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Information Suppression by Teams and Violations of the *Brady* Rule*

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We develop a model of individual prosecutors (and teams of prosecutors) and show how, in equilibrium, team-formation can lead to increased incentives to suppress evidence (relative to those faced by a lone prosecutor). Our model assumes that each individual prosecutor is characterized by a variable that captures that individual's level of tradeoff between a desire for career advancement (by winning a case) and a disutility for unjustly convicting an innocent defendant by suppressing exculpatory evidence. We assume a population of prosecutors that is heterogenous with respect to this tradeoff rate, and each individual's tradeoff rate is their own private information. A convicted defendant may later discover the exculpatory information; a judge will then void the conviction and may order an investigation. If the prosecutor is found to have violated the defendant's *Brady* rights (to exculpatory evidence), this results in penalizing the prosecutor. The payoff from winning a case is a public good (among the team members) while any penalties are private bads. The anticipated game between the prosecutors and the judge is the main focus of this paper. The decision to investigate a sole prosecutor, or a team of prosecutors, is determined endogenously. We show that the equilibrium assignment of roles within the team involves concentration of authority about suppressing/disclosing evidence.

1. Introduction

Disclosure by individual agents (individual sellers or firms viewed as unified agents) is a well-developed topic in the economics literature (see the literature review below for further discussion). In this paper we consider the effect of reliance on teams of agents on the provision of information by the team to a regulatory authority. We use the provision of exculpatory evidence (in a criminal proceeding) as a primary example to consider the allocation of roles within a prosecutorial team and the incentives to suppress evidence, by modeling the game between prosecutors in the team and a judge who obtains utility from detecting prosecutorial misconduct. The judge represents our regulatory authority. Other examples, which we raise very briefly, include firms facing safety or environmental regulation and possibly providing false reports to the relevant regulators.[1]

1.1 Background on the Brady Rule and Brady Violations

In the United States, *Brady v. Maryland* (1963) requires that prosecutors disclose exculpatory evidence favorable to a defendant; not disclosing is a violation of a defendant's constitutional right to due process. The *Brady* Rule itself requires disclosure of evidence material to guilt or punishment; in a series of judicial decisions this was extended to include: 1) evidence that can be used to impeach a witness; 2) evidence in the possession of the police; and 3) undisclosed evidence that the prosecution knew, or should have known, that their case included perjured testimony (see Kozinski, 2015, and Kennan, et. al., 2011). An authority on the elements and rules governing

[1] For example, Merck scientists failed to disclose relevant information to the Food and Drug Administration concerning severe cardiovascular side effects associated with their painkiller Vioxx. As another example, a comparatively small group of senior executives and engineers at Volkswagon developed and implemented software that would misreport the extent of pollution emitted by their diesel cars. We return to these two incidents in the concluding section, but focus our current attention on the suppression of information by prosecutors.

prosecutorial misconduct[2] has observed that "... violations of *Brady* are the most recurring and pervasive of all constitutional procedural violations, with disastrous consequences ..." (Gershman, 2007, p. 533).

As an example of a collection of *Brady* violations, in 1999 John Thompson, who had been convicted of murder and had been on death row in Louisiana for fourteen years, was within four weeks of his scheduled execution when a private investigator stumbled across evidence relevant to Thompson's defense, which a team of prosecutors in the Orleans Parish District Attorney's Office had suppressed.[3] Justice Ginsburg's dissent in *Connick v. Thompson* details how all of the aforementioned aspects of *Brady* protection were violated in Thompson's case. Judge Alex Kozinski has argued that "There is an epidemic of *Brady* violations abroad in the land" (*United States v. Olsen*, 737 F.3d 625, 626; 9th Cir. 2013), and listed a number of federal cases involving *Brady* violations. The few studies on prosecutorial misconduct that exist have found thousands of instances of various types of prosecutorial misconduct, including many *Brady* violations (see Kennan et. al., 2011).

1.2 This Paper

Motivated both by the problem of suppression of exculpatory evidence, and by the effect of teams on information suppression in general, we develop a model of individual prosecutors (and teams of prosecutors) and show how, in equilibrium, team-formation can lead to increased incentives

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[2] See Gershman (2015) for an extensive discussion of the different forms of prosecutorial misconduct.

[3] After being found innocent of murder in a retrial, Thompson sued Harry Connick, Sr. in his capacity as District Attorney for the Parish of Orleans. At trial, Thompson won $14 million dollars compensation from the Parish, but the U.S. Supreme Court in a 5-4 decision later voided the award. The description here and elsewhere in the paper is taken from a combination of the majority opinion authored by Justice Thomas and, especially, the dissenting opinion authored by Justice Ginsburg in *Connick v. Thompson*, 563 U.S. 51 (2011).

to suppress evidence (relative to those faced by a lone prosecutor). Our model assumes that each individual prosecutor is characterized by a variable that captures that individual's level of tradeoff between a desire for career advancement (by winning a case) and a disutility for knowingly convicting an innocent defendant by suppressing exculpatory evidence.[4] We assume a population of prosecutors that is heterogenous with respect to this tradeoff rate, and each individual's tradeoff rate is their own private information. A convicted defendant may later discover the exculpatory information; a judge will then void the conviction and may order an investigation, depending upon her (privately known) cost of investigation. If a prosecutor is found to have violated the defendant's *Brady* rights, this results in penalizing the prosecutor.[5] The anticipated game between the prosecutors and the judge is the main consideration of this paper.

1.3 Related Literature

Economists have developed an extensive literature on the incentives for individual agents (usually sellers in a market) to reveal information (see Dranove and Jin, 2010, for a recent survey of theoretical and empirical literature on the disclosure of product quality). A standard result concerning the disclosure of information about product quality when disclosure is costless is "unraveling" wherein an informed seller cannot, in equilibrium, resist disclosing the product's true quality in order to avoid an adverse inference (for example, see Grossman, 1981, and Milgrom, 1981). Complete unraveling does not occur if disclosure is costly or if there is a chance the seller is uninformed. Matthews and Postlewaite (1985) and Shavell (1994) provide models wherein an

[4] We intentionally abstract from positive incentives to form teams, such as work-sharing efficiencies and the training of new workers, so as to focus on information compartmentalization versus sharing.

[5] In reality, prosecutorial accountability is addressed via a variety of approaches in the different states; for example, in North Carolina cases referred to the State Bar (a government agency) are handled by a separate (civil) court, while in New York suits proceed via private lawsuits within the usual appeals system. We have simplified the response of the legal system to a judge ordering an investigation; for more institutional detail, see Keenan, et. al., 2011.

agent chooses whether to acquire information about their product's quality and then chooses whether to disclose it. The focus in these papers is on voluntary versus mandatory disclosure; where disclosure is mandatory, if the seller possesses the relevant information it is assumed that penalties are sufficient to induce compliance. However, they find that mandatory disclosure may discourage information acquisition.[6]

Possibly closest to our paper is Dye (forthcoming); in both Dye's paper and our paper, an agent may or may not possess private information but, if he has it, he has a duty to disclose it. Failure to disclose may be detected and entails a penalty. In Dye, the private information is about the future value of an asset, which is priced in the stock market. After the pricing stage, a fact-finder audits the agent with an exogenous probability; the penalty for failing to disclose is consistent with securities law. Our model differs in that our agent (a prosecutor) also has a moral cost associated with the consequences of his failure to disclose, and there is an endogenous investigation decision made by a judge (that is, the probability of an audit is endogenously determined). Furthermore, we consider the case wherein there is a team of prosecutors that can organize itself so as to influence the likelihood of an investigation.

Our prosecutor's objective function includes aspects of career concerns and moral concerns about causing the conviction of a defendant he knows to be innocent. The theoretical literature on plea bargaining and trial involves several different prosecutorial objective functions that place a varying amount of weight on these two aspects. Landes (1971) assumes the prosecutor maximizes expected sentences, whereas Grossman and Katz (1983), Reinganum (1988), Bjerk, (2007), and

[6] Garoupa and Rizzolli (2011) apply this finding to the case of the *Brady* rule. They argue that a prosecutor may be discouraged from searching for additional evidence (which might be exculpatory) if its disclosure is mandatory. They describe circumstances under which an innocent defendant can be harmed by the *Brady* rule.

Baker and Mezzetti (2011) employ objective functions that approximate social welfare. Daughety and Reinganum (2016) assume that a prosecutor's career concerns come from multiple sources: he benefits from obtaining longer expected sentences, but also endures informal sanctions (such as removal from office) from members of the community who might think the prosecutor is sometimes convicting the innocent and other times allowing the guilty to go free.

Empirical work on prosecutorial objectives finds evidence of career concerns, but also aspects of a preference for justice. For instance, Glaeser, Kessler, and Piehl (2000) find that some federal prosecutors are motivated by reducing crime while others are primarily motivated by career concerns. Boylan and Long (2005) find that higher private salaries are associated with a higher likelihood of trial by assistant U.S. attorneys (trial experience may be valuable in a subsequent private-sector job). Boylan (2005) finds that the length of prison sentences obtained is positively-related to the career paths of U.S. attorneys. McCannon (2013) and Bandyopadhyay and McCannon (2014) find evidence that prosecutors up for reelection seek to increase the number of convictions at trial; when it is an election year, this involves pursuing weaker cases, which leads to more reversals on appeal.

1.4 Plan of the Paper and Overview of the Results

In all versions of the model we have one judge (J, whose type is the cost of an investigation; this is J's private information) and one defendant (D, whose type is either guilty or innocent; this is D's private information). The equilibrium involves an action taken by a prosecutor (P), followed by an action taken by J if a convicted D discovers exculpatory evidence. In the next section (Section 2) we develop a one-P model, wherein P's disutility of convicting an innocent D (P's type) is his private information. Before trial, P may observe evidence that is exculpatory for D; he then chooses a report as to his possession of any exculpatory evidence. If no exculpatory evidence is disclosed, a trial ensues which convicts the defendant. If D is convicted but was actually innocent, then with positive probability she later observes exculpatory evidence, which she submits to J, who exonerates her and decides whether to investigate P. We first characterize the Bayesian Nash Equilibrium (BNE) between the prosecutor and the judge, wherein a subset of P-types will suppress information and a subset of J-types will conduct an investigation. We then exercise the model by examining comparative statics of the equilibrium with respect to a variety of model parameters.

Section 3 expands the analysis to consider two independently selected Ps (each with his own private information as to type) and examines two models, one wherein only one P can observe whether exculpatory evidence exists (we will refer to this as the "21" configuration to capture that there are two Ps but only one is aware of any exculpatory evidence) and one wherein both Ps learn whether such evidence exists (i.e., whichever P learns the information shares it with his team member; this is the "22" configuration). We find that more P-types are willing to suppress in the 21 configuration than in the 11 (i.e., single-prosecutor) model analyzed in Section 2; moreover, the equilibrium involves greater equilibrium suppression in the 21 configuration than in the 11 model. We further find that the set of P-types who would prefer to suppress the evidence is yet larger in the 22 configuration. However, because sharing may occur between types who prefer to suppress and types who prefer to disclose, the equilibrium probability of suppression in the 22 configuration is lower than in the 21 configuration.

In Section 4 we endogenize the decision to share such information within the team and find that sharing by an informed prosecutor with an uninformed team member is not part of an overall equilibrium. Thus, between configurations 21 and 22, only configuration 21 is part of an overall equilibrium. In Section 5 we consider the possibility that one member of the team imposes informal sanctions (e.g., disrespect, lack of cooperation, or sabotage in future interactions) on another if the recipient of the sanctions were to disclose evidence that the imposer of the sanctions would have suppressed. This reduces disclosure in equilibrium in the 21 configuration.[7] Section 6 provides a summary, some suggestions for alternative applications, and a discussion of policies intended to reduce such prosecutorial misconduct.

2. Model Set-up, Notation, and Analysis for the Single-Prosecutor Model

In this section, we will describe the model and results for the case of one prosecutor facing one defendant and one judge. P and D have access to (different) evidence-generating processes in the case for which P is prosecuting D. In either case, a party may observe exculpatory evidence (denoted as E) or not observe exculpatory evidence (denoted as φ).[8] We assume that P's opportunity to observe E occurs just prior to the trial, whereas D's opportunity to observe E occurs after the trial.[9] Note that this means that if P does observe E, but suppresses this information, then D may never observe E (D may only observe φ). Alternatively, if P does not observe E (i.e., P observes φ), then E may still exist and D might later observe it.

The evidence-generating process is based on D's true type, G (guilty) or I (innocent), which is D's private information. We assume that if D is G, then no exculpatory evidence exists so that neither P nor D will ever observe E; they will each observe φ with certainty. Let the prior

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[7] The reverse situation, wherein informal sanctions might be imposed on a prosecutor who suppresses evidence that his team member would have disclosed, will only be probabilistically imposed (since it may never come to light). We ignore this possibility; the direction we focus on is the more worrisome possibility.

[8] We assume that exculpatory evidence is "perfect" in the sense that it is absolutely persuasive and clearly material. Both of these aspects might be modified, at the cost of potentially significant complication of the analysis without an attendant increase in insight.

[9] Other timing specifications are possible, but this seems like the most interesting one for our purposes.

probability of innocence be denoted λ; that is, $\lambda \equiv \Pr\{D \text{ is } I\}$. Then, from P's point of view, let $\gamma \equiv \Pr\{P \text{ observes } E \mid D \text{ is } I\}$, so $1 - \gamma = \Pr\{P \text{ observes } \varphi \mid D \text{ is } I\}$. Similarly, from D's point of view, let $\eta \equiv \Pr\{D \text{ observes } E \mid D \text{ is } I\}$, so $1 - \eta = \Pr\{D \text{ observes } \varphi \mid D \text{ is } I\}$. The simplest way to interpret this is that exculpatory evidence exists whenever D is innocent, although it may not be found (observed) by either P or D.[10] Although we need not impose any ordering on γ and η, it is typically thought that the prosecution generally has more resources that can be brought to bear on finding evidence than does the defendant, so a typical ordering would be $\gamma > \eta$.

Before the trial begins, P has an opportunity to report (disclose) the receipt of exculpatory evidence. Let $\theta \in \{E, \varphi\}$ denote P's true evidence state (which is P's private information), and let $r \in \{E, \varphi\}$ denote P's reported evidence state. Then the pair $(r; \theta) = (E; E)$ implies that P disclosed E when he observed E, whereas $(r; \theta) = (\varphi; E)$ implies that P failed to disclose E when he observed E (because he reported having observed φ). We assume that E is "hard" evidence, so it cannot be reported when it was not observed; that is, when P observes φ, then he must report φ.

We assume that P obtains a payoff of S when D is convicted. However, P also suffers a loss of τ if D is falsely convicted due to P's suppression of exculpatory evidence, where τ is a random variable that is distributed according to $F(\tau)$, with density $f(\tau) > 0$, on $[0, \infty)$; that is, τ is P's type. Thus, P's payoff is affected by career concerns (as reflected in the value of a conviction, S), but is also affected by moral concerns about causing a false conviction (as reflected in τ). Some prosecutor types (τ-values) would prefer a false conviction to none at all, whereas others would prefer no conviction to being responsible for a false one.

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[10] Again, more complex lotteries could be specified (i.e., when D is innocent, exculpatory evidence may or may not exist, and may or may not be found when it does exist), but this generates additional complexities without accompanying benefits.

If P does not disclose any exculpatory evidence, we assume that the evidence provided at trial is sufficient to convict D. However, following D's conviction, it is possible that D will discover exculpatory evidence (if D is truly innocent). In this case, we assume that D will go to court and have her conviction overturned by a judge; in this event, P loses the amount S associated with a conviction (independent of whether P suppressed exculpatory evidence). J also has the opportunity to investigate the prosecutor's behavior, which could have been appropriate (if he did not observe E) or inappropriate (if he observed E but reported φ). The judge faces an investigation cost c, which is distributed according to H(c), with density h(c) > 0, on $[0, \bar{c}]$; c is J's private information. Thus, a judge with a sufficiently low value of c will investigate, whereas one with a sufficiently high value of c will overturn D's conviction but will forego investigating P; in this sense, the value of c that is drawn is J's type since it will influence whether or not J will investigate P. An investigation may fail to verify P's suppression of exculpatory evidence; let μ denote the probability that the investigation verifies P's failure to disclose. We assume there are no "false positives;" that is, an investigation never concludes that P failed to disclose E when P actually observed φ. When an investigation verifies P's failure to disclose, the judge receives a payoff of V and P receives a penalty of k.[11]

2.1. Timing of Moves

The aforementioned discussion implies the following distribution of information and timing of moves.

1. Nature determines whether D is G (guilty) or I (innocent), and reveals this only to D.
2. Nature determines whether P observes E or φ, as well as P's type τ; these are revealed

[11] See Gershman (2015), Chapter 14 for a discussion of sanctions for prosecutorial misconduct.

only to P.

3. P reports E or φ. If P reports E, then D is exonerated and the game ends. If P reports φ, then D is convicted; P obtains S but pays τ if P had observed E.

4. If D is convicted, then Nature determines whether D observes E or φ. If D observes φ, then the game ends. If D observes E (which is assumed to only be possible if D is innocent), then D provides E to the judge and is exonerated; P loses the payoff S previously obtained in step 3. Moreover, if P suppressed exculpatory evidence, he continues to bear the disutility loss τ.

5. Nature determines J's type c; this is revealed only to J.

6. J decides whether to investigate P. If J decides not to investigate P, then the game ends. If J investigates P, then if P is not found to have suppressed exculpatory information, the game ends; if P is found to have suppressed evidence, then P's penalty is k, J obtains V, and the game ends.

2.2. Payoff Functions and Decisions for P and J

Using the notation and timing specification described above, we can construct payoffs and analyze decisions for P and J. First, we consider the problem facing P. Let $\pi^P(r; \theta, \tau)$ denote P's expected payoff from reporting r when he observed θ; this payoff is indexed by P's type, τ, which represents the disutility he suffers from causing a D (that P knows is innocent) to be convicted. We assume that P's career concerns are such that he gains S from every conviction, but loses τ only when he knows he has caused a false conviction by suppressing exculpatory evidence.[12]

Thus, $\pi^P(E; E, \tau) = 0$: when P observes and discloses E, then D is not convicted. When P

[12] Even though some innocent Ds are convicted due to undiscovered exculpatory evidence, P can rationalize these as good – or at least untainted – convictions.

observes φ, he must also report φ. However, D may subsequently observe E, in which case the conviction is reversed but, since P acted appropriately, he faces no sanction (recall, we assume there are no "false positives" when J investigates P) and since he did not create a harm by suppressing E, he bears no disutility loss τ. Thus, $\pi^P(\varphi; \varphi, \tau) = S - \Pr\{D \text{ observes } E \mid P \text{ observed } \varphi\}S$. P's posterior belief $\Pr\{D \text{ observes } E \mid P \text{ observed } \varphi\} = \eta\lambda(1 - \gamma)/[1 - \lambda + \lambda(1 - \gamma)]$.[13] Therefore,

$$\pi^P(\varphi; \varphi, \tau) = S\{1 - \eta\lambda(1 - \gamma)/[1 - \lambda + \lambda(1 - \gamma)]\}.$$

Finally, when P observes E, he knows that D is innocent. Failure to disclose E (that is, a report of φ) means that P incurs a disutility loss equal to his type τ.[14] Moreover, if P suppresses E then there is a chance that D will discover it herself. In this case, P will not only lose the value of the conviction and incur the disutility loss for harming D, but he will also face the risk of investigation and possible sanction. Given the timing, J decides whether to investigate only when D provides evidence E and P did not previously report E; thus, when deciding whether to suppress or disclose an observation of E, P must form a conjecture about the likelihood that J will investigate. Let $\hat{\rho}$ denote P's conjectured likelihood of being investigated by J, when P reported φ and D provided the exculpatory evidence E. Thus $\pi^P(\varphi; E, \tau) = S - \tau - \Pr\{D \text{ observes } E \mid P \text{ observed } E\}(S + k\mu\hat{\rho})$. Since a P that observed E knows that D is innocent, P's posterior $\Pr\{D \text{ observes } E \mid P \text{ observed } E\} = \eta$. Therefore $\pi^P(\varphi; E, \tau) = S(1 - \eta) - \tau - \eta k\mu\hat{\rho}$.

We can now define a strategy for P and a best response for P to his conjecture about J's likelihood of investigation.

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[13] The denominator represents all the ways that P could observe φ (D is guilty, which happens with probability $1 - \lambda$, or D is innocent but P did not observe E, which happens with probability $\lambda(1 - \gamma)$). The ratio $\lambda(1 - \gamma)/[1 - \lambda + \lambda(1 - \gamma)]$ therefore represents P's posterior assessment that D is innocent, given P observed φ. The term η is the probability that an innocent D will discover E.

[14] We assume this disutility persists even if the conviction is eventually reversed.

Definition 1. A strategy for P is a choice of report, conditional on P's observation of θ and P's type τ; that is, $r(\theta, \tau) \in \{E, \varphi\}$. Note that in order to report (disclose) E, P must actually have observed E, so $r(\varphi, \tau) = \varphi$ is imposed; we need only consider $r(E, \tau)$. A best response for P to his conjecture $\hat{\rho}$ is the $r \in \{E, \varphi\}$ that maximizes $\pi^P(r; E, \tau)$.

It is clear that P will choose to suppress observed exculpatory evidence if:

$$\pi^P(\varphi; E, \tau) = S(1 - \eta) - \tau - \eta k\mu\hat{\rho} > \pi^P(E; E, \tau) = 0.$$

This occurs if and only if $\tau < t(\hat{\rho})$, where $t(\hat{\rho}) \equiv \max\{0, S(1 - \eta) - \eta k\mu\hat{\rho}\}$ and t is being used to denote a threshold value of τ. The following lemma characterizes the set of P-types that will suppress exculpatory evidence.[15]

Lemma 1. In the event that P observes E, P's best response is: $BR^P(\hat{\rho}; \tau) = \varphi$ if $\tau < t(\hat{\rho})$ and $BR^P(\hat{\rho}; \tau) = E$ if $\tau \geq t(\hat{\rho})$, where $t(\hat{\rho}) \equiv \max\{0, S(1 - \eta) - \eta k\mu\hat{\rho}\}$.

Lemma 1 states that a P of type τ who observes E and conjectures that J will investigate with probability $\hat{\rho}$ will optimally follow a cutoff rule with respect to suppression: suppress evidence if τ is sufficiently low and otherwise disclose the evidence.

Next, we consider the problem facing J. J has an opportunity to make a decision in this model only if P did not report E prior to D's conviction, and D subsequently discovered E following her conviction. J will reverse D's conviction but J can also decide whether to investigate P's behavior to ascertain whether P suppressed evidence of D's innocence. Let $d \in \{1, 0\}$ denote this decision, where $d = 1$ means that J investigates and $d = 0$ means that J does not investigate. To make this decision, J must construct a posterior probability that P actually had observed E but failed to disclose it. This requires J to conjecture a threshold, denoted $\hat{t}$, such that all P types with $\tau < \hat{t}$ are expected to report φ when they observe E. Since D provided J with the exculpatory evidence E, D

[15] Our specification of P's best response assumes an indifferent P-type discloses E; since there is a continuum of types, it would not affect our results if an indifferent P-type was assumed to suppress E. However, for some parameters and conjectures, it may be that every $\tau \geq 0$ strictly prefers to disclose (i.e., suppression is strictly deterred), in which case the constraint that $t(\hat{\rho}) \geq 0$ binds and we want $\tau = t(\hat{\rho}) = 0$ to belong to the set of types that disclose.

is now known to be innocent. Thus, J's posterior assessment that P lied when he reported φ is $\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$.[16]

Recall that J receives a value V when her investigation reveals and sanctions a P that has suppressed exculpatory evidence; that an investigation verifies P's suppression with probability μ; and that an investigation costs c, which is drawn from the distribution H(c). Then a J of type c has an expected payoff of $\pi^J(d; c)$, where:

$$\pi^J(1; c) = V\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})] - c \text{ and } \pi^J(0; c) = 0.$$

Hence, we define parallel notions of strategy and best response for J as follows.

Definition 2. A strategy for J is a decision to investigate or not (in the event that D provides E and P's prior report was φ), conditional on J's type c; that is, $d(c) \in \{1, 0\}$. A best response for J to her conjecture $\hat{t}$ is $d(c) \in \{1, 0\}$ that maximizes $\pi^J(d; c)$.

It is clear that $\pi^J(1; c) = V\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})] - c \geq \pi^J(0; c) = 0$ whenever $c \leq V\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$. The following lemma characterizes the set of J-types that will investigate P on suspicion of suppressing exculpatory evidence.

Lemma 2. In the event that P reported φ and D later provided E, J's best response is: $BR^J(\hat{t}; c) = 1$ if $c \leq V\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$ and otherwise $BR^J(\hat{t}; c) = 0$.

Lemma 2 states that a J faced with a convicted D submitting exculpatory evidence, when P previously reported φ, and who conjectures that the cutoff rule for P was to suppress if $\tau < \hat{t}$ will optimally follow her own cutoff rule with respect to investigation: investigate if her cost of doing so, c, is sufficiently low and otherwise do not investigate.

[16] The denominator consists of all the ways that P could have reported φ (given that we now know that D is innocent). P would have reported φ if he truly did not observe E (which happens with probability $1 - \gamma$) or if he did observe E, but his type fell below the threshold for disclosure (which happens with probability $\gamma F(\hat{t})$). Thus, the share of φ-reports that are due to evidence suppression is the ratio $\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$.

2.3. Equilibrium

Lemmas 1 and 2 characterize P's and J's best response functions. However, it will be more intuitive to work with the related functions which summarize the best response behavior of, respectively, P and J (and we use a superscript BR to capture this):

$$t^{BR}(\rho) \equiv S(1 - \eta) - \eta k\mu\rho; \tag{1}$$

$$\rho^{BR}(t) \equiv H(V\mu\gamma F(t)/[1 - \gamma + \gamma F(t)]). \tag{2}$$

The function $t^{BR}(\rho)$ represents the minimum threshold level of τ consistent with disclosure, given any conjectured probability ρ of J ordering an investigation. The function $\rho^{BR}(t)$ represents the probability that a randomly-drawn judge will decide to investigate, given any conjectured threshold t for disclosure.

Definition 3. A Bayesian Nash Equilibrium (BNE) is a pair (t^*, ρ^*), such that $t^* = \max\ \{0, t^{BR}(\rho^*)\}$ and $\rho^* = \rho^{BR}(t^*)$.

In what follows, we will also maintain the parameter restriction $V\mu\gamma < \bar{c}$; that is, the maximum possible cost of investigation is always large enough to ensure that the function $\rho^{BR}(t)$ is always strictly less than one.

Notice that equation (2) above implies that if t^* were 0 then ρ^* would be 0 as well, but then equation (1) above implies that $t^* > 0$. Therefore, it must be that $t^* > 0$. Basically, if J does not expect any P-types to suppress exculpatory evidence, then J will never investigate, but then some P-types will choose suppression. Thus, we know the equilibrium occurs along the function $t^{BR}(\rho)$.

Proposition 1. There is a unique BNE, (t^*, ρ^*), where $t^* \in (0, S(1 - \eta))$ and $\rho^* \in (0, 1)$, given by the pair of equations:

$$t^* = S(1 - \eta) - \eta k\mu\rho^*; \tag{3}$$

$$\rho^* = H(V\mu\gamma F(t^*)/[1 - \gamma + \gamma F(t^*)]). \tag{4}$$

The existence and nature of the equilibrium is most-easily seen through a graphical analysis in (t, ρ) space. In Figure 1, the functions $\rho^{BR}(t)$ and $t^{BR}(\rho)$ are graphed in (t, ρ) space. The function $\rho^{BR}(t) = H(V\mu\gamma F(t)/[1 - \gamma + \gamma F(t)])$ starts at the origin and increases (strictly) as t increases. This function is continuous, but need not be everywhere concave nor everywhere convex; by the parameter restriction above (i.e., $V\mu\gamma < \bar{c}$), it is strictly less than 1 for all values of t. The function $t^{BR}(\rho)$ is a linear decreasing function of t, which starts on the ρ-axis at $S(1 - \eta)/\eta k\mu$ and falls linearly until it reaches the t-axis at $t = S(1 - \eta)$. These functions must cross exactly once, allowing us to assert uniqueness of the BNE in Proposition 1.

Put Figure 1 Here

2.4. Comparative Statics

In Figure 1 we illustrate the BNE (t^*, ρ^*), meaning that if P's type, τ, belongs to $[0, t^*)$, then P (if he has observed E) will choose to suppress E, while if $\tau \geq t^*$, then P will disclose E to D. Thus, the probability that P suppresses observed exculpatory evidence is $F(t^*)$. We now consider how parameters of the model affect the two equilibrium probabilities, $F(t^*)$ and ρ^*.

There are three parameters that affect only the function $t^{BR}(\rho) = S(1 - \eta) - \eta k\mu\rho$. These are S, η, and k. The function $t^{BR}(\rho)$ increases with S and decreases with η and k. Thus, an increase in S results in a higher value of both t^* and ρ^*; a higher payoff from obtaining a conviction induces more evidence suppression and this warrants more investigation. On the other hand, an increase in either η or k results in a lower value of both t^* and ρ^*; a higher risk that D will discover E or a higher sanction for suppressing evidence induces less evidence suppression and this warrants less investigation.

There are two parameters that affect only the function $\rho^{BR}(t) = H(V\mu\gamma F(t)/[1 - \gamma + \gamma F(t)])$. These are V and γ. The function $\rho^{BR}(t)$ still begins at $\rho^{BR}(0) = 0$, but it increases with an increase in either V or γ for all $t > 0$. Thus, since $t^{BR}(\rho)$ is downward-sloping, an increase in V or γ results in a higher ρ^* and therefore a lower t^*. That is, an increase in the value of apprehending a P that has suppressed evidence, or an increase in the likelihood that P actually observed E (when he reported φ), increases J's incentive to investigate, and P's anticipation of this results in greater deterrence of evidence suppression.

Finally, the parameter μ affects both functions; an increase in μ decreases $t^{BR}(\rho)$, whereas it increases $\rho^{BR}(t)$. This implies a definite effect of μ on t^*: an increase in μ results in a decrease in t^*. That is, an increase in the effectiveness of an investigation ultimately reduces the threshold for disclosure and, hence, the extent of evidence suppression. But we are not able to determine the effect of an increase in μ on ρ^*; the direct effect is to increase J's incentive to investigate but this is offset to a greater or lesser extent by the increased deterrence of suppression (since $F(t^*)$ falls).

The distribution functions $F(\tau)$ and $H(c)$ can also be perturbed in the sense of first-order stochastic dominance. The distribution $F(\tau)$ <u>strictly</u> first-order stochastically dominates the distribution $\mathscr{F}(\tau)$ if $\mathscr{F}(\tau) > F(\tau)$ for all $\tau > 0$. Here, $\mathscr{F}$ places more weight on lower values of τ than F does. This means that the distribution $\mathscr{F}(\tau)$ represents stochastically lower disutility for convicting innocent defendants; that is, $\mathscr{F}$ represents a deterioration in P's moral standards. Analogously, the distribution H(c) <u>strictly</u> first-order stochastic dominates the distribution $\mathcal{H}(c)$ if $\mathcal{H}(c) > H(c)$ for all $c \in (0, \bar{c})$. This dominance represents stochastically lower costs of investigation under $\mathcal{H}$ than under H, since $\mathcal{H}$ places more weight on lower c-outcomes.

Only the curve $\rho^{BR}(t) = H(V\mu\gamma F(t)/[1 - \gamma + \gamma F(t)])$ is affected by a change in these distribution functions. In both cases, this curve still starts at $\rho^{BR}(0) = 0$, but it is everywhere higher under $\mathscr{F}(\cdot)$ or $\mathcal{H}(\cdot)$. Thus, a stochastically lower disutility for convicting innocent defendants on the part of P encourages J to investigate more often for any conjectured threshold: ρ^* increases and t^* decreases.[17] Similarly, a stochastically lower cost of investigation will result in a higher likelihood of investigation ρ^* and a lower threshold t^*.

3. Analysis for the Multiple-Prosecutor Model

In this section, we will consider two versions of a team of prosecutors. For simplicity, we will restrict attention to teams with two prosecutors; the versions will differ according to how exculpatory evidence is collected and disseminated within the team. We will first assume that the exculpatory evidence is received by only one prosecutor (we will call this the "disjoint" information configuration and, as indicated in Section 1, we denote this as the 21 configuration); next we will assume that all exculpatory evidence is shared by both prosecutors (we will call this the "joint" information configuration; it is denoted as the 22 configuration). Thus, we view the disjoint configuration as capturing concentration of knowledge about the exculpatory evidence in a subset (here, one prosecutor) of the team while the joint configuration represents common knowledge of the possession of exculpatory evidence by the entire team. In Section 4 we endogenize the organization of the team in this regard (i.e., we make the configuration part of the equilibrium).

Before proceeding to the analysis, we describe some aspects that will be common to the two versions of a team, and also indicate what aspects will be maintained consistent with the one-prosecutor model (which will now be denoted as the 11 configuration). In particular, we will

[17] It may seem counterintuitive that ρ^* increases when t^* decreases. But recall that the distribution of τ is also changing, and it is putting more weight on lower values of τ. Let (ρ^*, t^*) be the equilibrium under F and let $(\rho^{*\prime}, t^{*\prime})$ be the equilibrium under $\mathscr{F}$. Then $\rho^* < \rho^{*\prime}$ implies that $F(t^*) < \mathscr{F}(t^{*\prime})$, despite the fact that $t^{*\prime} < t^*$. That is, there is more evidence suppression under $\mathscr{F}$ (despite the lower threshold), which justifies a higher probability of investigation.

assume that the parameters λ, γ, μ, η, S, and k continue to apply as previously-defined. We assume that there is a public goods aspect to a conviction in the sense that both team-members receive the full payoff S when D is convicted.[18] On the other hand, the penalty for suppressing evidence, k, is imposed on each team-member that is found to have suppressed evidence.[19] We assume that each prosecutor has a type τ that is independently and identically drawn from the distribution F(τ) and, importantly, only a prosecutor who actively suppresses exculpatory evidence suffers the disutility loss. We also modify the judge's return to investigation (formerly V) to indicate whether 1 or 2 prosecutors are found to have suppressed evidence. Thus, V_i denotes the judge's payoff when $i \in \{1, 2\}$ prosecutors are found to have suppressed evidence; we assume that $V_2 \geq V_1 = V$.

Finally, we modify the distribution of investigation costs. Let $H_i(c)$ denote the distribution of the judge's investigation cost when $i \in \{1, 2\}$ prosecutors are investigated. Thus, $H_1(c) \equiv H(c)$ from the one-prosecutor model, and $H_2(c)$ will apply to both versions of the two-prosecutor model. We assume that the distribution $H_2(c)$ strictly stochastically dominates the distribution $H_1(c)$; that is, $H_1(c) > H_2(c)$ for all $c \in (0, \bar{c})$. Alternative put, the expected cost of an investigation under H_1 is less than the expected cost under H_2: it is stochastically more costly to investigate a two-person team of prosecutors as compared to a single prosecutor.[20] Finally, we assume that members of the team do not reward or punish each other; we relax this assumption in Section 5.

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[18] This payoff reflects career concerns; for instance, both prosecutors advance their careers based on their records of convictions and sentences obtained. Whether these were obtained as part of a team is assumed to not be relevant to their career concerns.

[19] We assume that clear evidence of personal misconduct is required to impose k on that prosecutor.

[20] Even if J knows that the configuration is 21, she must (potentially) investigate both Ps, since whether (and if so, which) a P received the private information about the existence of E is not known by J (nor by the P who did not receive the information). Moreover, even if J knew the configuration is 22, she must investigate both Ps so as to document individual misconduct before imposing k. Thus, we assume H_2 applies in both configurations.

3.1. Information is Received by a Single Team-member

In the first version of our two-person team of prosecutors, we assume that the exculpatory evidence (if any) is received by only one of the prosecutors, and it is random as to which one receives it; moreover, this (disjoint) configuration is common knowledge to all participants (including J). Thus, if prosecutor P1 receives exculpatory evidence, he knows that P2 did not receive it. On the other hand, if P1 does not receive exculpatory evidence, he does not know whether P2 received exculpatory evidence (since none may have been found, either because it did not exist or it did exist but was not discovered). More formally, if D is innocent, then Nature draws E with probability γ and randomly reveals it to one of the prosecutors.

Consider P1's payoff function. It now depends on the vector of types for P1 and P2, denoted (τ_1, τ_2); the vector of evidence states for P1 and P2, denoted (θ_1, θ_2); and the vector of reports by P1 and P2, denoted (r_1, r_2). The general form of P1's payoff is: $\pi_1^P(r_1, r_2; \theta_1, \theta_2, \tau_1, \tau_2)$. We continue to assume that any prosecutor that has observed φ (i.e., no exculpatory evidence was observed) must also report φ. There are several possible outcomes and associated payoffs, and these will be relevant in Section 4 when we consider endogenous information configurations. However, our immediate interest is in characterizing P1's behavior, and P1 only has a decision to make when $\theta_1 = E$. Moreover, in this case, P2 has no decision to make (he must report φ, as that is what he observed). If P1 observes E, the relevant payoff comparison for P1 is between $\pi_1^P(E, \varphi; E, \varphi, \tau_1, \tau_2)$ and $\pi_1^P(\varphi, \varphi; E, \varphi, \tau_1, \tau_2)$. The former equals zero since, once exculpatory evidence is disclosed, the case against D is dropped, while the latter equals $S(1 - \eta) - \tau_1 - \eta k\mu\hat{\rho}$, where $\hat{\rho}$ is now interpreted as P1's conjectured probability that J investigates when both prosecutors report φ and D provides E. Notice that this comparison is the same as in the one-prosecutor case, so P1 should disclose if $\tau_1 \geq t_{21}(\hat{\rho})$, where $t_{21}(\hat{\rho}) \equiv \max\ \{0, S(1 - \eta) - \eta k\mu\hat{\rho}\}$. The subscript indicates that there are 2 prosecutors on the team but at most 1 can observe E. Thus, the threshold from the one-prosecutor model (previously denoted as $t(\hat{\rho})$) would now be denoted $t_{11}(\hat{\rho})$; as can be seen, $t_{21}(\hat{\rho}) = t_{11}(\hat{\rho})$.

> **Lemma 3**. In the event that P1 (resp., P2) observes E, P1's (resp., P2's) best response is: $BR^P(\hat{\rho}; \tau) = \varphi$ if $\tau < t_{21}(\hat{\rho})$ and $BR^P(\hat{\rho}; \tau) = E$ if $\tau \geq t_{21}(\hat{\rho})$, where $t_{21}(\hat{\rho}) \equiv \max\ \{0, S(1 - \eta) - \eta k\mu\hat{\rho}\}$.

Comparing Lemma 3 with Lemma 1 in Section 2, we find that a single informed prosecutor in a two-prosecutor team follows the same best-response cutoff rule as that used by the sole prosecutor in the 11 configuration.

Now consider J's payoff. Since there is no interaction between P1 and P2 (only one makes a decision) and they are otherwise identical, the equilibrium threshold will be the same for both of them. Thus, J should have a common conjectured threshold for P1 and P2, which we denote as $\hat{t}$. When D provides E, but both P1 and P2 reported φ, J constructs a posterior belief about whether one of the prosecutors suppressed evidence (the alternative is that both Ps actually did observe φ). More precisely, the report pair (φ, φ) occurs if: (1) no exculpatory evidence was found, which happens with probability $1 - \gamma$; or (2) if exculpatory evidence was found but suppressed, which happens with probability $\gamma F(\hat{t})$. This latter expression includes the probability that it was found (γ) and it is P1 who received the evidence (with probability ½) and he suppressed it because $\tau_1 < \hat{t}$, plus the probability that it was found (γ) and it is P2 who received the evidence (with probability ½) and he suppressed it because $\tau_2 < \hat{t}$. Thus, J's posterior belief that evidence was suppressed is given by $\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$. This posterior belief is the same as in the one-prosecutor case.

Thus, J observes her cost of investigation, which is still denoted as c but is now drawn from the distribution $H_2(c)$, and decides whether to investigate ($d = 1$) or not ($d = 0$). J's payoff from investigation is now $\pi^J(1; c) = V_1\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})] - c$ and her payoff from not investigating is $\pi^J(0; c) = 0$. The parameter V_1 appears here because only one prosecutor can be suppressing evidence and thus only one prosecutor can be punished. Similar to the analysis in Section 2, it is clear that $\pi^J(1; c) = V_1\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})] - c \geq \pi^J(0; c) = 0$ whenever $c \leq V_1\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$. Notice that this is the same best-response cost threshold as was used in the 11 case, since $V_1 = V$.

Lemma 4. In the event that both P1 and P2 reported φ and D later provided E, J's best response is: $BR^J(\hat{t}; c) = 1$ if $c \leq V_1\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$ and $BR^J(\hat{t}; c) = 0$ otherwise.

That is, J investigates if c is low enough and does not investigate otherwise. Lemmas 3 and 4 characterize the prosecutors' and J's best response functions. As before, it will be more intuitive to work with the related functions:

$$t^{BR}_{21}(\rho) \equiv S(1 - \eta) - \eta k\mu\rho; \tag{5}$$

$$\rho^{BR}_{21}(t) \equiv H_2(V_1\mu\gamma F(t)/[1 - \gamma + \gamma F(t)]). \tag{6}$$

Recalling equation (1) from Section 2, one sees that $t^{BR}_{21}(\rho) = t^{BR}_{11}(\rho) \equiv t(\rho)$ from Section 2. However after comparing $\rho^{BR}_{21}(t)$ with $\rho^{BR}_{11}(t)$ it is straightforward to observe that $\rho^{BR}_{21}(t) < \rho^{BR}_{11}(t)$ for all $t > 0$ (since H_2 strictly stochastically dominates H_1).

A Bayesian Nash Equilibrium for this version of the two-prosecutor team, denoted (t^*_{21}, ρ^*_{21}), is defined analogously to the one in Section 2: both prosecutors and the judge play mutual best responses. Again, it is clear that $t^*_{21} > 0$ and (as stated earlier), $t^{BR}_{21}(\rho) = t^{BR}_{11}(\rho)$. The function $\rho^{BR}_{21}(t)$ starts at the origin and increases (strictly) as t increases.[21] The function $t^{BR}_{21}(\rho)$ is a linear decreasing function of t, which starts at $S(1 - \eta)/\eta k\mu$ on the ρ-axis and falls linearly until it reaches the horizontal axis at $t = S(1 - \eta)$. The functions $t^{BR}_{21}(\rho)$ and $\rho^{BR}_{21}(t)$ must cross exactly once, which

[21] This function is continuous, but need not be everywhere concave nor everywhere convex; by the parameter restriction above (i.e., $V_1\mu\gamma < \bar{c}$), it is strictly less than 1 for all values of t.

establishes the following result.

Proposition 2. (a) There is a unique BNE (t^*_{21}, ρ^*_{21}), where $t^*_{21} \in (0, S(1 - \eta))$ and $\rho^*_{21} \in (0, 1)$, given by the pair of equations:

$$t^*_{21} = S(1 - \eta) - \eta k \mu \rho^*_{21}; \tag{7}$$

$$\rho^*_{21} = H_2(V_1 \mu \gamma F(t^*_{21})/[1 - \gamma + \gamma F(t^*_{21})]). \tag{8}$$

(b) As compared to the one-prosecutor model, wherein the BNE (t^*_{11}, ρ^*_{11}) is given by equations (3) and (4), we find that $\rho^*_{21} < \rho^*_{11}$ and $t^*_{21} > t^*_{11}$. That is, in equilibrium, there is more evidence suppression and less investigation in the case of a team of two prosecutors (with random receipt of exculpatory evidence) than in the case of a sole prosecutor.

From the perspective of suppression of evidence as a social bad, the 21 configuration creates conditions for more suppression in equilibrium than the 11 configuration does. Basically, stochastically higher investigation costs (when a team must be investigated rather than a single P) leads to a lower probability of investigation. This in turn results in a higher threshold for disclosure and therefore a larger set of P-types who are willing to suppress evidence. We can see this by modifying Figure 1 in order to illustrate and compare the equilibria.[22] Since $t^{BR}_{21}(\rho) = t^{BR}_{11}(\rho)$, we need only add the function $\rho^{BR}_{21}(t)$.

Put Figure 2 here

3.2. Information is Shared Within the Team

We now consider configuration 22 wherein any exculpatory evidence is automatically shared with the other P in the team. That is, if either P observes E, then this evidence is shared with the other P, so it is common knowledge (within the team) that now both know the exculpatory

[22] Comparative statics results for this version of the team model are the same as for the one-prosecutor model.

evidence.[23] Since these are two individual agents, now P1 and P2 both have decisions to make. We assume that they make their disclosure decisions simultaneously and noncooperatively, based only on their own private information (i.e., their disutility of causing an innocent defendant to be convicted).[24]

Consider P1's payoff; again, the general form it takes is $\pi_1^P(r_1, r_2; \theta_1, \theta_2, \tau_1, \tau_2)$. However, now it must be that $\theta_1 = \theta_2$; either both team members observe E or both observe φ (and, in this latter case, both must report φ). For convenience, we will focus on those events in which P1 has a decision to make; we will fill out the details of the payoffs for the other events later when we endogenize the information structure. If P1 observes E, then disclosing it will yield $\pi_1^P(E, r_2; E, E, \tau_1, \tau_2) = 0$ for all (r_2, τ_1, τ_2); P2 will receive the same payoff. On the other hand, if P1 reports φ (i.e., P1 suppresses the exculpatory evidence) then if P2 discloses E, P1 will receive $\pi_1^P(\varphi, E; E, E, \tau_1, \tau_2) = 0$ for all (τ_1, τ_2); whereas if P2 also reports φ, P1 will receive $\pi_1^P(\varphi, \varphi; E, E, \tau_1, \tau_2) = S(1 - \eta) - \tau_1 - \eta k \mu \hat{\rho}$, where $\hat{\rho}$ is again interpreted as P1's and P2's common conjectured probability that J investigates when both prosecutors report φ and D provides E. Note that we assume P1 only suffers the disutility τ_1 if D is actually falsely convicted; if P1 suppresses evidence but his partner discloses it, P1 does not suffer the disutility τ_1. This implements the notion that it is not the act of suppressing evidence, but the act of causing an innocent D to be convicted, that generates P1's disutility.

Since P1 and P2 act simultaneously and without knowledge of each others' τ-values, P1 must have a conjecture about P2's behavior (much as J must have a conjecture about both P1's and P2's

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[23] J knows the configuration, but not whether E was observed.

[24] If utility were transferable, the team could use an incentive-compatible mechanism to elicit information about their τ-values and to recommend whether or not to disclose E to D. We address this issue briefly at the end of this section.

behavior). We assume that P1 and J maintain a common conjectured threshold, denoted $\hat{t}$, such that all P2 types with $\tau_2 < \hat{t}$ are expected to report φ when they observe E. Then P1's expected payoff when he observes E and reports φ is given by: $0 \cdot [1 - F(\hat{t})] + [S(1 - \eta) - \tau_1 - \eta k \mu \hat{\rho}]F(\hat{t})$. Thus, P1 should disclose if $\tau_1 \geq t_{22}(\hat{\rho})$, where $t_{22}(\hat{\rho}) \equiv \max \{0, S(1 - \eta) - \eta k \mu \hat{\rho}\}$, which is independent of the conjecture about P2's threshold. The subscript on this expression indicates that there are 2 prosecutors on the team and either 2 or zero observe E. As is readily apparent, $t_{22}(\hat{\rho}) = t_{21}(\hat{\rho}) = t_{11}(\hat{\rho})$. Similarly, P2's best response (to his conjecture about the probability that J will investigate, $\hat{\rho}$) is independent of his conjecture about P1, and is the same in all three cases: a team with joint information, a team with disjoint information, and a single prosecutor. This again leads to the same cutoff rule, now for each prosecutor.

> **<u>Lemma 5</u>**. In the event that P1 and P2 observe E, P1's (resp., P2's) best response is: $BR^P(\hat{\rho}; \tau) = \varphi$ if $\tau < t_{22}(\hat{\rho})$ and $BR^P(\hat{\rho}; \tau) = E$ if $\tau \geq t_{22}(\hat{\rho})$, where $t_{22}(\hat{\rho}) \equiv \max \{0, S(1 - \eta) - \eta k \mu \hat{\rho}\}$.

Now consider J's payoff. Since there is no interaction between P1 and P2 and they are otherwise identical, the equilibrium threshold will be the same for both of them. Thus, J should have a common conjectured threshold, which we denote as $\hat{t}$. When D provides E, but both prosecutors reported φ, J must construct a posterior belief about whether the prosecutors are suppressing evidence. The report pair (φ, φ) would have occurred if: (1) no exculpatory evidence was found, which happens with probability $1 - \gamma$; or (2) if exculpatory evidence was found but both prosecutors suppressed it, which happened with probability $\gamma(F(\hat{t}))^2$. Thus, J's posterior belief that the prosecutors suppressed evidence is given by $\gamma(F(\hat{t}))^2/[1 - \gamma + \gamma(F(\hat{t}))^2]$. This posterior belief is <u>not</u> the same as in the team with disjoint information (i.e., the 21 configuration) or the one-prosecutor case; in the team with joint information, each prosecutor can serve a "whistle-blowing" role by disclosing E (thus preventing the conviction of an innocent D).

We assume that J's cost of investigation in the case of joint information is still drawn from the distribution $H_2(c)$; that is, as discussed earlier, the cost of investigation depends on how many team members there are (and not on how information is distributed among them). We also assume that the investigation successfully verifies suppression by both team-members (with probability μ) or neither (with probability $1 - \mu$); it never verifies suppression by only one team-member. Finally, J's payoff from an investigation that verifies suppression of evidence by both prosecutors, denoted V_2, is assumed to be at least V_1; that is, apprehending two *Brady* violators gives J a higher payoff than apprehending one of them. J observes her cost of investigation and decides whether to investigate (d = 1) or not (d = 0). J's payoff from investigation is now $\pi^J(1; c) = V_2\mu\gamma(F(\hat{t}))^2/[1 - \gamma + \gamma(F(\hat{t}))^2] - c$ and her payoff from not investigating is $\pi^J(0; c) = 0$. It is clear that $\pi^J(1; c) = V_2\mu\gamma(F(\hat{t}))^2/[1 - \gamma + \gamma(F(\hat{t}))^2] - c \geq \pi^J(0; c) = 0$ whenever $c \leq V_2\mu\gamma(F(\hat{t}))^2/[1 - \gamma + \gamma(F(\hat{t}))^2]$.

Lemma 6. In the event that both P1 and P2 reported φ and D later provided E, J's best response is: $BR^J(\hat{t}; c) = 1$ if $c \leq V_2\mu\gamma(F(\hat{t}))^2/[1 - \gamma + \gamma(F(\hat{t}))^2]$ and $BR^J(\hat{t}; c) = 0$ otherwise.

Lemmas 5 and 6 characterize the prosecutors' and the judge's best response functions for the case of joint information. As before, it will be more intuitive to work with the related functions:

$$t_{22}^{BR}(\rho) \equiv S(1 - \eta) - \eta k\mu\rho; \tag{9}$$

$$\rho_{22}^{BR}(t) \equiv H_2(V_2\mu\gamma(F(t))^2/[1 - \gamma + \gamma(F(t))^2]). \tag{10}$$

Clearly, $t_{22}^{BR}(\rho) = t_{21}^{BR}(\rho) = t_{11}^{BR}(\rho)$; however, $\rho_{22}^{BR}(t)$ and $\rho_{21}^{BR}(t)$ (as well as $\rho_{22}^{BR}(t)$ and $\rho_{11}^{BR}(t)$) are not as easily-ordered. We first provide the characterization of the BNE for the 22 configuration and then we compare the equilibrium amounts of suppression and investigation.

A BNE for this version of the two-prosecutor team, denoted (t_{22}^*, ρ_{22}^*), is defined analogously as in Section 2: both prosecutors and the judge play mutual best responses. Again, it is clear that

$t^*_{22} > 0$. Finally, the function $\rho^{BR}_{22}(t)$ starts at the origin and increases (strictly) as t increases.[25] As before, $t^{BR}_{22}(\rho)$ and $\rho^{BR}_{22}(t)$ must cross exactly once, which establishes the following result.

Proposition 3. There is a unique BNE (t^*_{22}, ρ^*_{22}) where $t^*_{22} \in (0, S(1 - \eta))$ and $\rho^*_{22} \in (0, 1)$, given by the pair of equations:

$$t^*_{22} = S(1 - \eta) - \eta k \mu \rho^*_{22}; \quad (11)$$

$$\rho^*_{22} = H_2(V_2 \mu \gamma (F(t^*_{22}))^2/[1 - \gamma + \gamma(F(t^*_{22}))^2]). \quad (12)$$

We can modify Figure 2 in order to illustrate and compare the equilibria.[26] We need only add the function $\rho^{BR}_{22}(t)$. First consider the comparison between $\rho^{BR}_{22}(t)$ and $\rho^{BR}_{21}(t)$. Both functions start at the origin and increase with t, and both are based on the distribution $H_2(c)$; but for any given t, their arguments are not the same. Since $(F(t))^2 < F(t)$ for $t > 0$, $(F(t))^2/[1 - \gamma + \gamma(F(t))^2] < F(t)/[1 - \gamma + \gamma F(t)]$. So if V_2 was equal to V_1, then we could conclude that $\rho^{BR}_{22}(t) < \rho^{BR}_{21}(t)$ for all $t > 0$. This would further imply that $t^*_{22} > t^*_{21}$ (which already exceeds t^*_{11}) and $\rho^*_{22} < \rho^*_{21}$ (which is already less than ρ^*_{11}). This situation is depicted in Figure 3 below.

Put Figure 3 here

However, we expect that V_2 exceeds V_1, perhaps substantially, and an increase in V_2 increases the function $\rho^{BR}_{22}(t)$ for every value of $t > 0$. Thus, an increase in V_2 decreases t^*_{22} and increases ρ^*_{22}. This means that t^*_{22} could be less than t^*_{21} and ρ^*_{22} could exceed ρ^*_{21} for V_2 sufficiently above V_1; similarly, it seems to be theoretically possible for t^*_{22} to be less than t^*_{11} and ρ^*_{22} to be greater than ρ^*_{11}.

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[25] This function is continuous, but need not be everywhere concave nor everywhere convex; by the parameter restriction above (i.e., $V_2 \mu \gamma < \bar{c}$), it is strictly less than 1 for all values of t.

[26] Comparative statics results for this version of the team model are the same as for the one-prosecutor model.

Despite the inability to rank the equilibrium thresholds for suppressing evidence and the equilibrium likelihoods of investigation, we can rank the equilibrium likelihoods of evidence suppression in the two team environments. The equilibrium likelihood of evidence suppression under joint information is $(F(t^*_{22}))^2$, since both prosecutors' τ-values must fall below t^*_{22} in order for the evidence to be suppressed. The equilibrium likelihood of evidence suppression under disjoint information is $F(t^*_{21})$, since only the τ-value of the recipient of the exculpatory evidence must fall below t^*_{21} in order for evidence to be suppressed. The following proposition is proved in the Appendix.

<u>Proposition 4</u>. There is less evidence suppression in equilibrium under joint information as compared to disjoint information. That is, $(F(t^*_{22}))^2 < F(t^*_{21})$.

Thus, even though the joint information configuration may result in a higher threshold for evidence disclosure, the full effect will always be to reduce the likelihood of evidence suppression.

In the foregoing analysis with non-transferable utility, evidence is suppressed in the 22 configuration only if both prosecutors have sufficiently low values of disutility (τ) for convicting an innocent D. However, if prosecutors had transferable utility, then a team of prosecutors in a 22 configuration could design a direct mechanism that: (1) would induce them to report their τ-values truthfully (to the mechanism); and (2) would recommend the efficient decision (i.e., the one that maximizes the sum of their payoffs). To see how, let $w_i \equiv S(1 - \eta) - \tau_i - \eta k\mu\hat{\rho}$ denote prosecutor i's value for suppressing evidence; this may be positive or negative. Let W_i denote prosecutor i's reported value of w_i. The mechanism[27] works as follows: If $W_i + W_j \leq 0$, then the mechanism recommends that the evidence be disclosed; moreover, if $W_j > 0$, then prosecutor i pays a "tax" of

[27] This is a Groves-Clarke mechanism; see Mas-Collel, Whinston, and Green (1995), pp. 878-879.

W_j to a third party (so as not to affect prosecutor j's reporting strategy). Alternatively, if $W_i + W_j > 0$, then the mechanism recommends that the evidence be suppressed; moreover, if $W_j \leq 0$, then prosecutor i pays a "tax" of $-W_j$ since prosecutor i is changing the decision.

The amount of these taxes corresponds to what would be needed to compensate the other prosecutor for imposing an outcome he does not prefer; however, the taxes are not paid to the other prosecutor, but rather to a third party (so as not to affect the other prosecutor's reporting strategy). This mechanism induces truthful revelation of τ-values and results in the efficient (for the prosecutorial team) recommendation regarding disclosure: suppress evidence when the average disutility $(\tau_1 + \tau_2)/2 < S(1 - \eta) - \eta k \mu \hat{\rho}$, and otherwise disclose it to D. In the Appendix we show that there is more evidence suppression (and more investigation) in equilibrium under joint information when utility is transferable as compared to when it is not transferable.

However (as in all mechanism design problems), the prosecutors must somehow be committed to the mechanism, because there are circumstances in which a prosecutor would want to defect from the mechanism upon learning the recommendation. In particular, suppose the recommendation is to suppress the evidence; although the sum is positive, it could be that w_i is negative. Because prosecutor i is not actually compensated (taxes go to a third party), he still experiences $w_i < 0$ and therefore has an incentive to defect from the mechanism by disclosing E to D and refusing to pay the tax (this defection would raise his payoff to 0). Thus, there would need to be some sort of additional penalty that will ensure compliance with the mechanism. Because (in the setting we are considering) we don't believe that transferable utility and commitment to such a mechanism are compelling assumptions, we do not analyze this scenario further.

4. Endogenous Determination of the Information Configuration

In subsection 3.1 we assumed that only one team member received any exculpatory evidence (randomly, either P1 or P2). In subsection 3.2 we assumed that any exculpatory evidence was shared by both team members. In both analyses, J knew whether the configuration was 21 or 22. In this subsection, we examine which configuration(s) can emerge as part of an overall BNE for the game with endogenous information configuration. We consider two ways of endogenizing the information configuration. One way involves the team members coordinating *ex ante* and committing as to whether the information configuration will be joint or disjoint. We first assume that J knows the information configuration within a prosecutorial team. Then we consider the alternative case wherein J does not know the information configuration within a prosecutorial team; thus J's decision regarding investigation will depend on her conjecture about the information configuration within the prosecutorial team.[28] The other way of endogenizing the information configuration involves a single team member receiving any exculpatory evidence and then deciding whether to share it with his team member. In this version the decision is made at the *interim* stage (after the types and any exculpatory evidence have been realized); we assume that J cannot observe choices made within the team at the *interim* stage.

4.1. Ex ante Choice of Information Configuration when J Knows the Choice

First, we consider the *ex ante* choice of information configuration by the team, assuming that J knows the choice. For this analysis, we need to compute the *ex ante* expected payoff to a prosecutor under joint versus disjoint information; we also compare the *ex ante* expected payoff under a single prosecutor.

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[28] Of course, J can observe whether there is a single prosecutor or a team.

We start with the 11 configuration. Let Π^*_{11} denote a single prosecutor's *ex ante* expected payoff in the 11 configuration. Then:

$$\Pi^*_{11} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + \lambda\gamma\int\{S(1 - \eta) - \eta k\mu\rho^*_{11} - \tau\}dF(\tau), \qquad (13)$$

where the integral is over $[0, t^*_{11}]$. This expression is interpreted as follows. The first term reflects the fact that with probability $1 - \lambda$, D is actually guilty, so there is no exculpatory evidence and D will therefore be convicted, yielding a payoff of S. The second term reflects the fact that with probability λ, D is innocent but, with probability $(1 - \gamma)$, P does not observe E; thus D is convicted, yielding a payoff of S, which is lost if D subsequently observes E and the conviction is vacated, which occurs with probability η. Note that P loses the value of the conviction, but he does not suffer an internal disutility because his actions did not cause the false conviction. Finally, the last term reflects the fact that, with probability $\lambda\gamma$, D is innocent and P observes E. If P's type τ is less than t^*_{11}, then he suppresses the exculpatory evidence, which yields the payoff $S(1 - \eta) - \eta k\mu\rho^*_{11} - \tau$; this type-specific payoff is integrated over those types that would choose to suppress the evidence.

Next, we consider the 21 configuration. Let Π^*_{21} denote P1's *ex ante* expected payoff in a two-prosecutor team with configuration 21. Then:

$$\Pi^*_{21} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + (\lambda\gamma/2)S(1 - \eta)F(t^*_{21})$$
$$+ (\lambda\gamma/2)\int\{S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau\}dF(\tau), \qquad (14)$$

where the integral is over $[0, t^*_{21}]$. The first two terms are exactly the same as in the one-prosecutor model. The third term reflects the fact that, with probability λ, D is innocent and with probability $\gamma/2$, P2 observes exculpatory evidence, which he suppresses if $\tau_2 \leq t^*_{21}$ (i.e., with probability $F(t^*_{21})$); in this event, D is convicted, but the conviction is lost if D subsequently provides E, which happens with probability η. Finally, the last term reflects the fact that, with probability $\lambda\gamma/2$, D is innocent and P1 observes E. If P1's type τ_1 is less than t^*_{21}, then he suppresses the exculpatory evidence, which yields the payoff $S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau_1$; this type-specific payoff is integrated over those types that suppress the evidence.

It is straightforward to show that $\Pi^*_{21} > \Pi^*_{11}$ (see the Appendix). We summarize this result in Proposition 5.

> **Proposition 5**. *Ex ante*, a prosecutor would prefer to work in a team with disjoint information than to be the sole prosecutor.

The intuition behind this result is that, in a team with disjoint information, a prosecutor (say, P1) benefits from a false conviction that his team member causes; even if D finds exculpatory evidence and the conviction is overturned, P1 does not suffer the disutility of having caused the false conviction (since P2 caused it and P1 was unaware). Moreover, P1 benefits from the stochastically higher cost of investigating a team as compared to a sole prosecutor, as this stochastically higher cost acts as a disincentive for J regarding the net value of launching an investigation.

What if P1 suffered a disutility of $\alpha\tau_1$, where $\alpha \leq 1$, whenever P2's evidence suppression caused a false conviction of which P1 was unaware? Then P1's *ex ante* expected payoff under the 21 configuration could be lower than that under the 11 configuration if $\alpha E(\tau_1)$ was sufficiently large. Our maintained assumption is that $\alpha = 0$, but the results would continue to hold if α is sufficiently small, which we believe is most plausible. That is, even if P1 anticipates that there may be situations wherein P2 receives E and engages in evidence suppression, P1 does not experience substantial expected disutility from injustices to which he did not contribute.

Finally, consider the 22 configuration. Let Π^*_{22} denote P1's *ex ante* expected payoff in a two-prosecutor team with joint information. Then:

$$\Pi^*_{22} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + \lambda\gamma F(t^*_{22})\int\{S(1 - \eta) - \eta k\mu\rho^*_{22} - \tau\}dF(\tau), \qquad (15)$$

where the integral is over $[0, t^*_{22}]$. Again, the first two terms are exactly the same as in the one-prosecutor model and the two-prosecutor team with disjoint information. The third term reflects the fact that, with probability $\lambda\gamma$, D is innocent and both P1 and P2 observe exculpatory evidence, which P2 suppresses if $\tau_2 \leq t^*_{22}$ (i.e., with probability $F(t^*_{22})$). If P1's type τ_1 is less than t^*_{22}, then he also suppresses the exculpatory evidence, which yields the payoff $S(1 - \eta) - \eta k \mu \rho^*_{22} - \tau_1$; this type-specific payoff is integrated over those P1 types that suppress the evidence.

While somewhat more limited than the previous result, we obtain the following (see the Appendix for the proof).

Proposition 6. If $t^*_{22} \leq t^*_{21}$ (or $t^*_{22} > t^*_{21}$, but the difference is sufficiently small), then *ex ante*, a prosecutor would prefer to work in a team with disjoint information than in a team with joint information.

Thus, for example, if V_2 is sufficiently larger than V_1, then the Ps prefer there to be only one informed prosecutor (i.e., the 21 configuration), thereby reducing V back to V_1 (and thereby reducing J's incentive to investigate). A second intuition for this preference is that there are circumstances under which P1 would prefer to suppress the exculpatory information (e.g., low τ_1), but his team member is likely to disclose it if he also observes it (e.g., low t^*_{22}). The disjoint information configuration allows P1 to control the disclosure decision when he alone observes E.[29]

4.2. *Ex ante Choice of Information Configuration when J Does Not Observe the Choice*

When J cannot observe the two-prosecutor information configuration, we have to incorporate conjectures on J's part. Then the question is: can there be an equilibrium to the overall game

[29] Again, if P1 suffered sufficient expected disutility whenever P2's evidence suppression caused a false conviction of which P1 was unaware, then P1's *ex ante* expected payoff under the 21 configuration could be lower than that under the 22 configuration (wherein any evidence suppression must be done with P1's knowledge and consent).

wherein the team of prosecutors chooses a joint information configuration (resp., a disjoint information configuration)? First consider a joint information configuration. If J expects the team to choose a joint information configuration, then J will investigate with probability ρ^*_{22}. If P1 and P2 choose a joint information configuration, each can expect a payoff of Π^*_{22} as given in equation (15). What if, unobserved by J, P1 and P2 deviate to a disjoint configuration (and play in a subgame perfect way thereafter)? Having deviated to a disjoint information configuration, they might consider changing their equilibrium thresholds but, in fact, t^*_{22} is still a best response to ρ^*_{22}. However, the deviation payoff is:

$$\Pi_{22}^{dev} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + (\lambda\gamma/2)S(1 - \eta)F(t^*_{22})$$
$$+ (\lambda\gamma/2)\int\{S(1 - \eta) - \eta k\mu\rho^*_{22} - \tau\}dF(\tau),$$

where the integral is over $[0, t^*_{22}]$. The deviation is preferred whenever:

$$(\lambda\gamma/2)S(1 - \eta)F(t^*_{22}) + (\lambda\gamma/2)\int\{S(1 - \eta) - \eta k\mu\rho^*_{22} - \tau\}dF(\tau)$$
$$> \lambda\gamma F(t^*_{22})\int\{S(1 - \eta) - \eta k\mu\rho^*_{22} - \tau\}dF(\tau),$$

where both integrals are over $[0, t^*_{22}]$. The left-hand-side is the average of two terms, each of which is larger than the right-hand-side. So the deviation is <u>always</u> preferred and hence there cannot be an equilibrium wherein the team chooses a joint information configuration.

Next we ask whether there can be an equilibrium wherein the team chooses the 21 (disjoint) configuration. If J expects the team to choose a disjoint configuration, then J will investigate with probability ρ^*_{21}. If P1 and P2 choose a disjoint configuration, each can expect a payoff of Π^*_{21} as given in equation (14). What if, unobserved by J, P1 and P2 deviate to a 22 (joint) configuration (and play in a subgame perfect way thereafter)? Although they might consider changing their equilibrium thresholds, t^*_{21} is still a best response to ρ^*_{21}. However, the deviation payoff is:

$$\Pi_{21}^{dev} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + \lambda\gamma F(t^*_{21})\int\{S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau\}dF(\tau),$$

where the integral is over $[0, t^*_{21}]$. The deviation is preferred whenever:

$$\lambda\gamma F(t^*_{21})\int\{S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau\}dF(\tau)$$
$$> (\lambda\gamma/2)S(1 - \eta)F(t^*_{21}) + (\lambda\gamma/2)\int\{S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau\}dF(\tau),$$

where both integrals are over $[0, t^*_{21}]$. The right-hand-side is the average of two terms, each of which is larger than the left-hand-side. So the deviation is never preferred and hence there is an equilibrium wherein the team chooses the 21 configuration. Thus, when P1 and P2 choose the information configuration *ex ante*, but J cannot observe their choice, then the only equilibrium involves a disjoint configuration.

4.3. Interim Choice of Information Configuration when J Cannot Observe the Choice

In this case, we think of the information configuration as involving exculpatory evidence being observed by either P1 or P2 (with equal probability), but then the observing prosecutor can choose to share the information with his team member or to suppress it (both from the team member and the defendant). At the *interim* stage, both prosecutors know their own types.

Suppose that P1 observes exculpatory evidence. Can there be an equilibrium wherein P1 first shares this evidence with P2, and then each continues optimally (i.e., each decides simultaneously and noncooperatively whether to disclose E to D)? Suppose that J expects exculpatory evidence to be shared, and therefore investigates with probability ρ^*_{22}. Then if a P1 of type τ_1 shares the evidence with P2 (who does not disclose to D with probability $F(t^*_{22})$), then P1 can expect a payoff of $F(t^*_{22})(S(1 - \eta) - \eta k\mu\rho^*_{22} - \tau_1)$ if he does not disclose E to D. Thus, the threshold for P1 to disclose remains t^*_{22}. However, by deviating to not sharing the evidence with P2, P1 will obtain a payoff of $S(1 - \eta) - \eta k\mu\rho^*_{22} - \tau_1$ if he does not disclose E to D. Thus, when P1 has observed

E and when $\tau_1 \leq t^*_{22}$, then P1 will defect from the putative equilibrium involving evidence sharing, so as to preempt his team member from disclosing E to D.

Alternatively, can there be an equilibrium wherein P1 does not share exculpatory evidence with P2? Suppose that J expects exculpatory evidence not to be shared, and therefore investigates with probability ρ^*_{21}. Then if P1 of type τ_1 does not share the evidence with P2, then P1 can expect a payoff of $S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau_1$ if he does not disclose E to D, so he will disclose if $\tau_1 \geq t^*_{21}$. However, by deviating to sharing the evidence with P2, P1 will obtain a lower payoff of $F(t^*_{21})(S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau_1)$ if he does not disclose E to D. Thus (following the deviation) the threshold for P1 to disclose to D remains t^*_{21}, but P1 will never deviate to sharing exculpatory evidence with P2 because this would only give P2 the opportunity to disclose E when P1 prefers to suppress it.

When the decision regarding whether to share exculpatory evidence with a team member is taken at the *interim* stage, the only equilibrium involves not sharing with P2 when P1 prefers to keep the evidence from D; when P1 prefers to disclose to D, he can do it directly without previously sharing it with his team member.

The results of subsections 4.2 and 4.3 are summarized in the following proposition.

> **Proposition 7**. Assume that J cannot observe the information configuration within the team. If P1 and P2 choose the information configuration either jointly at the *ex ante* stage, or by making an individual decision about information sharing at the *interim* stage, then the overall equilibrium involves a disjoint information configuration.

5. The Effect of Informal Sanctions

Overall, the results of Section 4 imply that a team configuration is preferred (by the prosecutors) to being a sole prosecutor, but one should not expect information sharing to arise naturally.[30] Therefore, in this section we consider an extension in the case of a team with a disjoint information configuration. We have assumed that each prosecutor's type (disutility from causing the conviction of an innocent D) is their own private information, and that each prosecutor makes his disclosure decision noncooperatively. Moreover, we have ruled out transferable utility, so neither prosecutor can offer or extract a payment from the other. However, we view it as very possible that informal incentives can operate within the office. For instance, the "corporate culture" could reward or punish disclosure, so that P1's payoff from disclosing is now $\pi_1^P(E, \varphi; E, \varphi, \tau_1, \tau_2) = \beta$. If $\beta > 0$, then disclosure is rewarded, whereas if $\beta < 0$, then it is punished. This has the predictable effect of reducing suppression and investigation if disclosure is rewarded, and increasing suppression and investigation if disclosure is punished.

A more subtle version of informal sanctions could be imposed by the other member of the team. For instance, suppose that P1 received exculpatory evidence and disclosed it; P2 can evaluate what his decision would have been had he (rather than P1) received the evidence. If P2 would have chosen to disclose it as well, we assume that P2 does not impose any informal sanctions on P1. But if P2 would have suppressed it, then P2 could impose an informal sanction in the amount $\sigma > 0$ on P1. This informal sanction may consist of disrespect, uncooperativeness, or sabotage in future interactions with P1. The fact that it is informal tends to limit the magnitude of σ, as overall office culture may discourage informal sanctions, or at least prefer the response be limited so as not to attract public scrutiny.

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[30] A joint information configuration may well be socially-preferred, although this analysis is beyond the scope of this paper. We anticipate that it will be difficult to implement a joint information configuration effectively, given that it requires complete evidence sharing and there are many points at which a P who receives E and wishes to suppress it can tamper with what is jointly known.

Revisiting the analysis of subsection 3.2, P1's payoff from suppressing E remains $S(1 - \eta) - \tau_1 - \eta k\mu\hat{\rho}$, where $\hat{\rho}$ is P1's conjectured probability that J investigates when both prosecutors report φ and D later provides E. However, P1's expected payoff when he discloses is now $\pi_1^P(E, \varphi; E, \varphi, \tau_1, \tau_2) = -\sigma F(\hat{t})$, since P1 conjectures that all P2 types with $\tau_2 < \hat{t}$ would have reported φ if they had been the one that observed E. Now P1's best response is to both conjectures, $\hat{t}$ and $\hat{\rho}$: P1 should disclose if $\tau_1 \geq t_{21}(\hat{t}, \hat{\rho})$, where $t_{21}(\hat{t}, \hat{\rho}) \equiv \max\{0, S(1 - \eta) - \eta k\mu\hat{\rho} + \sigma F(\hat{t})\}$, and P2 should follow the analogous rule. Notice that if P1 conjectures that P2 will use a higher threshold $\hat{t}$, then P1's best response is also to use a higher threshold. This strategic complementarity can result in multiple equilibria (more on this below).

Lemma 7. In the event that P1 (resp., P2) observes E, P1's (resp., P2's) best response is: $BR^P(\hat{t}, \hat{\rho}; \tau) = \varphi$ if $\tau < t_{21}(\hat{t}, \hat{\rho})$ and $BR^P(\hat{t}, \hat{\rho}; \tau) = E$ if $\tau \geq t_{21}(\hat{t}, \hat{\rho})$, where $t_{21}(\hat{t}, \hat{\rho}) \equiv \max\{0, S(1 - \eta) - \eta k\mu\hat{\rho} + \sigma F(\hat{t})\}$.

We will characterize an equilibrium in which P1 and P2 use the same threshold. J's problem is unchanged; she uses a common conjecture $\hat{t}$ for both P1 and P2. Her best response is still as given in Lemma 4. That is, $BR^J(\hat{t}; c) = 1$ if $c \leq V_1\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})]$ and $BR^J(\hat{t}; c) = 0$ otherwise. This results in the same best-response likelihood of investigation, $\rho_{21}^{BR}(\hat{t}) = H_2(V_1\mu\gamma F(\hat{t})/[1 - \gamma + \gamma F(\hat{t})])$. Let the equilibrium threshold for P1 and P2 be denoted $t_{21}^*(\sigma)$; J's equilibrium likelihood of investigation will be denoted $\rho_{21}^*(\sigma)$. As before, it is clear that $t_{21}^*(\sigma) = 0$ cannot be part of an equilibrium; some evidence suppression will be necessary to motivate investigation by J. Thus, a Bayesian Nash Equilibrium $(t_{21}^*(\sigma), \rho_{21}^*(\sigma))$ is a solution to the equations:

$$t = S(1 - \eta) - \eta k\mu\rho + \sigma F(t); \tag{16}$$

$$\rho = H_2(V_1\mu\gamma F(t)/[1 - \gamma + \gamma F(t)]). \tag{17}$$

Note that equation (16) defines $t_{21}^*(\sigma)$ implicitly. It will be easier to visualize and understand the BNE if we solve equation (16) for ρ in terms of t, which we will denote as $b_{21}(t; \sigma)$. The function $\rho = b_{21}(t; \sigma) \equiv [S(1 - \eta) - t + \sigma F(t)]/\eta k\mu$ is increasing in σ for all t > 0, but begins at the same vertical intercept, $S(1 - \eta)/\eta k\mu$, for all σ (and it lies above $b_{21}(t; 0)$ for all t > 0). When σ = 0, this is simply the usual negatively-sloped line that crosses the horizontal axis at S(1 - η). For σ > 0, we can no longer be sure that $b_{21}(t; \sigma)$ is downward-sloping everywhere; however, it will cross the horizontal axis when t gets sufficiently large. It is clear that there is at least one BNE, $(t^*_{21}(\sigma), \rho^*_{21}(\sigma))$, and that $t^*_{21}(\sigma) > t^*_{21}(0)$ and $\rho^*_{21}(\sigma) > \rho^*_{21}(0)$. That is, informal sanctions as described above result in more evidence suppression and more investigation. Since $b_{21}(t; \sigma)$ need not be everywhere downward-sloping, it is possible that multiple BNE exist; however, all BNE for σ > 0 involve more evidence suppression and more investigation than the BNE for σ = 0. The functions $b_{21}(t; \sigma)$, $b_{21}(t; 0)$, and $\rho^{BR}_{21}(t)$ are graphed in Figure 4 below; a scenario with three BNEs is depicted. Note that since $\rho^{BR}_{21}(t)$ is increasing in t, all the equilibria are rankable, with higher t-thresholds associated with higher likelihoods of investigation.

<u>**Proposition 8**</u>. There is at least one BNE $(t^*_{21}(\sigma), \rho^*_{21}(\sigma))$ given by equations (16)-(17). For any BNE with σ > 0, $t^*_{21}(\sigma) > t^*_{21}(0)$ and $\rho^*_{21}(\sigma) > \rho^*_{21}(0)$.

Put Figure 4 here

Finally, within the 22 configuration another type of informal sanction is possible.[31] If P1 discloses but P2 suppresses, then there is no risk of formal sanctions for P2 (because no conviction occurs), but P1 could impose an informal sanction on P2. This can also result in multiple equilibrium thresholds for the prosecutors; one type of equilibrium is similar to those described above but another equilibrium involves no suppression by either prosecutor. In particular, if P2

[31] We thank Giri Parameswaran for pointing out this scenario and the resulting full-disclosure equilibrium.

conjectures that P1 will always disclose (regardless of type), then it is a best response for P2 to always disclose as well (and J need not investigate). But then neither P can ever benefit from suppressing evidence. If the prosecutors can coordinate on a particular equilibrium, then they will avoid this one; moreover, if this is the anticipated equilibrium in the 22 configuration, then they will have even more reason to avoid the 22 configuration.

6. Summary, Discussion, and Conclusions

In this paper we have modeled prosecutors' objectives as a mixture of career concerns and moral concerns about causing innocent defendants to be convicted. We found that a team of prosecutors with a disjoint information configuration engaged in more evidence suppression in equilibrium. Moreover, on an *ex ante* basis (that is, before learning the extent of their moral concerns) prosecutors prefer the team with disjoint information to being sole prosecutors. We found that a team of prosecutors with a joint information configuration engaged in less evidence suppression in equilibrium, but this configuration was not part of an overall equilibrium when the information configuration was determined endogenously (and was not observable to a judge considering whether to investigate). Finally, the potential for informal sanctions by team members who would have suppressed evidence (if they had discovered it) leads not only to more suppression of evidence but also to the possibility of multiple equilibria.

6.1. Policies to Reduce Evidence Suppression

The comparative statics results suggest that the following policies could reduce evidence suppression. First, a decrease in P's payoff from a successful conviction (S) or an increase in P's penalty from being caught suppressing evidence (k) both operate to reduce evidence suppression. It is unclear how the perceived benefit from a conviction can be moderated, but current practice leaves much scope for increasing k. Kozinski (2015, p. xxxix) notes that prosecutors are "absolutely immune from damages liability for misconduct they commit when performing the traditional activities of a prosecutor." They are (in principle) subject to criminal prosecution but, Kozinski says: "Despite numerous cases where prosecutors have committed willful misconduct, costing innocent defendants decades of their lives, I am aware of only two who have been criminally prosecuted for it; they spent a total of six *days* behind bars."[32] Other possible sanctions include temporary suspension or permanent loss of one's law license, or perhaps demotion or firing from one's position as a prosecutor, but these are also rarely-employed. Kozinski (2015, p. xxvi) suggests a "naming and shaming" strategy: "Judges who see bad behavior by those appearing before them, especially prosecutors who wield great power and have greater ethical responsibilities, must hold such misconduct up to the light of public scrutiny."

Second, a stochastically higher disutility of convicting an innocent D leads to less evidence suppression. This distribution is arguably affected by the law school curriculum on professional responsibility, by continuing education, and by the culture of the DA's office. Although presumably the first two of these items would have a beneficial effect on evidence suppression, the last item could go either way depending upon whether the office culture promotes disclosure or suppression.

Third, conditional on D being truly innocent, an increase in the likelihood of P discovering exculpatory evidence (γ) or D discovering exculpatory evidence (η) both operate to reduce evidence suppression. An increase in γ also allows more cases to be disposed of by disclosure, thus avoiding erroneous convictions in the first place, whereas an increase in η allows more erroneous convictions to be overturned. In both cases, these increases would presumably be the outcome of devoting more

[32] California recently passed a law making it a felony for prosecutors to knowingly withhold or falsify evidence; the sentence can run from 16 months to three years.

resources to careful investigation of the crime and collection of evidence. Greater use of technology such as surveillance cameras and smartphone tracking might also increase η and γ, but might have other less desirable effects (such as invasion of privacy).

Fourth, an increase in the judge's return to catching *Brady* violators (V), an increase in the effectiveness of investigation of prosecutors who may have committed a *Brady* violation (μ), and a stochastically lower cost of such an investigation on the part of judges all contribute to reducing evidence suppression. Better internal (to the prosecutors' office) documentation procedures may improve μ and the cost distribution for investigation. It is not clear exactly what contributes to V, the judge's return to punishing evidence suppression. For instance, a judge might also be viewed as having a moral concern for justice, and this contributes to V. On the other hand, if the prosecution can retaliate against the judge, this may lower V. As an, in an ongoing capital-murder case in Orange County, Scott Dekraai was convicted (in part) on the basis of testimony by a jailhouse informant. As described in Kozinski (2015, p. xxvi), during the penalty phase of the trial, the defense challenged the informant and

> "... Superior Court Judge Thomas Goethals ... eventually found that the Orange County District Attorney's office had engaged in a 'chronic failure' to disclose exculpatory evidence pertaining to a scheme run in conjunction with jailers to place jailhouse snitches known to be liars near suspects they wished to incriminate, effectively manufacturing false confessions. The judge then took the drastic step of disqualifying the Orange County District Attorney's office from further participation in the case."

Subsequently, the Orange County DA's office made use of peremptory challenges to remove Judge Goethals from significant cases they were prosecuting. According to the Orange County Register (July 15, 2016), "Appellate justices ruled Monday that the Orange County District Attorney's Office can disqualify Superior Court Judge Thomas Goethals from 46 murder cases, though the justices also said the practice is abusive and disruptive of the court system." That is, the trial judge may end up with a lower V if they proceed to investigate and enforce *Brady*.

A proposal intended to break the professional and social inter-relationships between judges and prosecutors that are likely to arise in repeated interactions, relationships that may reduce a judge's willingness to investigate or increase the power of a prosecutor's office to pursue potential retaliation, is to diffuse case assignments over jurisdictions. That is, making both actors' assignments more randomly distributed over a much broader geographical area could help reduce the frequent interactions that breed such inter-relationships. Admittedly, this might be more feasible to accomplish in the federal system than in the state systems, since it is the state systems wherein judges and chief prosecutors are often elected by local constituencies. Alternatively, the result of a convicted D later bringing forth exculpatory evidence would trigger a separate state agency or court to determine whether there was a basis for investigating the prosecutors involved, and to initiate such an investigation.

Finally, the internal organization of the DA's office in terms of evidence sharing and decision-making matters. At present the prosecution is only required to turn over evidence that is "material" and "exculpatory," which allows for a discretionary decision on the part of a prosecutor that can all too readily result in a decision that disclosure (either to D or to a fellow P) is not required. If this discretionary decision could somehow be avoided, then evidence would be more broadly-shared within the prosecution team and with the defense. Kozinski (2015, p. xxvi) calls for "open files," meaning that "If the prosecution has evidence bearing on the crime with which a defendant is being charged, it must promptly turn it over to the defense." According to Kozinski (p. xxvii), North Carolina has implemented such a rule by statute. "Prosecutors were none too happy with the law and tried hard to roll it back in 2007 and again in 2012, but the result was an even stronger law that applies not only to prosecutors but to police and forensic experts, as well it should."

6.2. Other Applications

In the Introduction, we raised other potential applications of disclosure in teams; these involved the sale of a product wherein information about poor quality was suppressed. Two recent examples include the case of Volkswagen's use of software to generate false low pollution measures[33] and Merck's suppression of evidence in their submission to the FDA that Vioxx caused an elevated risk of cardiovascular side effects.[34] In both cases, information that was to be provided to regulators (respectively, the EPA and the FDA) and is owed to potential customers (and, due to potential liability concerns, to shareholders) was suppressed by a subset of employees and/or officers of the firms. Unlike prosecutors, these companies do not have immunity for civil damages; besides possible fines, they face civil liability for harms to their customers and to shareholders that purchased while the information was suppressed and then suffered losses when it was revealed. Thus, a careful analysis of these issues for a corporate entity would require an extension to include issues of vicarious liability, monitoring, and corporate governance.

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[33] See Smith and Parloff, http://fortune.com/inside-volkswagen-emissions-scandal/.

[34] See Loftus, http://www.wsj.com/articles/merck-to-pay-830-million-to-settle-vioxx-shareholder-suit-1452866882

Appendix

Proposition 4. There is less evidence suppression in equilibrium under joint information as compared to disjoint information. That is, $(F(t^*_{22}))^2 < F(t^*_{21})$.

Proof. To see this, we first make this argument assuming that $V_2 = V_1$. We then argue that an increase in V_2 (holding V_1 constant) reinforces the result. Recall that $\rho^{BR}_{22}(t) = H_2(V_2\mu\gamma(F(t))^2/[1 - \gamma + \gamma(F(t))^2])$ and $\rho^{BR}_{21}(t) = H_2(V_1\mu\gamma F(t)/[1 - \gamma + \gamma F(t)])$. If $V_2 = V_1$, then $\rho^{BR}_{22}(t) < \rho^{BR}_{21}(t)$ for all $t > 0$ because the expression $X/[1 - \gamma + \gamma X]$ is increasing in X and $(F(t))^2 < F(t)$. Since the function $t^{BR}_{22}(\rho) = S(1 - \eta) - t - \eta k\mu\rho = t^{BR}_{21}(\rho)$ is downward-sloping and the functions $\rho^{BR}_{22}(t)$ and $\rho^{BR}_{21}(t)$ are upward-sloping, the equilibrium likelihoods of investigation can be ranked: $\rho^*_{22} < \rho^*_{21}$. Since $\rho^*_{22} = H_2(V_1\mu\gamma(F(t^*_{22}))^2/[1 - \gamma + \gamma(F(t^*_{22}))^2]) < \rho^*_{21} = H_2(V_1\mu\gamma F(t^*_{21})/[1 - \gamma + \gamma F(t^*_{21})])$ and H_2 is increasing in its argument, it follows that $V_1\mu\gamma(F(t^*_{22}))^2/[1 - \gamma + \gamma(F(t^*_{22}))^2] < V_1\mu\gamma F(t^*_{21})/[1 - \gamma + \gamma F(t^*_{21})]$. This inequality holds if and only if $(F(t^*_{22}))^2 < F(t^*_{21})$. Thus we have established the claim under the assumption that $V_2 = V_1$. Now consider the effect of increasing V_2. The expression $F(t^*_{21})$ is unaffected because t^*_{21} is based on V_1. But an increase in V_2 increases the function $\rho^{BR}_{22}(t)$ for every $t > 0$, which results in an increase in ρ^*_{22} and a decrease in t^*_{22}. A decrease in t^*_{22} reduces the expression $(F(t^*_{22}))^2$, which reinforces the result that $(F(t^*_{22}))^2 < F(t^*_{21})$.

Proof of Proposition 5.

Proposition 5 claims that $\Pi^*_{21} > \Pi^*_{11}$. We will first re-write these expressions in a more useful format. In the 11-BNE (see equation (3)), $t^*_{11} = S(1 - \eta) - \eta k\mu\rho^*_{11}$. Thus, we can re-write Π^*_{11} in equation (13) as follows:

$$\Pi^*_{11} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + \lambda\gamma\int\{t^*_{11} - \tau\}dF(\tau),$$

where the integral is over $[0, t^*_{11}]$.

In the 21-BNE (see equation (7)), $t^*_{21} = S(1 - \eta) - \eta k\mu\rho^*_{21}$. Thus, we can re-write Π^*_{21} in equation (14) as follows:

$$\Pi^*_{21} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + (\lambda\gamma/2)S(1 - \eta)F(t^*_{21}) + (\lambda\gamma/2)\int\{t^*_{21} - \tau\}dF(\tau),$$

where the integral is over $[0, t^*_{21}]$.

The first two terms in each profit expression are the same, so the result depends on the comparison of the remaining terms. The result that $\Pi^*_{21} > \Pi^*_{11}$ follows from two facts. First,

$$(\lambda\gamma/2)S(1 - \eta)F(t^*_{21}) > (\lambda\gamma/2)\int\{S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau\}dF(\tau) = (\lambda\gamma/2)\int\{t^*_{21} - \tau\}dF(\tau),$$

where all integrals are over $[0, t^*_{21}]$. Second, $\int\{t^*_{21} - \tau\}dF(\tau)$ (where the integral is over $[0, t^*_{21}]$) > $\int\{t^*_{11} - \tau\}dF(\tau)$ (where the integral is over $[0, t^*_{11}]$). This latter result follows from the facts that $\int_0^x\{x - \tau\}dF(\tau)$ is increasing in x and $t^*_{21} > t^*_{11}$.

Proof of Proposition 6.

Proposition 6 claims that $\Pi^*_{21} > \Pi^*_{22}$, at least for $t^*_{22} \leq t^*_{21}$ or for $t^*_{22} > t^*_{21}$, but sufficiently close. In the 22-BNE (see equation (11)), $t^*_{22} = S(1 - \eta) - \eta k\mu\rho^*_{22}$. Thus, we can re-write Π^*_{22} in equation (15) as follows:

$$\Pi^*_{22} = (1 - \lambda)S + \lambda(1 - \gamma)S(1 - \eta) + \lambda\gamma F(t^*_{22})\int\{t^*_{22} - \tau\}dF(\tau), \quad (15)$$

where the integral is over $[0, t^*_{22}]$.

Recall that there is no clear ordering between t^*_{22} and t^*_{21}. If $V_2 = V_1$, then $t^*_{22} > t^*_{21}$, but a sufficient increase in V_2 relative to V_1 could, in principle, reverse this inequality. Suppose that $t^*_{22} \leq t^*_{21}$; then $\Pi^*_{22} < \Pi^*_{21}$. This follows from three facts. First, $(\lambda\gamma/2)S(1 - \eta)F(t^*_{21}) > (\lambda\gamma/2)\int\{S(1 - \eta) - \eta k\mu\rho^*_{21} - \tau\}dF(\tau) = (\lambda\gamma/2)\int\{t^*_{21} - \tau\}dF(\tau)$, where all integrals are over $[0, t^*_{21}]$. Second, $\int\{t^*_{21} - \tau\}dF(\tau)$ (where the integral is over $[0, t^*_{21}]$) $> \int\{t^*_{22} - \tau\}dF(\tau)$ (where the integral is over $[0, t^*_{22}]$). This latter result follows from the facts that $\int_0^x\{x - \tau\}dF(\tau)$ is increasing in x and $t^*_{21} > t^*_{22}$ (the two terms are equal if $t^*_{21} = t^*_{22}$). Finally, the expression $\int\{t^*_{22} - \tau\}dF(\tau)$ (where the integral is over $[0, t^*_{22}]$) is pre-multiplied by $F(t^*_{22}) < 1$. Since the inequalities in these profit comparisons are strict, they also hold for $t^*_{22} > t^*_{21}$ (but sufficiently close).

Evidence Suppression in the 22 Configuration with Transferable Utility

Here we compare the BNE in the 22 case without transferable utility to the analogous model with transferable utility. Because many of the arguments are analogous to those made in the text, we will abbreviate them here. We claim that there is more evidence suppression (and investigation), in equilibrium, when utility is transferable as compared to when it is not transferable.

Putting aside our concern voiced in the main text about the problem of obtaining pre-commitment to a mechanism, the Groves-Clarke mechanism will induce truthful reporting and will recommend that the evidence be suppressed whenever the <u>average</u> disutility of causing an innocent D to be convicted, $(\tau_1 + \tau_2)/2$, is less than $t_{22}(\hat{\rho}) \equiv \max\{0, S(1 - \eta) - \eta k\mu\hat{\rho}\}$. Note that this is the same threshold as in the model without transferable utility.

Next we consider J's payoff, assuming that J knows the prosecutorial team employs a Groves-Clarke mechanism. J conjectures that a prosecutorial team observing E will suppress it whenever the average disutility $(\tau_1 + \tau_2)/2$ is less than some threshold $\hat{t}$. Thus, when D provides E, but the prosecutorial team reported φ, J's posterior belief that the prosecutors are suppressing evidence is given by $\gamma F^{avg}(\hat{t})/[1 - \gamma + \gamma F^{avg}(\hat{t})]$, where $F^{avg}(\hat{t}) = \Pr\{(\tau_1 + \tau_2)/2 < \hat{t}\}$. J's expected payoff from investigation is now $V_2\mu\gamma F^{avg}(\hat{t})/[1 - \gamma + \gamma F^{avg}(\hat{t})] - c$. Thus J's best response is to investigate whenever $c \leq V_2\mu\gamma F^{avg}(\hat{t})/[1 - \gamma + \gamma F^{avg}(\hat{t})]$.

The following functions summarize the best-response behavior (the superscript "BR" denoting best response has been replaced with "TU" denoting transferable utility):

$$t^{TU}_{22}(\rho) \equiv S(1 - \eta) - \eta k\mu\rho; \tag{9'}$$
$$\rho^{TU}_{22}(t) \equiv H_2(V_2\mu\gamma F^{avg}(\hat{t})/[1 - \gamma + \gamma F^{avg}(\hat{t})]). \tag{10'}$$

Clearly, $t^{TU}_{22}(\rho) = t^{BR}_{22}(\rho)$; the threshold value of t in terms of ρ remains the same, but now it is the average disutility $(\tau_1 + \tau_2)/2$ that must meet that threshold in order to induce disclosure. However, $\rho^{TU}_{22}(t) = H_2(V_2\mu\gamma F^{avg}(t)/[1 - \gamma + \gamma F^{avg}(t)]) > \rho^{BR}_{22}(t) = H_2(V_2\mu\gamma(F(t))^2/[1 - \gamma + \gamma(F(t))^2])$. This follows because the function $H_2(V_2\mu\gamma X/[1 - \gamma + \gamma X])$ is increasing in X and $F^{avg}(t) > (F(t))^2$ for $t > 0$. To see why this last inequality holds, note that $(F(t))^2 = \Pr\{\text{both } \tau_1 \text{ and } \tau_2 < t\}$, whereas $F^{avg}(t) = \Pr\{(\tau_1 + \tau_2)/2 < t\}$. The set of values of (τ_1, τ_2) that satisfy $(\tau_1 + \tau_2)/2 < t$ strictly contains the set of (τ_1, τ_2)-values such that both τ_1 and τ_2 are simultaneously less than t.

There is a unique BNE, denoted (t_{22}^{TU*}, ρ_{22}^{TU*}), which is given by:

$$t_{22}^{TU*} = S(1 - \eta) - \eta k\mu\rho_{22}^{TU*}; \quad (11')$$
$$\rho_{22}^{TU*} = H_2(V_2\mu\gamma F^{avg}(t_{22}^{TU*})/[1 - \gamma + \gamma F^{avg}(t_{22}^{TU*})]). \quad (12')$$

Since $\rho_{22}^{TU}(t) > \rho_{22}^{BR}(t)$ for all $t > 0$, and $t_{22}^{TU}(\rho) = t_{22}^{BR}(\rho)$ for all ρ, the intersection of $\rho_{22}^{TU}(t)$ and $t_{22}^{TU}(\rho)$ must be to the northwest of the intersection of $\rho_{22}^{BR}(t)$ and $t_{22}^{BR}(\rho)$. That is, $\rho_{22}^{TU*} > \rho_{22}^{*}$ and $t_{22}^{TU*} < t_{22}^{*}$; under transferable utility the equilibrium likelihood of investigation will be higher and the threshold for evidence disclosure will be lower. The equilibrium probability of suppression is $F^{avg}(t_{22}^{TU*})$ under transferable utility and $(F(t_{22}^{*}))^2$ when utility is not transferable. Since $\rho_{22}^{TU*} > \rho_{22}^{*}$, it follows (by comparing equation 12 in the text with equation 12' above) that $F^{avg}(t_{22}^{TU*}) > (F(t_{22}^{*}))^2$. That is, there is more evidence suppression in equilibrium when utility is transferable as compared to when it is not transferable.

References

Baker, Scott, and Claudio Mezzetti. 2001. "Prosecutorial Resources, Plea Bargaining, and the Decision to Go to Trial," 17 *Journal of Law, Economics, and Organization* 149-167.

Bandoyopadhyay, S., and Bryan C. McCannon. 2014. "The Effect of the Election of Prosecutors on Criminal Trials," 161 *Public Choice* 141-156.

Bjerk, David. 2007. "Guilt Shall not Escape of Innocence Suffer: The Limits of Plea Bargaining When Defendant Guilt is Uncertain," 9 *American Law and Economics Revie*w 305-329.

Boylan, Richard T., and Cheryl X. Long. 2005. "Salaries, Plea Rates, and the Career Objectives of Federal Prosecutors," 48 *Journal of Law and Economics* 627-652.

Boylan, Richard T. 2005. "What do Prosecutors Maximize? Evidence from the Careers of U.S. Attorneys," 7 *American Law and Economics Review* 379-402.

Daughety, Andrew F. And Jennifer F. Reinganum. 2016. "Informal Sanctions on Prosecutors and Defendants and the Disposition of Criminal Cases," 32 *Journal of Law, Economics, and Organizations* 359-394.

Dranove, David, and Ginger Zhe Jin. 2010. "Quality Disclosure and Certification: Theory and Practice," 48 *Journal of Economic Literature* 935-963.

Dye, Ronald. Forthcoming. "Optimal Disclosure Decisions When There are Penalties for Nondisclosure," *RAND Journal of Economics*.

Garoupa, Nuno, and Matteo Rizzolli. 2011. "The Brady Rule May Hurt the Innocent," 13 *American Law and Economics Review* 168-200.

Gershman, Bennett L. 2015. *Prosecutorial Misconduct*, 2nd Ed. Thompson Reuters.

Glaeser, Edward L., Daniel P. Kessler, and Anne M. Piehl. 2000. "What do Prosecutors Maximize?

An Analysis of the Federalization of Drug Crimes," 2 *American Law and Economics Review* 259-290.

Grossman, Gene M., and Michael L. Katz. 1983. "Plea Bargaining and Social Welfare," 73 *The American Economic Review* 749-757.

Grossman, Sanford. 1981. "The Informational Role of Warranties and Private Disclosure about Product Quality," 24 *Journal of Law and Economics* 461-483.

Kennan, David, Deborah Jane Cooper, David Lebowitz, and Tamar Lerer. "The Myth of Prosecutorial Accountability after *Connick v. Thompson*: Why Existing Professional Responsibility Measures Cannot Protect Against Prosecutorial Misconduct," 121 *The Yale Law Journal Online*, 25 October 2011.

Kozinski, Alex. "Criminal Law 2.0," Preface to the Annual Review of Criminal Procedure, 44 Georgetown Law Journal, 2015 iii-xliv.

Landes, William M. 1971. "An Economic Analysis of the Courts," 14 *Journal of Law and Economics* 61-108.

Loftus, Peter, "Merck to Pay $830 Million to Settle Vioxx Shareholder Suit," Wall Street Journal online edition, Jan. 15, 2016.

http://www.wsj.com/articles/merck-to-pay-830-million-to-settle-vioxx-shareholder-suit-1452866882 accessed September 5, 2016.

Mas-Collel, Andreu, Michael D. Whinston, and Jerry R. Green. 1995. *Microeconomic Theory*. New York, NY: Oxford University Press.

Matthews, Steven and Andrew Postlewaite. 1985. "Quality Testing and Disclosure," 16 *RAND Journal of Economics* 328-340.

McCannon, Bryan C. 2013. "Prosecutor Elections, Mistakes, and Appeals," 10 *Journal of Empirical Legal Studies* 696-714.

Milgrom, Paul. 1981. "Good News and Bad News: Representation Theorems and Applications," 12 *Bell Journal of Economics* 380-391.

Reinganum, Jennifer F. 1988. "Plea Bargaining and Prosecutorial Discretion," 78 *American Economic Review* 713-728.

Shavell, Steven. 1994. "Acquisition and Disclosure of Information Prior to Sale," 25 *RAND Journal of Economics* 20-36.

Smith, Geoffrey, and Roger Parloff, "Hoaxwagen," Fortune Magazine online, http://fortune.com/inside-volkswagen-emissions-scandal/ accessed September 5, 2016 (print version appears in the March 15, 2016 issue of Fortune).

Brady v. Maryland, 373 U.S. 83 (1963).

United States v. Olsen, 737 F.3d 625, 626 (9th Cir. 2013).

Connick v. Thompson, 563 U.S. 51 (2011).

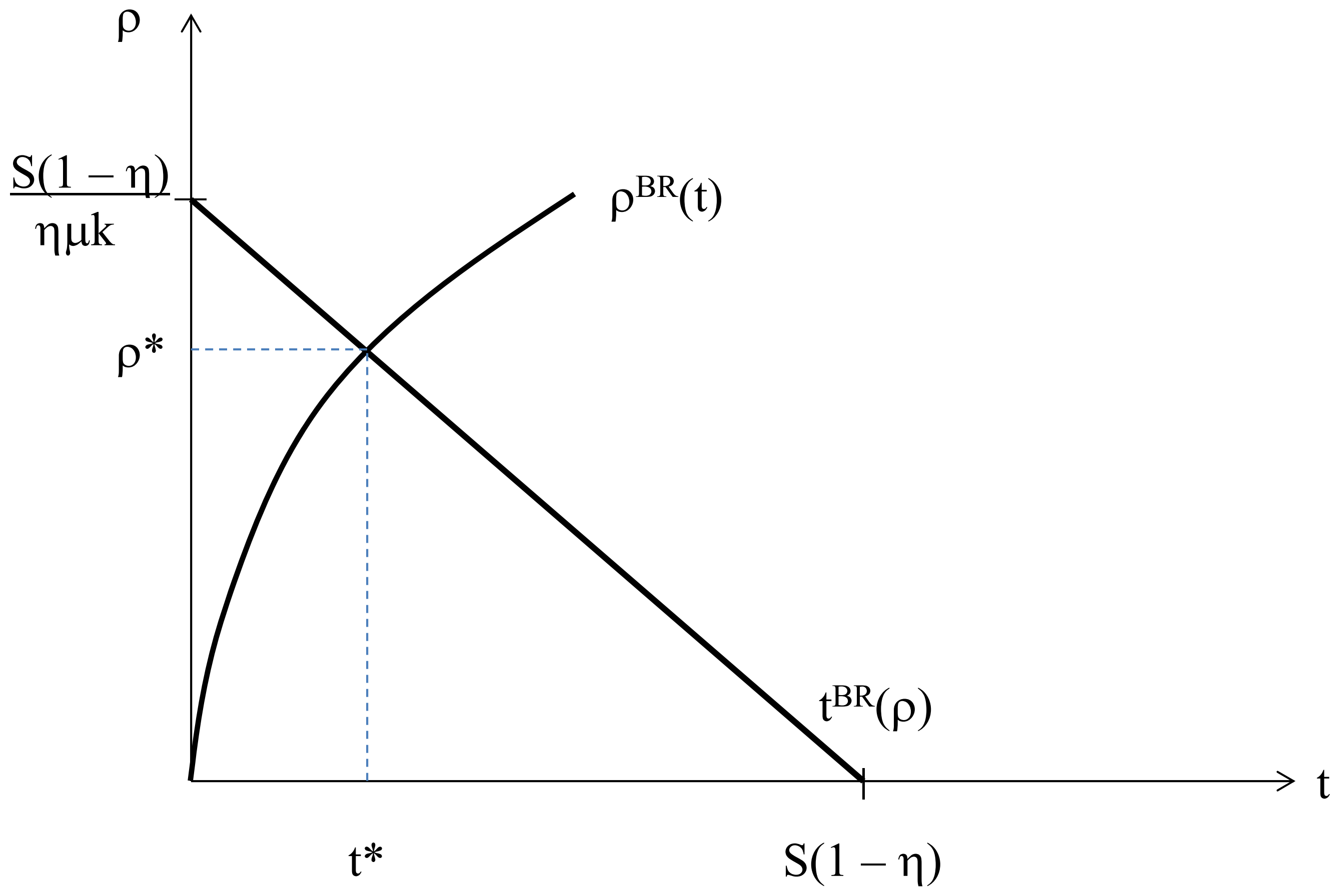

Figure 1: Equilibrium in the One-Prosecutor Model

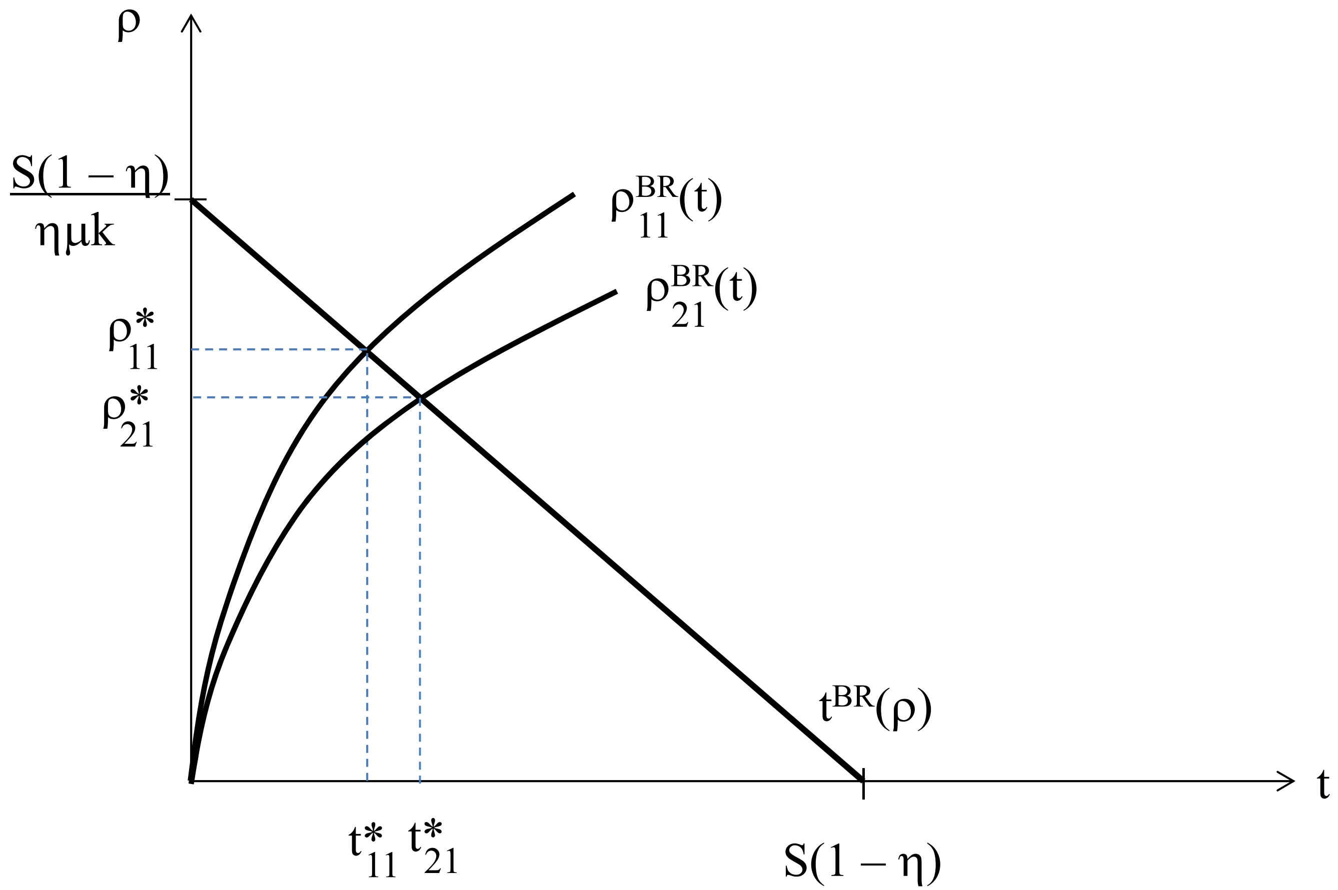

Figure 2: Equilibrium in the 11 and 21 Configurations

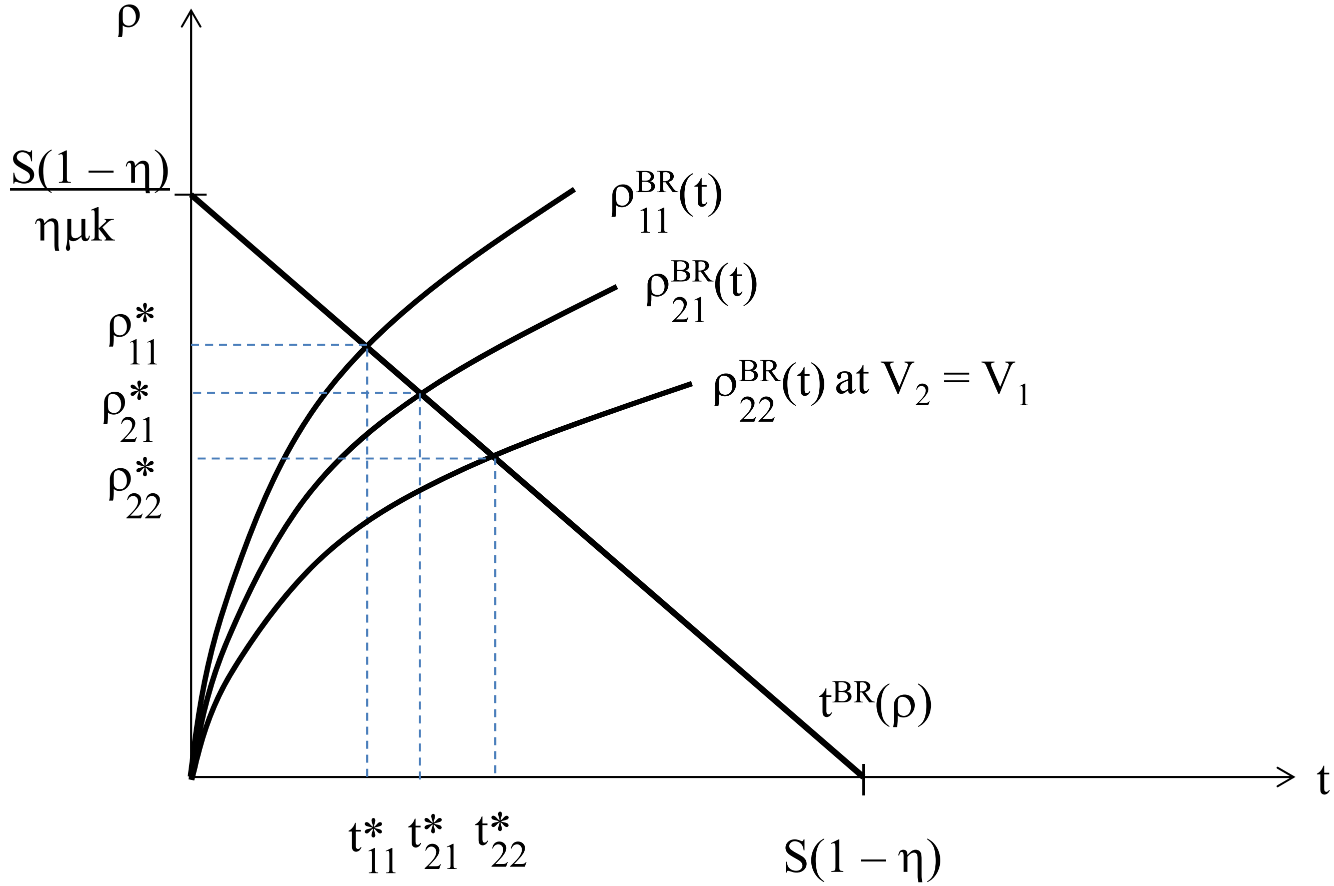

Figure 3: Equilibrium in the 11, 21, and 22 Configurations

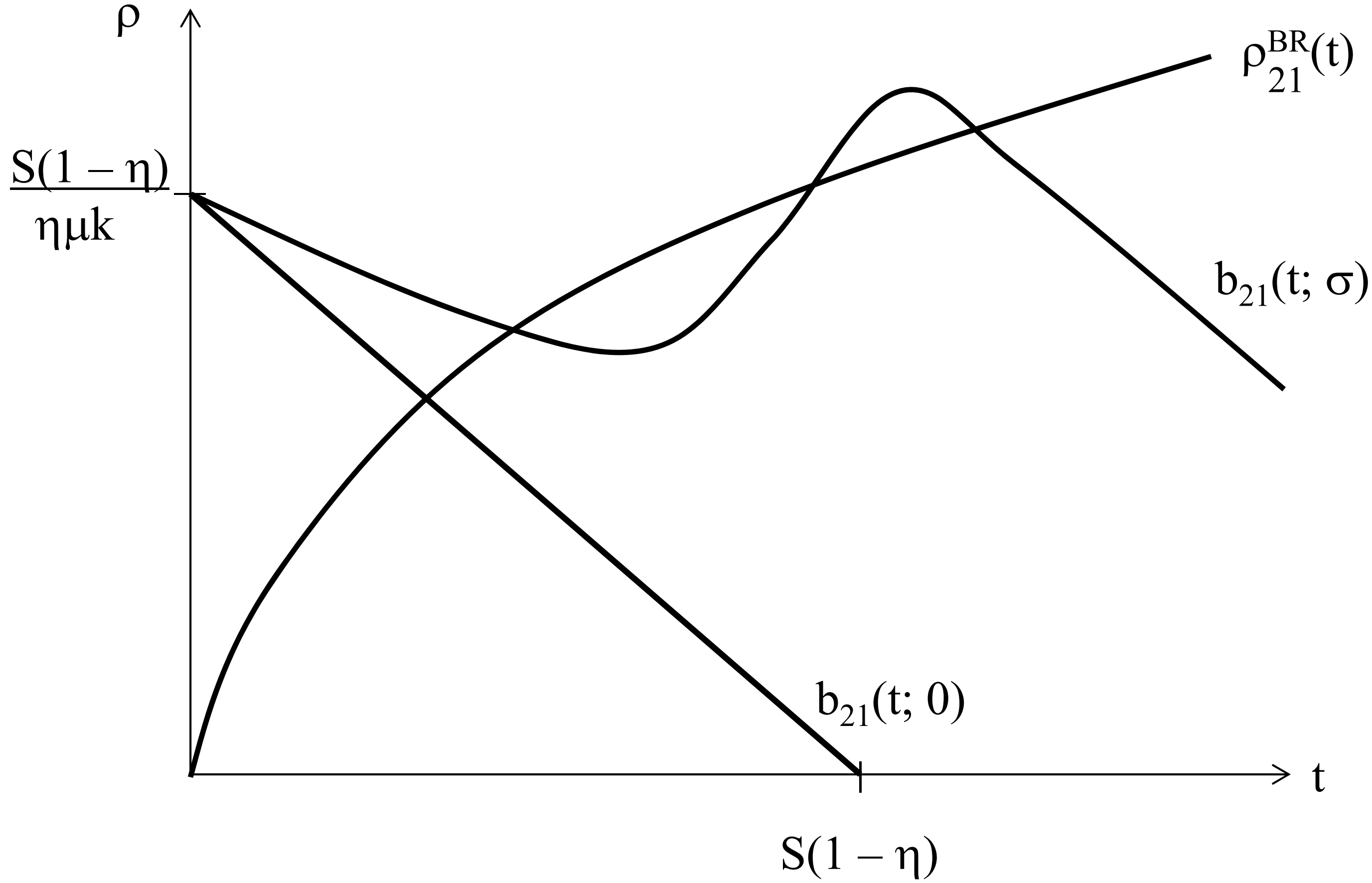

Figure 4: Equilibrium in the 21 Configuration with Informal Sanctions