Technical Appendix for

"Reducing Unjust Convictions: Plea Bargaining, Trial, and Evidence Disclosure"

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In this Technical Appendix we examine the three regimes considered in the main text (N, B, and X), construct the probability that an innocent defendant is (unjustly) convicted of a crime, and provide comparisons of the relevant probabilities across the three regimes. We divide the unjust convictions into two subgroups: those wherein P was informed as to D's innocence are called "informed unjust convictions" and those wherein P was uninformed (and instead relied upon her prior and any updating that the dynamics provided) are called "uninformed unjust convictions." We also construct the probability of a "just conviction" for a guilty defendant.

We find that the regimes X and B always dominate regime N in the sense that regimes X and B always have a (at least weakly) lower probability of informed, and uninformed, convictions of innocent defendants and a (at least weakly) higher probability of conviction of guilty defendants. However, the comparison between X and B is, surprisingly, not uniform. Regime X eliminates informed unjust convictions, but it also causes a higher plea offer to be made. This means a G will reject more often which decreases the probability of a just conviction. Moreover, if an I receives an offer under regime X, he knows that P is uninformed and will not drop the case after rejection, so I will accept more often, despite the higher offer, increasing the likelihood of uninformed unjust convictions.

Constructing Probabilities of Conviction

Consider regime N and let iuc^N denote the probability (given $D = I$ and P is informed) of an

informed unjust conviction, uuc^N denote the probability (given $D = I$ and P is uninformed) of an uninformed unjust conviction, and jc^N denote the probability (given $D = G$) of a just conviction; for the other disclosure regimes we define parallel notions with superscripts B and X. Thus, for regime N, when the equilibrium offer from an informed P is $S_O^N(E_1)$, we have the probability of an informed unjust conviction of I as:

$$\text{iuc}^N = \delta_I^N(S_O^N(E_1))/\delta^M + (1 - \delta_I^N(S_O^N(E_1))/\delta^M)(1 - \eta_2)\pi,$$

where the first term accounts for (I, δ) types who accept the offer $S_O^N(E_1)$, while the second term accounts for those who reject the offer, do not discover exculpatory evidence during period 2, and are convicted at trial. Similarly, in regime N, when the equilibrium offer from an uninformed P is $S_O^N(\varphi_1)$, we have the probability of an uninformed unjust conviction of I as:[1]

$$\text{uuc}^N = \delta_I^N(S_O^N(\varphi_1))/\delta^M + (1 - \delta_I^N(S_O^N(\varphi_1))/\delta^M)(1 - \eta_2)\pi.$$

Finally, in regime N, when the equilibrium offer from an uninformed P is $S_O^N(\varphi_1)$, we have the probability of a just conviction of G as:

$$\text{jc}^N = \delta_G^N(S_O^N(\varphi_1))/\delta^M + (1 - \delta_G^N(S_O^N(\varphi_1))/\delta^M)\pi.$$

In a similar manner, we derive the conviction probabilities for regime B (recall, this is a pooling equilibrium, so $S_O^B(E_1) = S_O^B(\varphi_1)$) as:

$$\text{iuc}^B = \delta_I^B(S_O^B(\varphi_1))/\delta^M + 0;$$

the second term is zero because an informed P drops the case after a rejection, so as to avoid being penalized for a *Brady* violation. Continuing:

$$\text{uuc}^B = \delta_I^B(S_O^B(\varphi_1))/\delta^M + (1 - \delta_I^B(S_O^B(\varphi_1))/\delta^M)(1 - \eta_2)\pi; \text{ and}$$

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[1] The expressions for iuc^N and uuc^N reflect convictions. After conviction it is possible that during period 3 I will discover exculpatory evidence, and the conviction would be voided by a court. Adjusting for this possibility simply involves multiplying these expressions (and their analogs in regimes B and X below) by $(1 - \eta_3)$, which does not affect the comparisons.

$$jc^B = \delta_G^B(S_O^B(\varphi_1))/\delta^M + (1 - \delta_G^B(S_O^B(\varphi_1))/\delta^M)\pi.$$

Lastly, we derive the conviction probabilities for regime X (recall that in this regime a separating equilibrium obtains wherein an informed P immediately discloses the exculpatory evidence) as:

$$iuc^X = 0;$$

$$uuc^X = \delta_I^X(S_O^X(\varphi_1))/\delta^M + (1 - \delta_I^X(S_O^X(\varphi_1))/\delta^M)(1 - \eta_2)\pi; \text{ and}$$

$$jc^X = \delta_G^X(S_O^X(\varphi_1))/\delta^M + (1 - \delta_G^X(S_O^X(\varphi_1))/\delta^M)\pi.$$

Comparisons of Regimes

First, we compare regime N and regime B. As shown in Theorem 4 in the main text, $\delta_I^B(S_O^B(\varphi_1)) < \delta_I^N(S_O^N(E_1))$, and since iuc^B consists entirely of convictions due to acceptance of the informed P's plea offer, we know that $iuc^N > iuc^B$. Also, as shown in Theorem 4, when λ_0 is sufficiently small, $\delta_I^B(S_O^B(\varphi_1)) < \delta_I^N(S_O^N(\varphi_1))$. Both uuc^N and uuc^B can be viewed as convex combinations of the values 1 and $(1 - \eta_2)\pi$, yielding: $uuc^N > uuc^B$. Finally, by the same reasoning, $jc^N < jc^B$. That is, regime B results in a lower likelihood of informed unjust convictions, a lower likelihood of uninformed unjust convictions, and a higher likelihood of just convictions than obtain in regime N. It is straightforward to show that similar qualitative results hold for regime X versus regime N: (1) $iuc^X = 0 < iuc^N$; (2) $uuc^X = uuc^N$; and (3) $jc^X = jc^N$, so regime X, by eliminating informed unjust convictions (and being the same on other dimensions), reduces overall unjust convictions for Is, and leaves just convictions of Gs unchanged, as compared with regime N.

An important tradeoff arises in comparing B and X. While X eliminates informed unjust convictions, $uuc^X > uuc^B$ and $jc^X < jc^B$: uninformed unjust convictions are higher in regime X than in regime B and just convictions are lower in regime X compared with regime B.

We summarize the results in this Technical Appendix in the following theorem.

<u>Theorem TA1</u>. Comparison of Conviction Probabilities Across Regimes.

$\quad$ (i) $iuc^N > iuc^B > iuc^X$; (ii) $uuc^N = uuc^X > uuc^B$; (iii) $jc^B > jc^N = jc^X$.

That is, a perfectly-enforced *Brady* rule generates the lowest probability of uninformed unjust conviction and the highest probability of just conviction, while the extended disclosure rule generates the lowest probability of informed unjust conviction. So the reduction in the likelihood of an informed unjust conviction that would come about by shifting from regime B to regime X is accompanied by an increased likelihood of an uninformed unjust conviction of an innocent defendant and a reduction in the likelihood of a just conviction of a guilty defendant.