcomes. If plea bargaining depends on the average (over all the judges) trial sentence, then harsher sentences are a public good which won't be provided. I thank Tracy Lewis and Preston McAfee for this observation.

17. For a proof of uniqueness, see Reinganum and Wilde (1986). When a revealing equilibrium exists, equilibrium refinements may be invoked to eliminate pooling or partial pooling equilibria; either D1 (Cho and Kreps, 1987) or universal divinity (Banks and Sobel, 1987) will do the trick in this case.

18. It is now easy to verify that $S^*(x; x^T) = (1 - \epsilon)x + \epsilon x^T - k^p$ does minimize $\Pi^D(S, x; r^*(S; x^T))$. The first-order condition is satisfied by construction and the second-order condition $\partial^2 \Pi^D(S, x; r^*(S; x^T)) / \partial S^2 > 0$ reduces to $(2/K)\exp\{-(\bar{S} - S)/K\} - (1/K)\exp\{-(\bar{S} - S)/K\} > 0$, which is clearly true.

19. One way to determine this posterior distribution is through updating the prior via the equilibrium probability of trial. However, this posterior is also the actual frequency distribution of the public signal which the court observes, since $1 - \epsilon$ of the time the public signal is informative.

20. I thank Daniel Kessler for suggesting this robustness check.

21. If plea bargaining did not exist, then $ESL(x^T) = (1 - \alpha)ESE^T(x^T)$ and $x^G = x^J$.

22. Grossman and Katz (1983) provide a screening model of plea bargaining in which the prosecutor's offer sorts guilty and innocent defendants.