

# **An economic theory of the Fifth Amendment**

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*The Fifth Amendment's due process clause requires the prosecution to share evidence with the defense, and its right to silence blocks the jury from drawing an adverse inference from the defendant's silence during trial. I examine the effect of the right to silence and the disclosure requirement on conviction rates and social welfare in an economic model of criminal trials. Many policy-relevant results emerge. The right to silence can only improve welfare if juries discriminate unduly against defendants. With the right to silence, mandatory disclosure always increases welfare. The most efficient mechanism analyzed is either mandatory disclosure alone or mandatory disclosure combined with the right to silence.*

The Fifth Amendment is an old friend and a good friend. It is one of the great landmarks in men's struggle to be free of tyranny, to be decent and civilized.

William O. Douglas (1898-1980), U.S. Supreme Court Justice

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## 1. Introduction

The Fifth Amendment to the Constitution of the United States guarantees that:

No person (...) shall be compelled in any Criminal Case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law.<sup>1,2</sup>

This paper studies important aspects of the Fifth Amendment's right to silence and right to due process of law.

*Right to silence.* The clause against self-incrimination implies that a criminal defendant has a right to remain silent at his own trial. But if the defendant's silence were to lead the jury to draw an inference against the defendant, the right to silence would be a limited one. In *Griffin v. California* (April 5, 1965), the Supreme Court held that a comment by the prosecution on the defendant's failure to testify violated the Fifth Amendment. In *Carter v. Kentucky* (January 14, 1981), the Court held that the Fifth Amendment required an instruction to the jury that no inference be drawn from the defendant's silence:

No judge can prevent jurors from speculating about why a defendant stands mute in the face of a criminal accusation, but a judge can, and must, if requested to do so, use the unique power of the jury instruction to reduce that speculation to a minimum. (450 U.S. at 303).

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Pennsylvania.

<sup>1</sup> See, for example, Gunther and Sullivan, 1997, p. A-9.

<sup>2</sup> For a Pulitzer prize-winning account of the history of the Fifth Amendment, from its origins in the Israel of biblical times, see Leonard Levy (1968).

Northern Ireland abolished the right to silence in 1988, and England followed in 1994, mainly to facilitate the conviction of suspected terrorists. England's *Criminal Justice and Public Order Act 1994* (Part 3, Section 35.2) specifies that "it will be permissible for the court or jury to draw such inferences as appear proper from the failure of the accused to give evidence or his refusal, without good cause, to answer any question."<sup>3</sup>

What is the effect of the right to silence on social welfare? To answer this question, a model of criminal trials is developed, and the right to silence is given formal expression in terms of the parameters. In the model, before the defense makes its case, the jury has a posterior over the defendant's innocence, given all information available to date. The right to silence is the requirement that this posterior continue to govern the jury's decision-making upon observing silence from the defendant.

One might speculate that in reality juries draw adverse inferences from silence despite the judge's instruction to the contrary. But the judge's principal role in a criminal trial is to instruct the jury on matters of law. The law explicitly requires jurors to ignore the defendant's silence. To the extent that jurors obey the law, they obey the judge's instruction. Moreover, the jury is more likely to understand and obey the instruction when the judge provides an explanation for it. In the trial of O.J. Simpson, Judge Lance Ito formulated and explained his instruction to the jury as follows:

Ladies and gentlemen of the jury, you have heard all the evidence, and it is now my duty to instruct you on

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<sup>3</sup> See Bucke, Street, and Brown (2000) and Jackson, Wolfe, and Quinn (2000) for reports on the new legislation against the right to silence in England and Northern Ireland, respectively.

the law that applies to this case. (...) A defendant in a criminal trial has a constitutional right not be compelled to testify. You must not draw any inference from the fact that a defendant does not testify. Further, you must neither discuss this matter, nor permit it to enter into your deliberations. In deciding whether or not to testify, the defendant may choose to rely upon the state of the evidence and upon the failure, if any, of the prosecution to prove beyond a reasonable doubt every essential element of the crime charged against him. (*O.J. Simpson Trial Transcripts and Documents*, 1995, p. 47124).

As a final means of enforcement, judges can set aside a verdict if they believe that it was unjustified given the evidence and their instructions to the jury.

In the model, the instruction that no inference be drawn from silence is assumed to be successful, and is shown to reduce the conviction rate. If the prosecution fails to present incriminating evidence, the defense can remain silent and be acquitted. This helps the guilty by increasing wrongful acquittals, and also helps the innocent by reducing wrongful convictions.<sup>4</sup> If social preferences are measured in terms of the two types of court error, the right to silence cannot improve social welfare unless the jury's preferences are biased relative to those of society; if jury preferences coincide with social preferences, the first best outcome is achieved without the right to silence. The preferences of juries may be biased relative to those of society in cases where juries discriminate against defendants based on race or social class, or in cases where defendants cannot afford the lawyers who are best able to select the juries to minimize the biases against their clients. In cases where juries are biased, the welfare effect of the

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<sup>4</sup> This seems to contradict a claim by Jeremy Bentham: "Not only are the guilty served but it is they alone that are served (by the right to silence), without any mixture of the innocent" (Bentham, 1825, p. 161). But Bentham was writing at a time when the accused was prohibited from testifying at trial. In the mid-1800s, the rule was changed to give defendants the right to testify. Bentham was referring to the more restrictive rule of the time, not to the modern rule by which defendants are free to testify, and if they do not, the jury is prohibited from drawing an adverse inference.

right to silence depends on the model's other parameters, several of which are affected by the Fifth Amendment's due process requirement.

*Due process of law.* The second Fifth Amendment right analyzed in the paper is the right to due process of law. Among other things, the due process clause requires prosecutors to share evidence with the defense. In most of the U.S., discovery power is much broader for the defense than for the prosecution. And all states require the prosecution to share exculpatory evidence. Mandatory disclosure by the prosecution ensures that the defense is no less informed, and in most cases, better informed than the prosecution.

In the model without the right to silence, the disclosure requirement has an ambiguous effect on the conviction rate. It increases the likelihood that the defense has exculpatory evidence, which can decrease the conviction rate; but it also makes the jury's adverse inference from the defendant's silence more adverse, which increases the conviction rate. However, with the right to silence, mandatory disclosure cannot make the adverse inference from silence more adverse since the right to silence blocks the adverse inference in the first place. Thus, mandatory disclosure always reduces the conviction rate with the right to silence.

If efficiency is measured in terms of the two types of court error, mandatory disclosure always reduces the efficiency of the right to silence. Society always feels worse about reversing the jury's verdict given silence from guilty to innocent if it can rule out the possibility that the defendant was silent for lack of being informed, which it can with mandatory disclosure. On the other hand, mandatory disclosure always improves efficiency in the presence of the right to silence. With the right to silence,

mandatory disclosure only increases the chances that exculpatory evidence comes out at trial, which cannot harm, and may benefit, society. This implies that the right to silence combined with mandatory disclosure (the Fifth Amendment) is more likely to increase welfare than is the right to silence alone.

But among the four mechanisms, no Fifth Amendment, the right to silence alone, mandatory disclosure alone, and the Fifth Amendment, which is the most efficient? It turns out that the most efficient is either the Fifth Amendment or mandatory disclosure alone. Thus, mandatory disclosure is always part of the optimal mechanism in this constrained set. Whether the right to silence is also part of it depends on the extent of jury bias and on the model's other parameters. For example, the prior probability that the defendant is truly guilty in the model is linked to the reputations of the police and the judiciary. All else constant, the right to silence is part of the optimal mechanism for a larger range of parameters the worse are the reputations of the police and the judiciary. In this case, more innocent defendants, and fewer guilty defendants, stand to benefit from the right to silence, so that it is more likely to improve welfare.

Section 2 relates the contribution to existing literature. Section 3 develops the economic model of criminal trials with and without mandatory disclosure and with and without the right to silence. Section 4 derives equilibrium in each of these four models, and analyzes the effects of the right to silence and mandatory disclosure on equilibrium conviction rates. Section 5 derives equilibrium welfare (measured in terms of court errors at trial) in each model, and identifies the most efficient of the four mechanisms analyzed. Section 6 discusses the relationship between the constitutional structures and the possibility of plea bargaining. Section 7 summarizes and proposes avenues for further

research.

## **2. Relation to existing literature**

In the economics literature on pre-trial bargaining (see, for example, P'ng, 1983, Reinganum, 1988, and Spier, 1992), the trial process is usually modeled with a single parameter, the exogenous probability that the defendant is ultimately convicted. Relatively fewer papers model the trial process more explicitly. Gay et al. (1989) develop an inquisitorial model of trials, in which defendants choose whether to be tried by a judge or jury. The right to a jury trial is a Sixth Amendment right, whereas due process and the right to silence are Fifth Amendment rights. Also, the model that is developed here to analyze the efficiency of Fifth Amendment rights is adversarial rather than inquisitorial.

Shin (1998) compares the adversarial and inquisitorial systems in terms of social efficiency, concluding that the adversarial model is superior. In the author's models, social utility coincides with the jury's utility, and weighs wrongful acquittals and wrongful convictions equally. Jury preferences may be biased relative to social preferences, and wrongful convictions may not be as socially desirable as wrongful acquittals, especially in criminal cases. Thus, Shin's conclusions do not easily apply to criminal cases. In contrast, the model developed here allows the jury's utility to differ from social utility, and allows each of them to weigh wrongful convictions more heavily than wrongful acquittals. As such, the conclusions derived from the model apply to criminal cases as well.

Cooter and Rubinfeld (1994) analyze legal discovery. They note that discovery,

which compels information sharing, can affect the settlement probability and trial accuracy. They focus their analysis more on the former effect, mentioning only briefly that mandatory disclosure can improve the accuracy of trials by increasing the information available to the jury. The present paper focuses more on the effect of mandatory disclosure on trial outcomes, and demonstrates that this effect is potentially ambiguous. Moreover, Cooter and Rubinfeld do not consider the combination of mandatory disclosure and the right to silence.

Seidmann and Stein (2000) analyze the right to silence, but do not consider its combination with mandatory disclosure. They argue that the right to silence helps the innocent, that is, reduces wrongful convictions, only because it allows criminals to avoid conviction without lying, so that statements by innocent defendants are more credible. In the model developed here, the right to silence reduces wrongful convictions without the possibility of perjury, by tending to block unraveling, the phenomenon that no news is bad news, which was first described by Milgrom (1981). Baird, Gertner, and Picker (1998, p. 91) mention that the right to silence at trial may prevent unraveling, but do not pursue this line of inquiry formally.

### **3. Model of criminal trials**

The set of players is  $\{P, D, J\}$ , where P is the prosecution, D is the defense, and J is the jury. D and the defendant are treated as the same person, so there are no agency problems. Although J comprises several jurors, their individual verdicts are inputs into a group decision-rule, usually unanimity, which outputs a unified and final verdict. In this

sense, J is treated as one player with one voice.<sup>5</sup>

Let  $\Omega$  denote the state space. The model's intrinsic uncertainty is summarized by the vector  $(\tau, \varepsilon, \kappa) \in \Omega$ , where  $\Omega = \{I_\tau, G_\tau\} \times \{I_\varepsilon, G_\varepsilon\} \times 2^{(P,D)}$ . The random variable  $\tau$ , called the "truth," can be in one of two states,  $I_\tau$ , interpreted as "The truth is that D is innocent," or  $G_\tau$ , interpreted as "The truth is that D is guilty." The random variable  $\varepsilon$ , called the "evidence," can be in one of two states,  $I_\varepsilon$ , interpreted as "The evidence is in favor of D's innocence," or  $G_\varepsilon$ , interpreted as "The evidence is in favor of D's guilt."

The random variable  $\kappa$ , called the "knowledge," can be in one of four states, either both P and D know the evidence, only D knows the evidence, only P knows the evidence, or neither D nor P know the evidence. J does not know  $\varepsilon$ ,  $\tau$  nor  $\kappa$ . P, D, and J have a common prior over the realization of the truth, denoted by  $P[G_\tau]$ .

This prior exogenously embodies everything leading up to the trial, including police investigations and preliminary hearings involving motions to suppress evidence. If participants in the trial have come to trust that the police and judges are fair and unbiased, in the sense that they usually conduct their investigations and render their decisions without regard for race or social class, then they may be more likely to believe ex ante that the person who stands before them in court is guilty, which means that their prior belief that D is guilty will tend to be higher. But if the participants perceive that the police and judges are corrupt or biased, their prior will tend to be lower. They naturally form an assessment that D is likely to be guilty of what is charged given that D has already made it this far into the system.

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<sup>5</sup> Several papers have investigated the welfare implications of different group decision rules, for example,

The quality of the evidence is represented by the likelihood matrix given in Table 1, where  $P[G_\epsilon | I_\tau]$ , for example, is the probability that the evidence indicates that D is guilty given that D is innocent. The evidence is more often right than wrong:  $P[I_\epsilon | I_\tau] > P[G_\epsilon | I_\tau]$  and  $P[I_\epsilon | G_\tau] < P[G_\epsilon | G_\tau]$ . In cases where the evidence is more accurate,  $P[G_\epsilon | I_\tau]$  and  $P[I_\epsilon | G_\tau]$  are closer to 0, while in cases where the evidence is less accurate, they are closer to 1/2.

Table 1. Likelihood matrix representing evidence quality

		$I_\epsilon$	$G_\epsilon$
$P[I_\tau]$	$I_\tau$	$P[I_\epsilon   I_\tau]$	$P[G_\epsilon   I_\tau]$
$P[G_\tau]$	$G_\tau$	$P[I_\epsilon   G_\tau]$	$P[G_\epsilon   G_\tau]$

Lawyers are no more likely to know the evidence if it is in their favor than if it is not, and no more likely to know it if the defendant is guilty than if he is not. More precisely,  $\kappa$  is stochastically independent from  $(\tau, \epsilon)$ . Denote the unconditional probability that D knows the evidence by  $\delta$ , and the unconditional probability that P knows the evidence by  $\pi$ .

Initially, the event that D is informed and the event that P is informed of the evidence are independent. Then Table 2 represents the lawyers' information structures.

Table 2. Information structures without mandatory disclosure

		P knows $\epsilon$	P does not know $\epsilon$
D knows $\epsilon$		$\delta\pi$	$\delta(1-\pi)$
D does not know $\epsilon$		$(1-\delta)\pi$	$(1-\delta)(1-\pi)$

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Fedderson and Pesendorfer (1998) and Duggan and Martinelli (2001).

The independence of D and P's information structures will be relaxed when the Fifth Amendment's disclosure requirement on prosecutors is introduced at the end of this section.

In the model, action unfolds in four time periods. At time 1, the truth,  $\tau$ , the evidence,  $\varepsilon$ , and the lawyers' knowledge of the evidence,  $\kappa$ , are realized. At time 2, P makes its case. At time 3, D makes its case. At time 4, J renders its verdict having heard D and P.

It is assumed that D and P cannot say what they know to be false, and cannot say that for which they lack any evidence. In the U.S., lawyers are disbarred if they are found to have presented false evidence or to have knowingly allowed their clients to commit perjury. With this assumption, if D or P know the evidence  $\varepsilon$ , their action set is  $\{ " \varepsilon ", " s " \}$ , where the quotation marks indicate vocalization of the evidence, and  $s$  stands for silence. If they do not know the evidence, they must take action "s". J's action set is  $\{ I_v, G_v \}$ , where  $I_v$  is the not guilty verdict, and  $G_v$  is the guilty verdict. The outcome space is  $\{ G_v \& G_\tau, G_v \& I_\tau, I_v \& G_\tau, I_v \& I_\tau \}$ . The second outcome is a wrongful conviction, the third is a wrongful acquittal. Assume D wants the verdict to be  $I_v$ , and P wants the verdict to be  $G_v$ , regardless of the state. The utilities of the lawyers are, after normalization,

$$\begin{aligned} U_p(G_v, G_\tau) = 1, \quad U_p(G_v, I_\tau) = 1, \quad U_p(I_v, G_\tau) = 0, \quad U_p(I_v, I_\tau) = 0 \\ U_D = 1 - U_p. \end{aligned} \tag{1}$$

One might object that even in the U.S., trials are not strictly adversarial. In principle,

perhaps, state and federal prosecutors are supposed to maximize social welfare. If this were the case, it would be more realistic to assume that P wants the verdict to be  $G_v$  if and only if the state is  $G_\tau$ . In practice, however, prosecutors may not simply maximize social welfare.<sup>6,7</sup> Either to climb the ranks in U.S. Attorney offices or to have better outside options, prosecutors need trial experience and a reputation for winning cases. Moreover, even if reputation and human capital incentives would lead prosecutors to withhold evidence when it is in the defendant's favor, the Fifth Amendment's disclosure requirement on prosecutors would not allow them to do so. Below, we formulate this requirement in terms of the parameters, and analyze its effect on equilibrium when prosecutors only care to win at trial.

J's attitude toward risk is normalized such that its utility from a rightful conviction or a rightful acquittal is 1, its utility from a wrongful acquittal is 0, and its utility from a wrongful conviction is  $U_J = U_J(G_v, I_\tau) \leq 0$ . In a parallel fashion, society's attitude toward risk is normalized such that its utility from a rightful conviction or a rightful acquittal is 1, its utility from a wrongful acquittal is 0, and its utility from a wrongful conviction is  $U_S = U_S(G_v, I_\tau) \leq 0$ . J's utility may differ from society's utility in two broad ways:  $U_J < U_S$  or  $U_J > U_S$ . The first case corresponds to a jury that overly discriminates in favor of the defendant. The second case corresponds to a jury that is too

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<sup>6</sup> Glaeser, Kessler, and Piehl (2000) examine data on prisoners incarcerated for drug crimes. Their empirical analysis reveals that Assistant U.S. Attorneys tend to prosecute wealthier and more educated individuals, perhaps in part because these cases increase their reputation, and therefore their salary in the private sector.

<sup>7</sup> Boylan and Long (2000) analyze federal drug trafficking cases from 1993 to 1996 and find that the plea rate is smaller in U.S. Attorney districts where private salaries are higher. Moreover the plea rate is smaller in districts where there are either few or many, but not an average number of, prosecutors. The authors' explanation is that prosecutors take cases to trial to acquire human capital, unless they are closely monitored.

biased against the defendant. If the jury is prejudiced against the defendant, then it may not attach enough (from society's point of view) relative disutility to the outcome in which the defendant is convicted though actually innocent of the crime charged.

During the jury selection stage, experienced lawyers can detect and eliminate candidate jurors who are unfavorably biased against their clients. Poorer defendants are not able to afford the best lawyers, and are instead randomly appointed one by the State. Thus, indigent defendants may be more likely to face a jury that is overly biased against them.<sup>8</sup>

The Fifth Amendment's mandatory disclosure requirement and right to silence are now expressed in terms of the adversarial model developed above.

*Mandatory disclosure.* Let MD denote mandatory disclosure by the prosecution. Without MD, the event that D is informed and the event that P is informed of the evidence are independent. Then Table 2 represents the correct information structures. With MD, if D is not informed, P cannot be informed of the evidence. Then Table 3 represents the correct information structures.

Table 3. Information structures with mandatory disclosure

	P knows $\varepsilon$	P does not know $\varepsilon$
D knows $\varepsilon$	$\pi$	$\delta(1-\pi)$
D does not know $\varepsilon$	0	$(1-\delta)(1-\pi)$

Without MD, the probability that D is informed is  $\delta$ , but with MD, the probability that D is informed is  $\pi + \delta(1-\pi) > \delta$ . MD alters the time structure of the

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<sup>8</sup> For factual evidence of the disadvantages of having court-appointed counsel in capital cases, see Bright (1990, 1994) and Vick (1995).

model: between time 1 and time 2 (that is, right before P makes its case), D learns any evidence that P knows.

*Right to silence.* Let RTS denote the right to silence. RTS alters the time structure of the model too: if D remained silent at time 3, the judge instructs J of D's RTS at the start of time 4 (that is, right before J renders its verdict). At the start of time 3, just before D makes its case, J has a posterior over D's innocence, given all information available to date (including P's case). RTS means that this posterior should continue to govern J's decision-making upon observing silence from D, that is, no updating should occur upon observing D's silence. In the model without MD, for example,

$$\begin{aligned}
 & P[I_\tau \mid P \text{ and } D \text{ chose "s"}] \\
 &= \frac{P[I_\tau] \{P[I_\varepsilon \mid I_\tau](1-\delta) + P[G_\varepsilon \mid I_\tau](1-\pi)\}}{P[I_\tau] \{P[I_\varepsilon \mid I_\tau](1-\delta) + P[G_\varepsilon \mid I_\tau](1-\pi)\} + P[G_\tau] \{P[I_\varepsilon \mid G_\tau](1-\delta) + P[G_\varepsilon \mid G_\tau](1-\pi)\}} \quad (2)
 \end{aligned}$$

and

$$\begin{aligned}
 & P[I_\tau \mid P \text{ chose "s"}] \\
 &= \frac{P[I_\tau] \{1-\pi + P[I_\varepsilon \mid I_\tau]\pi\}}{P[I_\tau] \{1-\pi + P[I_\varepsilon \mid I_\tau]\pi\} + P[G_\tau] \{1-\pi + P[I_\varepsilon \mid G_\tau]\pi\}}. \quad (3)
 \end{aligned}$$

Without RTS, J's decision-making given silence is governed by  $P[I_\tau \mid P \text{ and } D \text{ chose "s"}]$ , but with RTS, it should be governed by  $P[I_\tau \mid P \text{ chose "s"}]$ .

#### 4. Equilibrium

Let  $\Gamma^{00}$  denote the model without MD and without RTS,  $\Gamma^{10}$  the model with MD

and without RTS,  $\Gamma^{01}$  the model without MD and with RTS, and  $\Gamma^{11}$  the model with MD and with RTS. Let us characterize equilibrium behavior in each of these models.

If J is so biased that it attaches a utility level of  $-\infty$  to a wrongful conviction, then the evidence against D could not lead J to convict, no matter how accurate it is. In this case, the evidence is not pivotal to J's verdict.

*Definition 1.* Evidence is pivotal if J's optimal action is to convict if it knows  $G_\varepsilon$  and to acquit if it knows  $I_\varepsilon$ .

*Lemma 1.* J's optimal action is to convict if it knows  $G_\varepsilon$  and acquit if it knows  $I_\varepsilon$  if and only if

$$U_J \in [\underline{\eta}, \bar{\eta}] \text{ where } \underline{\eta} = 1 - \frac{P[G_\tau] P[G_\varepsilon | G_\tau]}{P[I_\tau] P[G_\varepsilon | I_\tau]} \text{ and } \bar{\eta} = 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau]}{P[I_\tau] P[I_\varepsilon | I_\tau]}.$$

*Proof.* Proofs of the main results are in the Appendix.

The first proposition identifies a perfect Bayesian equilibrium of each of the four adversarial models, assuming that evidence is pivotal, that is,  $U_J \in [\underline{\eta}, \bar{\eta}]$ .

*Proposition 1.* If  $U_J \in [\underline{\eta}, \bar{\eta}]$ , the following strategy vector is a perfect Bayesian equilibrium and the only one surviving iterative deletion of weakly dominated strategies: P and D reveal the evidence if and only if it is in their favor (otherwise they remain silent), J acquits if it hears evidence in favor of D, convicts if it hears evidence against D, and if it hears nothing but silence, it acquits if and only if  $U_J \leq \eta^{ij}$  in  $\Gamma^{ij}$  for all

$i, j \in \{0,1\}$ , where

$$\begin{aligned}\eta^{00} &= 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau](1-\delta) + P[G_\varepsilon | G_\tau](1-\pi)}{P[I_\tau] P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau](1-\pi)} \\ \eta^{10} &= 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau](1-\delta) + P[G_\varepsilon | G_\tau]}{P[I_\tau] P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau]} \\ \eta^{01} = \eta^{11} &= 1 - \frac{P[G_\tau] 1 - \pi + P[I_\varepsilon | G_\tau]\pi}{P[I_\tau] 1 - \pi + P[I_\varepsilon | I_\tau]\pi} \\ \eta^{10} &< \eta^{00} < \eta^{01} = \eta^{11}.\end{aligned}$$

The parameter  $\eta^{ij}$  is the cutoff, below which D is acquitted, and above which D is convicted, given silence. For example, in  $\Gamma^{00}$ , if  $\delta = 1$ , the cutoff reduces to

$$1 - \frac{P[G_\tau] P[G_\varepsilon | G_\tau]}{P[I_\tau] P[G_\varepsilon | I_\tau]}, \quad (4)$$

which is  $\underline{\eta}$ , the lower bound of the set of juries for whom evidence is pivotal. Thus, if D is completely informed, J always convicts given silence. If J knows that D is perfectly informed and D has remained silent, J knows that the evidence is against D, and since evidence is pivotal, J convicts. If  $\pi = 1$ , the cutoff reduces to

$$1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau]}{P[I_\tau] P[I_\varepsilon | I_\tau]}, \quad (5)$$

which is  $\bar{\eta}$ . If P is perfectly informed, J always acquits given silence. If J knows that P is perfectly informed and P has remained silent, J knows the evidence is against P, and since evidence is pivotal, J acquits.

In the adversarial context, J draws an inference against D if D is silent. RTS blocks J's adverse inference from D's silence. Naturally, this reduces the cutoff, above which J convicts, and below which J acquits, given silence. Thus,  $\eta^{10} < \eta^{00}$ . In contrast,

MD makes J's adverse inference from D's silence more adverse. With MD, J is more likely to believe that D is silent because D knows the evidence and it is not in D's favor, than because D does not know the evidence, since MD increases the probability that D knows the evidence. Thus,  $\eta^{00} < \eta^{01}$ . But with RTS, J's cutoff, above which it convicts, and below which it acquits, given silence, is the same with or without MD. Intuitively, MD cannot make J's adverse inference from silence more adverse with RTS, because RTS blocks the adverse inference in the first place. Thus,  $\eta^{01} = \eta^{11}$ .

The next proposition identifies the conviction probability in each of the four models.

*Proposition 2.* For all  $j \in \{0,1\}$ , the conviction probability in  $\Gamma^{0j}$  is

$$P[G_v]^{0j} = \begin{cases} \pi P[G_\varepsilon] & \text{for all } U_j \in [\underline{\eta}, \eta^{0j}] \\ P[G_\varepsilon] + (1-\delta)P[I_\varepsilon] & \text{for all } U_j \in (\eta^{0j}, \bar{\eta}] \end{cases},$$

and the conviction probability in  $\Gamma^{1j}$  is

$$P[G_v]^{1j} = \begin{cases} \pi P[G_\varepsilon] & \text{for all } U_j \in [\underline{\eta}, \eta^{1j}] \\ P[G_\varepsilon] + (1-\pi)(1-\delta)P[I_\varepsilon] & \text{for all } U_j \in (\eta^{1j}, \bar{\eta}] \end{cases}.$$

From Proposition 2, we can analyze the separate, interactive, and combined effects of MD and RTS on the conviction probability. Let us consider these effects in turn.

*Corollary 1.* Without RTS, MD increases the conviction probability by  $(1-\pi)\{(1-\delta)P[I_\varepsilon] + P[G_\varepsilon]\}$  for all  $U_j \in [\eta^{10}, \eta^{00}]$ , leaves it unchanged for all  $U_j \in [\underline{\eta}, \eta^{10})$ , and reduces it by  $\pi(1-\delta)P[I_\varepsilon]$  for all  $U_j \in (\eta^{00}, \bar{\eta}]$ .

Without RTS, the effect of MD on the conviction probability is ambiguous. From Proposition 1, we know that MD makes J's adverse inference from D's silence more adverse, which tends to increase the conviction rate (a strategic effect). But MD also increases the probability that D has exculpatory evidence to present, which tends to decrease the conviction rate (a direct effect). A J drawn from  $(\eta^{00}, \bar{\eta}]$  so little dislikes a wrongful conviction that its equilibrium action given silence is to convict with or without MD (no strategic effect); but MD nevertheless reduces the probability that such a J convicts because it increases the probability that D has exculpatory evidence to present (direct effect).

A J drawn from  $[\underline{\eta}, \eta^{10})$  so dislikes a wrongful conviction that its equilibrium action given silence is to acquit with or without MD (no strategic effect); and although MD increases the probability that D has exculpatory evidence to present, this cannot reduce the probability that J convicts either, because J is already acquitting given silence (no direct effect). In this case, MD does not affect the conviction rate.

Only if J is drawn from  $[\eta^{10}, \eta^{00}]$  does MD affect the verdict given silence. This type of J would acquit without MD, but convict with MD. Intuitively, without MD, if J hears only silence, it might infer that the evidence is in D's favor but only P knows it. With MD, if J hears only silence, it is less likely to draw such an inference: now J knows that D is better informed, and hence J's adverse inference in the face of silence becomes more adverse (strategic effect). And although MD also tends to reduce the conviction rate because it increases the probability that D has exculpatory evidence to present (direct effect), the strategic effect dominates, so that MD results in a higher conviction rate.

While the effect of MD on the conviction probability is ambiguous without RTS, it is unambiguous with RTS.

*Corollary 2.* With RTS, MD leaves the conviction probability unchanged for all  $U_j \in [\underline{\eta}, \eta^{11}]$  and reduces it by  $\pi(1-\delta)P[I_\epsilon]$  for all  $U_j \in (\eta^{11}, \bar{\eta}]$ .

Corollary 2 reveals that MD generally reduces the conviction probability in the presence of RTS. Intuitively, MD cannot make J's adverse inference from silence more adverse if RTS does not allow an adverse inference from silence in the first place. Thus, with RTS, MD only increases the probability that D has exculpatory evidence to present, and hence either reduces the conviction probability or leaves it unchanged.

While the effect of MD is ambiguous without RTS but unambiguous with RTS, the effect of RTS is unambiguous with or without MD.

*Corollary 3.* Without MD, RTS reduces the conviction probability by  $(1-\delta)P[I_\epsilon] + (1-\pi)P[G_\epsilon]$  for all  $U_j \in [\eta^{00}, \eta^{11}]$  and leaves it unchanged for all  $U_j \in [\underline{\eta}, \eta^{00}) \cup (\eta^{11}, \bar{\eta}]$ .

RTS reduces the conviction probability because it blocks J's inference from D's silence, an inference that is adverse to D in the model's adversarial context.

*Corollary 4.* With MD, RTS reduces the conviction probability by  $(1-\pi)\{(1-\delta)P[I_\epsilon] + P[G_\epsilon]\}$  for all  $U_j \in [\eta^{10}, \eta^{11}]$  and leaves it unchanged for all

$$U_j \in [\underline{\eta}, \eta^{10}) \cup (\eta^{11}, \bar{\eta}].$$

Corollaries 3 and 4 indicate that RTS generally reduces the conviction probability with or without MD. By reducing the conviction probability, RTS helps innocent defendants by reducing wrongful convictions, but also helps guilty defendants by increasing wrongful acquittals. RTS protects D if D (and hence P, without MD) does not know the evidence, or if D knows the evidence, it is not in D's favor, but P does not know it. In the former case, D must remain silent; in the latter case, D chooses to remain silent. In either case, if D is guilty, D is rightfully convicted without RTS, but wrongfully acquitted with it. If D is innocent, D is wrongfully convicted without RTS, but rightfully acquitted with it. Thus, RTS protects the innocent by reducing the probability of wrongful conviction, but also protects the guilty by increasing the probability of wrongful acquittal.

Comparing Corollaries 3 and 4 reveals that RTS reduces the conviction probability (and reduces the probability of wrongful conviction, and increases the probability of wrongful acquittal) for a larger range of juries (since  $[\eta^{00}, \eta^{11}] \subset [\eta^{10}, \eta^{11}]$ ), but by a smaller measure for any jury in that range (since  $(1 - \delta)P[I_\epsilon] > (1 - \pi)(1 - \delta)P[I_\epsilon]$ ), with MD than without it. On one hand, MD directly reduces the conviction probability by increasing the probability that D knows exculpatory evidence. Thus, RTS cannot reduce the conviction probability by as great a measure if MD has already directly made it low. But on the other hand, MD also increases the conviction probability by making J's inference from D's silence more adverse. Thus, RTS can reduce the conviction probability by a greater measure if it can cancel out this strategic effect of MD.

*Corollary 5.* MD combined with RTS (the Fifth Amendment) reduces the conviction probability by  $(1-\delta)P[I_\varepsilon]+(1-\pi)P[G_\varepsilon]$  for all  $U_j \in [\eta^{00}, \eta^{11}]$ , leaves it unchanged for all  $U_j \in [\underline{\eta}, \eta^{00})$ , and reduces it by  $\pi(1-\delta)P[I_\varepsilon]$  for all  $U_j \in (\eta^{11}, \bar{\eta}]$ .

Comparing Corollaries 3 and 5 reveals that the Fifth Amendment reduces the conviction probability for a larger range of juries (since  $[\eta^{00}, \eta^{11}] \subset [\eta^{10}, \bar{\eta}]$ ), and by a greater or equal measure for any jury in this range, than RTS alone. By blocking J's adverse inference, RTS reduces the conviction probability. Adding MD to RTS reduces the conviction probability even more, since MD also directly reduces the conviction probability by increasing the probability that D knows exculpatory evidence. And although MD also indirectly tends to increase the conviction probability by making J's adverse inference from silence more adverse, this effect is neutralized by the presence of RTS. Thus, the Fifth Amendment generally reduces the conviction probability more than RTS alone.

## 5. Social welfare

To study the effect of RTS on social welfare, society's preferences are now measured in terms of the two types of court error. Social preference,  $U_s$ , can differ from jury preferences,  $U_j$ , but evidence is pivotal for society and juries alike, that is,  $U_j, U_s \in [\underline{\eta}, \bar{\eta}]$ . Denote equilibrium welfare in  $\Gamma^i$  by  $W^i$  for all  $i, j \in \{0, 1\}$ . The

following proposition identifies equilibrium welfare in each of the four adversarial models.

*Proposition 3.* For all  $j \in \{0,1\}$ , social welfare in  $\Gamma^{0j}$  is

$$W^{0j} = \begin{cases} P[I_\tau]\{P[I_\varepsilon | I_\tau] + P[I_\varepsilon | I_\tau](\pi U_s + 1 - \pi)\} \\ \quad + P[G_\tau]P[G_\varepsilon | G_\tau]\pi & \text{for all } U_j \in [\underline{\eta}, \eta^{0j}] \\ P[I_\tau]\{P[I_\varepsilon | I_\tau](\delta + (1 - \delta)U_s) + P[G_\varepsilon | I_\tau]U_s\} \\ \quad + P[G_\tau]\{P[I_\varepsilon | G_\tau](1 - \delta) + P[G_\varepsilon | G_\tau]\} & \text{for all } U_j \in (\eta^{0j}, \bar{\eta}] \end{cases},$$

and welfare in  $\Gamma^{1j}$  is

$$W^{1j} = \begin{cases} P[I_\tau]\{P[I_\varepsilon | I_\tau] + P[I_\varepsilon | I_\tau](\pi U_s + 1 - \pi)\} \\ \quad + P[G_\tau]P[G_\varepsilon | G_\tau]\pi & \text{for all } U_j \in [\underline{\eta}, \eta^{1j}] \\ P[I_\tau]\{P[I_\varepsilon | I_\tau](\pi + (1 - \pi)(\delta + (1 - \delta)U_s)) + P[G_\varepsilon | I_\tau]U_s\} \\ \quad + P[G_\tau]\{P[I_\varepsilon | G_\tau](1 - \delta)(1 - \pi) + P[G_\varepsilon | G_\tau]\} & \text{for all } U_j \in (\eta^{1j}, \bar{\eta}] \end{cases}.$$

From Proposition 3, we can analyze the separate, interactive, and combined effects of MD and RTS on welfare. Let us also consider these effects in turn.

*Corollary 6.* Without RTS, MD increases welfare if and only if  $U_s > \eta^{10}$  for all  $U_j \in [\eta^{10}, \eta^{00}]$ , leaves it unchanged for all  $U_j \in [\underline{\eta}, \eta^{10})$ , and increases it if and only if  $U_s \leq \bar{\eta}$  for all  $U_j \in (\eta^{00}, \bar{\eta}]$ .

Since evidence is pivotal for society too, without RTS, MD always increases welfare for all  $U_j \in (\eta^{00}, \bar{\eta}]$ . Therefore, MD's overall effect on welfare is ambiguous without RTS. But it is unambiguous with RTS, much like its effect on the conviction

probability.

*Corollary 7.* With RTS, MD does not affect welfare for all  $U_j \in [\underline{\eta}, \eta^{11})$ , and increases it if and only if  $U_s \leq \bar{\eta}$ , that is, always increases it, for all  $U_j \in (\eta^{11}, \bar{\eta}]$ .

According to Corollary 7, MD generally increases welfare with RTS. With RTS, MD only increases the probability that D is informed of the evidence. If this evidence is exculpatory, D will present it and J will acquit since the evidence is pivotal. With MD, P cannot suppress the exculpatory evidence. Thus, MD only makes exculpatory evidence more likely to come out, which cannot harm society as long as evidence is pivotal for society as well.

RTS prevents some juries from convicting given silence. With these juries, increasing the likelihood that D knows exculpatory evidence does not affect welfare. Even if P suppresses exculpatory evidence, and D does not learn about it and hence must be silent, D is nevertheless acquitted, as long as RTS is in effect. But other juries would convict given silence even with RTS. For these juries, increasing the likelihood that D knows exculpatory evidence actually does society good. Without MD, if P suppresses exculpatory evidence, and D does not learn about it and hence must be silent, then D is convicted, even with RTS. Because evidence is more often right than wrong, many of these convictions are wrongful. But with MD, if P knows exculpatory evidence, D learns and presents it, and hence is acquitted since evidence is pivotal. With these juries, MD strictly increases welfare with RTS.

Without RTS, MD also makes J's adverse inference from D's silence more

adverse, which may harm a society that sufficiently dislikes wrongful convictions. Thus, without RTS, MD need not increase welfare. But this does not imply that RTS necessarily increases the welfare efficiency of MD. For example, if society tolerates wrongful convictions sufficiently that MD increases welfare for all  $U_j \in [\eta^{10}, \eta^{00}]$  without RTS, then MD increases welfare less with RTS than without it. Let us now turn to the welfare-effects of RTS with and without MD.

*Corollary 8.* Without MD, RTS does not affect welfare for all  $U_j \in [\underline{\eta}, \eta^{00}) \cup (\eta^{01}, \bar{\eta}]$ , and increases it if and only if  $U_s \leq \eta^{00}$  for all  $U_j \in [\eta^{00}, \eta^{01}]$ .

Corollary 8 reveals that a necessary condition for RTS to improve welfare is that  $U_s < U_j$ . That is, RTS can only improve welfare if J's preferences are biased against D relative to social preferences. If  $U_s = U_j$ , society's problem (whether or not to implement RTS) and J's problem (whether or not to convict given silence) exactly coincide, so the first best outcome is achieved without RTS. If  $U_s > U_j$ , J incurs more disutility from a wrongful conviction than society does. In this case, RTS cannot improve welfare either since RTS reduces the probability of wrongful conviction. Hence, there must be jury discrimination against defendants for the right to silence to improve welfare.

*Corollary 9.* With MD, RTS does not affect welfare for all  $U_j \in [\underline{\eta}, \eta^{10}) \cup (\eta^{11}, \bar{\eta}]$ , and increases it if and only if  $U_s \leq \eta^{10}$  for all  $U_j \in [\eta^{10}, \eta^{11}]$ .

Corollaries 8 and 9 imply that MD reduces the welfare efficiency of RTS. Recall that  $\eta^{10} < \eta^{00}$  from Proposition 1. Consider the three regions of parameter space, (1)  $U_s < \eta^{10} < \eta^{00}$ , (2)  $\eta^{10} < U_s < \eta^{00}$ , and (3)  $\eta^{10} < \eta^{00} < U_s$ . The extent to which  $U_s$  is smaller (greater) than  $\eta^{10}$  ( $\eta^{00}$ ), determines the extent to which RTS increases (decreases) welfare in the model with MD (without MD). Thus, in region (1), RTS increases welfare, but less with MD than without it. RTS changes J's verdict given silence from  $G_v$  to  $I_v$  for all juries in  $[\eta^{10}, \eta^{11}]$ , and this change is beneficial to society with or without MD, because in this region society's disutility from wrongful conviction is relatively large. Without MD, if D remains silent, society cannot rule out the possibility that D does not know the evidence, nor the possibility that the evidence misleadingly indicates that D is guilty. But with MD, if D remains silent, society can rule out the former possibility, leaving only the latter. Thus, society benefits more (in expected terms) from the verdict change given silence from  $G_v$  to  $I_v$  without MD than with it.

In region (2), RTS reduces welfare with MD, but increases welfare without it. In this region, society's disutility from wrongful conviction is sufficiently high that, if it cannot rule out the possibility that D does not know the evidence, it benefits from the verdict change from  $G_v$  to  $I_v$ , but its disutility from wrongful conviction is also sufficiently low that, if it can rule out this possibility, it is harmed by the change in verdict occasioned by RTS. In region (3), RTS reduces welfare, but more with MD than without it. The verdict change due to RTS is beneficial to society with or without MD, because in this region society's disutility is relatively small. But the verdict change is more beneficial to society without MD, because with MD, society can eliminate the

possibility that D does not know the evidence if D remained silent, leaving only the possibility that the evidence wrongfully indicates that D is guilty. Thus RTS either increases welfare less or reduces welfare more with MD than without it. In other words, MD reduces the welfare efficiency of RTS.

*Corollary 10.* MD combined with RTS (the Fifth Amendment) does not affect welfare for all  $U_j \in [\underline{\eta}, \eta^{00})$ , increases it if and only if  $U_s \leq \eta^{00}$  for all  $U_j \in [\eta^{00}, \eta^{01}]$ , and increases it if and only if  $U_s \leq \bar{\eta}$ , that is, always increases it, for all  $U_j \in (\eta^{11}, \bar{\eta}]$ .

Comparing Corollaries 8 and 10, we find that the Fifth Amendment improves welfare for a larger range of parameters than does RTS on its own. Recall that MD always increases welfare in the presence of RTS. Therefore, adding MD and RTS naturally has a better effect on welfare than adding RTS alone.

Having derived the interactive and combined welfare-effects of RTS and MD, let us now search for the most efficient mechanism among  $\Gamma^{00}$ ,  $\Gamma^{10}$ ,  $\Gamma^{01}$ , and  $\Gamma^{11}$ . The following proposition identifies the necessary and sufficient condition for  $\Gamma^{11}$  (the Fifth Amendment) to be the most efficient mechanism in this constrained set.

*Proposition 4.* If  $U_s \leq \eta^{01}$ , then  $\Gamma^{11}$  is the most efficient mechanism. If  $U_s > \eta^{01}$ , then  $\Gamma^{10}$  is the most efficient mechanism.

Some juries would acquit given silence regardless of the legal regime. With these juries, all regimes yield equal welfare. Even MD does not affect welfare. MD does not

reduce the conviction probability even though it increases the probability that D presents exculpatory evidence, because these juries acquit even if D remains silent rather than presenting the exculpatory evidence. Other juries would convict given silence regardless of the legal regime. With these juries, only MD affects welfare. In particular, MD increases welfare with or without RTS, since with these juries, MD only increases the probability that exculpatory evidence comes out, which improves welfare as long as evidence is pivotal for society. With these juries, any regime with MD is optimal.

With yet other juries, the verdict given silence can only be affected by MD alone, that is, MD without RTS (recall that with RTS, MD cannot affect the verdict given silence). With these juries, acquittal would follow silence under any legal regime other than MD alone. But with MD alone, conviction would follow silence. This harms society if and only if society sufficiently dislikes wrongful convictions. Thus, with these juries, all regimes other than MD alone yield equal welfare, and MD alone yields higher welfare if and only if society sufficiently dislikes wrongful convictions.

The verdict given silence of the remaining jury types is only affected by either RTS alone or RTS with MD. With these juries, conviction follows silence under any other regime. But acquittal follows silence with RTS alone or RTS with MD. Welfare is always higher with MD alone than without MD or RTS, since with these juries, MD has no strategic effect (the juries always acquit given silence with or without MD), and hence only increases the probability that exculpatory evidence comes out, which increases welfare. Moreover, welfare is higher with RTS alone or RTS with MD than it is with MD alone if and only if society sufficiently dislikes wrongful convictions.

Therefore, only MD alone or MD with RTS can be optimal across all parameter

ranges. Hence, in general, either the Fifth Amendment or MD on its own is the most efficient mechanism studied. If society sufficiently dislikes wrongful convictions, then the most efficient mechanism is the Fifth Amendment, otherwise it is MD alone.

Whether RTS is part of the efficient mechanism depends on the extent of jury discrimination (that is, the extent to which  $U_s$  is smaller than  $U_j$ ), and on the model's other parameters. Proposition 4 states that RTS is part of the efficient mechanism if and only if

$$U_s \leq \eta^{01} = 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau](1 - \delta) + P[G_\varepsilon | G_\tau]}{P[I_\tau] P[I_\varepsilon | I_\tau](1 - \delta) + P[G_\varepsilon | I_\tau]} . \quad (6)$$

The prior probability that D is truly guilty ( $P[G_\tau]$ ) is connected to the reputations of the police and the judiciary. If the police and the judiciary have a reputation for being corrupt or biased, then J is more likely to believe ex ante that D is innocent, so that  $P[G_\tau]$  will tend to be lower. On the other hand, the prior probabilities that correlate the evidence with the truth ( $P[G_\varepsilon | G_\tau]$  and  $P[I_\varepsilon | I_\tau]$ ) are linked to the strength or accuracy of the evidence, which may vary from case to case. RTS is part of the efficient mechanism for a larger parameter range in cases for which evidence is weaker and the worse are the reputations of the police and the judiciary. In weaker cases, the evidence might well indicate guilt even though D is innocent, and might well indicate innocence even though D is guilty. Moreover, D is more likely to be innocent the worse are the reputations of the police and the judiciary. Thus, more innocent defendants and fewer guilty defendants stand to benefit from RTS, and therefore it is more likely to improve welfare. This

suggests that the prevalence of police discrimination (which may reduce police reputation) and jury discrimination (without which the right to silence cannot improve welfare) would be arguments to preserve or implement RTS, at least in cases for which evidence is less accurate.

King (1993) reviews the empirical evidence concerning the effect of race on jury decisions in the United States. The author reports the results of four independent studies in different parts of the country that indicate that the racial composition of juries does affect verdicts. For example, a 1984 study in Dade County, Florida found that juries with at least one black juror were less likely than all-white juries to convict black defendants. Donohue and Levitt (2001) present evidence that the racial composition of police forces in different U.S. cities affects the racial patterns of arrests in these cities. They find that increases in the number of white police officers increases the number of nonwhites arrested, but does not affect the number of whites arrested. The model suggests that RTS is more likely to improve social welfare in places where jury and police discrimination of this kind are widespread.

## **6. Plea bargaining**

The possibility of plea bargaining affects the composition of cases that go to trial. The cases that do not settle are the ones where there is asymmetric information and this is more likely in cases for which evidence is less accurate ( $P[G_\varepsilon | G_\tau]$  and  $P[I_\varepsilon | I_\tau]$  are closer to  $\frac{1}{2}$ ). With MD, any informational asymmetry favors D. In this case, a reduction in evidence accuracy increases the parameter range for which RTS is efficient, as is

apparent from inequality (6).

Intuitively, MD rules out the possibility that P knows the evidence, the evidence is in D's favor, but D does not know it. Then there is more weight on the possibility that D knows the evidence but it is not in D's favor. But the less accurate is the evidence, the less this implies that D is actually guilty. So RTS, by blocking J's adverse inference from silence, is expected to help fewer guilty defendants the less accurate is the evidence. Therefore, given MD, the possibility of plea bargaining, by selecting for trial cases for which evidence is less accurate, makes RTS efficient for a larger parameter range. This may be an argument to preserve RTS in legal systems that strongly encourage plea bargaining to reduce court costs.

Given the possibility of plea bargaining, RTS and MD can also affect the probability that cases go to trial. Reinganum (1988) develops a basic model of plea bargaining with prosecutorial discretion to dismiss cases and negotiate guilty pleas to lesser crimes in exchange for reduced sentences. Her model assumes P has private information about case strength, which is only possible without MD at the plea-stage. The main results are that P dismisses cases that are sufficiently weak and offers D a sentence in exchange for a guilty plea in cases that are sufficiently strong, the sentence offered increases with the conviction probability at trial, and defendants are more likely to reject higher sentence offers. Thus, the trial probability increases with the strength of P's case.

RTS reduces the strength of P's case. With RTS, P cannot count on J's negative inference from D's silence. This reduces the conviction probability at trial, as is shown in Corollary 3. Therefore, RTS should reduce the trial probability, at least in the absence of

MD at the pre-trial stage. Moreover, the combination of RTS and MD was shown to reduce the conviction probability by an even greater extent than RTS alone. Thus, RTS combined with MD only at the trial stage should reduce the trial probability even more than RTS alone.

## **7. Conclusion**

The paper's main findings are the following. Mandatory disclosure by prosecutors has an ambiguous effect on the conviction probability without the right to silence, but reduces it with the right to silence. With or without mandatory disclosure, the right to silence reduces the conviction probability, increases the probability of wrongful acquittal, and reduces the probability of wrongful conviction. If social welfare is measured only in terms of the court errors, the right to silence can only improve welfare in cases where jury preferences are biased against defendants relative to social preferences. With the right to silence, mandatory disclosure always increases welfare. Mandatory disclosure reduces the welfare-efficiency of the right to silence. The right to silence combined with mandatory disclosure is more likely to increase welfare than is the right to silence alone. The most efficient of the mechanisms studied is either mandatory disclosure alone or combined with the right to silence. The latter is more likely to be the most efficient mechanism the worse is the reputation of the police and the weaker is the evidence.

These results may shed light on important policy questions, such as whether to preserve the right to silence in the U.S. now that it has been eliminated in England and Ireland, and whether and how to implement mandatory disclosure or the right to silence

in developing countries. At the very least, the model demonstrates that the efficiency of the right to silence is intimately connected to the prevalence of jury and police discrimination, and that the efficiency of mandatory disclosure and that of the right to silence are intimately connected to each other.

Several of the theoretical predictions may also be empirically testable. For example, one could test whether the right to silence at trial has reduced plea rates and conviction rates in the U.S. by examining the effect of the Supreme Court ruling in *Carter v. Kentucky* (January 14, 1981), which gave defendants the right to have the judge instruct the jury not to draw an adverse inference from a failure to testify. It might also be possible to test the prediction that the right to silence reduces wrongful convictions by examining cases for which guilty verdicts have been successfully appealed. If one found that the fraction of verdicts reversed on appeal decreased after *Carter v. Kentucky*, one would have support for the prediction that the right to silence reduces wrongful convictions.

## Appendix

Proofs of Lemma 1 and Propositions 1 and 4 follow.

*Proof of Lemma 1.* After learning  $I_\varepsilon$ , if J chooses  $G_v$ , then J's expected utility is

$$P[I_\tau | I_\varepsilon]U_J(G_v, I_\tau) + P[G_\tau | I_\varepsilon]U_J(G_v, G_\tau) = P[I_\tau | I_\varepsilon]U_J + P[G_\tau | I_\varepsilon]. \quad (\text{A1})$$

If J chooses  $I_v$ , then J's expected utility is

$$P[I_\tau | I_\varepsilon]U_J(I_v, I_\tau) + P[G_\tau | I_\varepsilon]U_J(I_v, G_\tau) = P[I_\tau | I_\varepsilon]. \quad (\text{A2})$$

Therefore, J renders the verdict  $I_v$  (that is, the evidence is pivotal) if and only if

$$U_J \leq 1 - \frac{P[G_\tau | I_\varepsilon]}{P[I_\tau | I_\varepsilon]} = 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau]}{P[I_\tau] P[I_\varepsilon | I_\tau]}. \quad (\text{A3})$$

After learning  $G_\varepsilon$ , if J chooses  $G_v$ , then J's expected utility is

$$P[I_\tau | G_\varepsilon]U_J(G_v, I_\tau) + P[G_\tau | G_\varepsilon]U_J(G_v, G_\tau) = P[I_\tau | G_\varepsilon]U_J + P[G_\tau | G_\varepsilon]. \quad (\text{A4})$$

If J chooses  $I_v$ , then J's expected utility is

$$P[I_\tau | G_\varepsilon]U_J(I_v, I_\tau) + P[G_\tau | G_\varepsilon]U_J(I_v, G_\tau) = P[I_\tau | G_\varepsilon]. \quad (\text{A5})$$

Therefore, J renders the verdict  $G_v$  (that is the evidence is pivotal) if and only if

$$U_J \geq 1 - \frac{P[G_\tau | G_\varepsilon]}{P[I_\tau | G_\varepsilon]} = 1 - \frac{P[G_\tau] P[G_\varepsilon | G_\tau]}{P[I_\tau] P[G_\varepsilon | I_\tau]}. \quad (\text{A6})$$

In general, the evidence is pivotal if and only if

$$U_J \in [\underline{\eta}, \bar{\eta}] \text{ where } \underline{\eta} = 1 - \frac{P[G_\tau] P[G_\varepsilon | G_\tau]}{P[I_\tau] P[G_\varepsilon | I_\tau]} \text{ and } \bar{\eta} = 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau]}{P[I_\tau] P[I_\varepsilon | I_\tau]}. \quad (\text{A7})$$

Q.E.D.

*Proof of Proposition 1.* Consider first  $\Gamma^{00}$ . Given the candidate strategies for P and D, three of J's information sets are reached with positive probability: " $I_\varepsilon$ ", " $G_\varepsilon$ ", " $s$ ". Since evidence is pivotal, J renders verdict  $G_v$  if it hears " $G_\varepsilon$ " and verdict  $I_v$  if it hears " $I_\varepsilon$ ".

Upon hearing nothing, J's posterior is

$$\begin{aligned} & P[I_\tau | P \text{ and } D \text{ chose "s"}] \\ &= \frac{P[I_\tau] \{P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau](1-\pi)\}}{P[I_\tau] \{P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau](1-\pi)\} + P[G_\tau] \{P[I_\varepsilon | G_\tau](1-\delta) + P[G_\varepsilon | G_\tau](1-\pi)\}}. \end{aligned} \quad (\text{A8})$$

J renders verdict  $I_v$  if and only if

$$\begin{aligned}
& P[G_\tau | \text{"s"}]U_J(I_v, G_\tau) + P[I_\tau | \text{"s"}]U_J(I_v, I_\tau) \\
& \geq P[G_\tau | \text{"s"}]U_J(G_v, G_\tau) + P[I_\tau | \text{"s"}]U_J(G_v, I_\tau).
\end{aligned} \tag{A9}$$

Substituting (A.8) and the values of J's utility function into (A.9), we get that J renders verdict  $I_v$  when it hears silence if and only if

$$U_J \leq 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau](1-\delta) + P[G_\varepsilon | G_\tau](1-\pi)}{P[I_\tau] P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau](1-\pi)} = \eta^{00}. \tag{A10}$$

Whether or not (A.10) is satisfied, P and D at least weakly prefer to present the evidence if and only if they know that it is in their favor. Thus, the candidate strategies for D and P are best responses to J's persuasion rule. It is straightforward but tedious to show that iterative deletion of weakly dominated strategies eliminates all equilibria other than this one.

Next consider  $\Gamma^{10}$ . In this game, J's posterior given silence is

$$\begin{aligned}
& P[I_\tau | P \text{ and } D \text{ chose "s"}] \\
& = \frac{P[I_\tau] \{P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau]\}}{P[I_\tau] \{P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau]\} + P[G_\tau] \{P[I_\varepsilon | G_\tau](1-\delta) + P[G_\varepsilon | G_\tau]\}}.
\end{aligned} \tag{A11}$$

Therefore, J renders verdict  $I_v$  when it hears silence if and only if

$$U_J \leq 1 - \frac{P[G_\tau] P[I_\varepsilon | G_\tau](1-\delta) + P[G_\varepsilon | G_\tau]}{P[I_\tau] P[I_\varepsilon | I_\tau](1-\delta) + P[G_\varepsilon | I_\tau]} = \eta^{10}. \tag{A12}$$

Now consider first  $\Gamma^{01}$ . In this game, J's posterior following silence by both P and D is given by (A.8). However, J's posterior following only silence by P is given by

$$\begin{aligned}
& P[I_\tau | P \text{ chose "s"}] \\
& = \frac{P[I_\tau] \{1-\pi + P[I_\varepsilon | I_\tau]\pi\}}{P[I_\tau] \{1-\pi + P[I_\varepsilon | I_\tau]\pi\} + P[G_\tau] \{1-\pi + P[I_\varepsilon | G_\tau]\pi\}}.
\end{aligned} \tag{A13}$$

Without RTS, J's decision-making is governed by  $P[I_\tau | P \text{ and } D \text{ chose "s"}]$ , but with RTS, it should be governed by  $P[I_\tau | P \text{ chose "s"}]$ . Therefore, in  $\Gamma^{01}$ , J's posterior following

silence is (A.13). Hence, J renders verdict  $I_v$  when it hears silence if and only if

$$U_J \leq 1 - \frac{P[G_\tau]1 - \pi + P[I_\varepsilon | G_\tau]\pi}{P[I_\tau]1 - \pi + P[I_\varepsilon | I_\tau]\pi} = \eta^{01}. \quad (\text{A14})$$

A similar calculation reveals that  $\eta^{01} = \eta^{11}$ . Moreover,

$$\begin{aligned} \frac{1 - \pi + P[I_\varepsilon | G_\tau]\pi}{1 - \pi + P[I_\varepsilon | I_\tau]\pi} &< \frac{P[I_\varepsilon | G_\tau]}{P[I_\varepsilon | I_\tau]} \\ &< \frac{P[I_\varepsilon | G_\tau](1 - \delta) + P[G_\varepsilon | G_\tau](1 - \pi)}{P[I_\varepsilon | I_\tau](1 - \delta) + P[G_\varepsilon | I_\tau](1 - \pi)} \\ &< \frac{P[I_\varepsilon | G_\tau](1 - \delta) + P[G_\varepsilon | G_\tau]}{P[I_\varepsilon | I_\tau](1 - \delta) + P[G_\varepsilon | I_\tau]}. \end{aligned} \quad (\text{A15})$$

because  $P[I_\varepsilon | I_\tau] > P[G_\varepsilon | I_\tau]$  and  $P[I_\varepsilon | G_\tau] < P[G_\varepsilon | G_\tau]$  since evidence is assumed to be more often right than wrong. Therefore,  $\eta^{10} < \eta^{00} < \eta^{01} = \eta^{11}$ . Q.E.D.

*Proof of Proposition 4.* From Proposition 3, we see that for all  $U_J \in [\underline{\eta}, \eta^{10})$ ,  $W^{00} = W^{01} = W^{10} = W^{11}$ . For all  $U_J \in [\eta^{11}, \bar{\eta}]$ ,  $W^{00} = W^{01}$  and  $W^{10} = W^{11}$ . Moreover,  $W^{11} > W^{00}$  if and only if  $U_s \leq \bar{\eta}$ , which is true by assumption. Therefore, for all  $U_J \in [\eta^{11}, \bar{\eta}]$ ,  $W^{10} = W^{11} > W^{00} = W^{01}$ . For all  $U_J \in [\eta^{10}, \eta^{00}]$ ,  $W^{11} = W^{01} = W^{00}$ . Moreover,  $W^{11} > W^{00}$  if and only if  $U_s \leq \eta^{10}$ . Lastly, for all  $U_J \in [\eta^{00}, \eta^{11}]$ ,  $W^{11} = W^{01}$  and  $W^{10} > W^{00}$ . Moreover,  $W^{11} > W^{10} > W^{00}$  if  $U_s \leq \eta^{01}$ ,  $W^{10} > W^{11} > W^{00}$  if  $U_s \in [\eta^{10}, \eta^{00}]$ ,  $W^{10} > W^{00} > W^{11}$  if  $U_s > \eta^{00}$ . Therefore, if  $U_s \leq \eta^{01}$ ,  $\Gamma^{11}$  is the most efficient mechanism, and if  $U_s > \eta^{01}$ ,  $\Gamma^{10}$  is the most efficient mechanism. Q.E.D.

## References

- BAIRD, D.G., GERTNER, R.H. and PICKER, R.C. *Game Theory and the Law*. Cambridge, MA: Harvard University Press, 1998.
- BENTHAM, J. *A Treatise on Judicial Evidence*. London: Quality Court, 1825.
- BOYLAN, R.T. and LONG, C.X. "Size, Monitoring, and Plea Rate: An Examination of United States Attorneys." Political Economy Working Paper, Washington University in St. Louis, 2000.
- BRIGHT, S.B. "Death by Lottery—Procedural Bar of Constitutional Claims in Capital Cases Due to the Inadequate Representation of Indigent Defendants." *West Virginia Law Review*, Vol. 92 (1990), pp. 679-692.
- . "Counsel for the Poor: the Death Sentence Not for the Worst Crime But for the Worst Lawyer." *Yale Law Journal*, Vol. 103 (1994), pp. 1835-1883.
- BUCKE, T., SREET, R. and BROWN, D. *The Right to Silence: the Impact of the Criminal Justice and Public Order Act 1994*. A Research, Development and Statistics Directorate Report, Home Office Research Study 199, London: Home Office, 2000.
- Carter v. Kentucky*, 450 U.S. 288, 1981 U.S. LEXIS 77 (January 14, 1981).
- Criminal Justice and Public Order Act 1994: Elizabeth II. Chapter 33*. London: The Stationery Office Books, 1994.
- COOTER, R. and RUBINFELD, D. "An Economic Model of Legal Discovery." *Journal of Legal Studies*, Vol. 23 (1994), pp. 435-463.
- DONOHUE, J.J. III and LEVITT, S.D. "The Impact of Race on Policing and Arrests." *Journal of Law and Economics*, Vol. 44 (2001), pp. 367-394.

- DUGGAN, J. and MARTINELLI, C. "A Bayesian Model of Voting in Juries." *Games and Economic Behavior*, Vol. 37 (2001), pp. 259-294.
- FEDDERSEN, T. and PESENDORFER, W. "Convicting the Innocent: The Inferiority of Unanimous Jury Verdicts under Strategic Voting." *American Political Science Review*, Vol. 92 (1998), pp. 23-35.
- GAY, G.D., GRACE, M.F., KALE, J.R. and NOE, T.H. "Noisy Juries and the Choice of Trial Mode in a Sequential Signaling Game: Theory and Evidence." *RAND Journal of Economics*, Vol. 20 (1989), pp. 196-213.
- GLAESER, E.L., KESSLER, D.P. and PIEHL, A.M. "What Do Prosecutors Maximize? An Analysis of the Federalization of Drug Crimes." *American Law and Economics Review*, Vol. 2 (2000), pp. 259-290.
- Griffin v. California* , 380 U.S. 960, 1965 U.S. LEXIS 1490 (April 5, 1965).
- GUNTHER, G. and SULLIVAN, K.M. *Constitutional Law*. Thirteenth Edition, New York: The Foundation Press, 1997.
- JACKSON, J., WOLFE, M. and QUINN, K. *Legislating Against Silence: The Northern Ireland Experience*. NIO Research and Statistical Series No. 1, 2000.
- KING, N.J. "Postconviction Review of Jury Discrimination: Measuring the Effects of Juror Race on Jury Decisions." *Michigan Law Review*, Vol. 92 (1993), pp. 63-130.
- LEVY, L. *Origins of the Fifth Amendment*. New York: Oxford University Press, 1968.
- MILGROM, P.R. "Good News and Bad News: Representation Theorems and Applications." *Bell Journal of Economics*, Vol. 12 (1981), pp. 380-391.
- O.J. Simpson Trial Transcripts and Documents*. WESTLAW, Notable Trials Library, 1995.

- P'NG, I.P.L. "Strategic Behavior in Suit, Settlement, and Trial." *Bell Journal of Economics*, Vol. 14 (1983), pp. 539-550.
- REINGANUM, J.F. "Plea Bargaining and Prosecutorial Discretion." *American Economic Review*, Vol. 78 (1988), pp. 713-728.
- SEIDMANN, D.J. and STEIN, A. "The Right to Silence Helps the Innocent: A Game-Theoretic Analysis of the Fifth Amendment Privilege." *Harvard Law Review*, Vol. 114 (2000), pp. 431-510.
- SHIN, H.S. "Adversarial and inquisitorial procedures in arbitration." *RAND Journal of Economics*, Vol. 29 (1998), pp. 378-405.
- SPIER, K.E. "The Dynamics of Pretrial Negotiation." *Review of Economic Studies*, Vol. 59 (1992), pp. 93-108.
- VICK, D.W. "Poorhouse Justice: Underfunded Indigent Defense Services and Arbitrary Death Sentences." *Buffalo Law Review*, Vol. 43 (1995), pp. 329-460.