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Targeting Employees for Corporate Crime and Preventing Their Indemnification

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**“Targeting Employees for Corporate Crime and
Preventing Their Indemnification”**

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Targeting Employees for Corporate Crime and Preventing Their Indemnification

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Abstract: The literature on corporate crime has focused on crimes committed by employees who are not necessarily acting in the interest of the firm. In this setting it is clear employees should be sanctioned; the question is whether the firm should be as well. The recent wave of corporate scandals has a different character: in many of these cases, the crime serves firm owners' direct interest; employees commit crimes only in response to incentives provided by the firm. In this latter setting it is clear the firm should be sanctioned; the question is whether employees should be as well. We show sanctioning employees solves a number of enforcement problems—increasing deterrence in the presence of a judgment-proof firm; reducing the chance that type-I enforcement errors lead to the bankruptcy of honest firms by provide the same level of deterrence with lower overall fines. We show that preventing indemnification is usually inefficient. The one case we find it to be useful is to encourage the employee's cooperation with prosecutors to increase the probability of successful prosecution of the firm.

Keywords: corporate crime, indemnification, principal-agent model

JEL Classification: K22, D82, L20

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1 Introduction

Much of the literature on corporate crime that studies the problem using a principal-agent framework (e.g., Macey 1991, Newman and Wright 1991, Arlen 1994, Chu and Qian 1995, Davis 1996, Arlen and Kraakman 1997, Shavell 1997, Arlen 1998, Garoupa 2000, Gans 2000) postulates that the agent (manager or employee) who commits a corporate crime acts in his own interest and against the interest of the principal (firm owners). In such a model, it is natural that the agent should be sanctioned in the socially-optimal legal regime; the interesting question is whether the principal should be as well. Drawing on the broader literature on vicarious liability (e.g., Sykes 1984, Shavell 1987, Hay and Spier 2004), the articles show that sanctioning the firm increases deterrence if limits to the agent's wealth prevent his paying sanctions sufficient to deter the crime; targeting the firm is particularly effective if it can monitor the agent's actions better than can government authorities.

We do not deny that many corporate crimes involve the agent's profiting at the expense of the firm. The much-publicized case of former Tyco CEO Dennis Kozlowski, who was charged with stealing over \$170 million to fund lavish personal consumption, is but one extreme example.¹ Indeed, Alexander and Cohen's (1996, 1999) empirical findings that large firms (presumably with worse shareholder monitoring of management) and firms in which management has a smaller equity stake are more likely to have been convicted of corporate crimes has been taken as evidence that, on average, corporate crime is not committed in the interest of the firm. However, we suggest that there are still a broad range of cases, including a number of widely-publicized recent cases, in which the alleged employee conduct benefitted the firm (at least before the conduct was detected and government sanctions levied). For example, federal indictments were returned in April 2004 against Reliant Energy Services, Inc., and four former and current executives for

¹See Mark Maremont and Jerry Markon, "Leading the News: Former Tyco Executives Are Charged—New York Prosecutors Say Ex-CEO, Finance Officer Ran 'Criminal Enterprise' " *Wall Street Journal* September 13, 2002, p. A3.

creating the “false appearance of a shortage” by shutting down generation plants, resulting in higher wholesale electricity prices in California and millions of dollars of extra profit for the firm.² Firms’ widespread adoption of indemnification policies, whereby the firm promises to reimburse employees for legal expenses and fines arising from their work on behalf of the firm, presents something of a puzzle if agents’ potentially criminal actions are opposed to the interests of the firm.

In this paper, we employ a principal-agent model to study the case in which the employee obtains no direct benefit from a corporate crime but may be induced to commit it by the structure of the compensation scheme he receives from the firm. In such a model, it is natural that the firm should be sanctioned in the socially-optimal legal regime; the interesting question is whether the employee should be as well. This is the opposite question from that posed by much of the literature on corporate crime cited above. Intertwined with the question of employee liability is the question of employee indemnification. If the firm can indemnify the employee for criminal sanctions, the firm may be able to turn a *de jure* employee-liability regime into a *de facto* firm-liability regime. Are there conditions under which the firm does not fully unravel employee-targeted sanctions, so that there are strict social benefits to introducing employee-targeted sanctions? In order for employee-targeted sanctions to have strict social benefits, is it necessary for the government authority to prevent indemnification? For that matter, should the government authority allow indemnification at all if indemnification only serves to promote corporate crime?

We propose a model in which an employee and firm owners operate in a principal-agent relationship under a legal regime set by the government authority. The legal regime may impose fines on the firm, on the employee, or on the firm and manager jointly. The crucial element in our model is that the government authority is not a perfect enforcer: it makes type-I enforcement errors—i.e., convicting honest firms of corporate crime with some probability—as well as the usual type-II enforcement errors—i.e., not catching criminal firms with some probability. The

²“U.S. Says Reliant Unit, Officials Gamed Calif. Market,” *Megawatt Daily*, April 12, 2004, p. 1–8.

existence of type-I enforcement errors provides a rationale for firms, even honest firms, to maintain a policy of indemnifying employees. It is a way to shift the risk of sanctions from the high-cost bearer—the risk-averse agent—to the low-cost bearer—the risk-neutral principal. Moreover, it provides a rationale for the government authority to allow such indemnification.

The previous paragraph highlights a potential cost of targeting the employee arising if indemnification is incomplete (either because of limited firm assets or legal prohibition). Offsetting this potential cost of targeting the employee are several social benefits. First, if the firm has limited assets (is judgment-proof in the parlance of the literature), it may not be able to pay a sufficiently high fine to deter the crime. Stronger deterrence can be obtained by targeting the employee with additional fines. A more subtle effect, second, is that employee sanctions indirectly place a heavier burden on criminal than on honest firms. To induce the employee to commit the crime (assumed to be costly to him), the firm has to provide a higher wage contingent on firm performance. This higher wage provides more resources that can be seized if employee fines are set so high that they bankrupt the employee. Therefore, the actual fine paid by an employee of a criminal firm may be higher than that paid by the employee of an honest firm even though the nominal level of the fine is the same. Our model thus provides several rationales for employee-targeted sanctions.

Interestingly, neither the first nor the second effect from the preceding paragraph requires the government authority to forbid indemnification. Considering the first effect, if the firm is up against its liability constraint, it would not have the resources to indemnify the agent even if it wanted to. Considering the second effect, the nominal employee fine can be set sufficiently high so that the firm would choose not to indemnify the agent, letting the employee's limited-liability/bankruptcy constraint serve as a ceiling on the actual fine that has to be paid to the government authority. We are then still left with the puzzle of why the government authority would ever find it socially-efficient to forbid indemnification. It has been postulated in the literature (Stone 1980, Kraakman 1984, Privileggi, Marchese, and Cassone 2001) that preventing

indemnification magnifies the frictions in the principal-agent relationship, increasing the operating costs of a criminal firm. While our formal analysis shows this postulate is true, our analysis further shows that this does not provide a rationale for forbidding indemnification. In our model, the government authority's problem is not deterring crime: it can always do so with a sufficiently high combination of fines on the firm and employee. The problem is deterring crime *efficiently*, preventing crime without also inducing the exit of an honest firm, a danger because honest firms are subject to fines because of type-I enforcement errors. We show that the ratio of the marginal burden of an employee fine on honest firms relative to criminal firms is higher if indemnification is forbidden than if it is allowed.

The rationale for forbidding indemnification that does survive formal scrutiny is that forbidding indemnification can help secure the cooperation of the employee in prosecuting the firm. Authorities can offer to reduce the employee's fine in return for his cooperation, an offer that would be beneficial for the employee only if he were not fully indemnified by the firm. Assuming the employee cannot fabricate evidence, his cooperation could increase the probability of convicting criminal firms, while leaving the probability of convicting honest firms unaffected. A subtle issue that is addressed in the formal analysis is that by reducing the employee's fine in return for cooperation, the criminal firm's cost of inducing the employee to commit the crime is reduced, an effect which must be offset by the increased probability of convicting the criminal firm.

Our reconsideration of the law and economics of corporate crime is timely. The recent wave of corporate scandals has returned the issue to the forefront of public attention. Even before the recent wave of corporate scandals, there had been a dramatic expansion in the prosecution of corporations for criminal or regulatory violations. The sanctions imposed for violations had increased as well (Cohen 1991). A number of these offenses carry a dual structure of liability, in which both the corporation (i.e. the shareholders) and the manager are liable for fines or imprisonment. For example, a corporation convicted of price fixing faces corporate fines of up

to \$1 million per count, and more importantly, treble damages.³ The individual managers face fines up to \$100,000 and up to three years in prison. Other examples abound. “The areas of taxation, securities issuance and financing, antitrust, purchasing and sales, environmental safety, worker safety, government contracts, campaign contributions, and international transactions are rife with issues that create potential criminal exposure for a corporation as well as for those who run it” (Webb, Molo, and Hurst 1994, p. 618).

The question of whether indemnification should be prevented is of substantial public policy interest. State incorporation laws differ as to what costs the firm may indemnify, but most allow firms to reimburse agents’ legal costs and losses from settlements, judgments, and fines. Significantly, Delaware law grants incorporating firms a broad ability to insure their agents, either through direct indemnification payments from the firm itself or through third-party Director and Officer (D&O) insurance (Easterbrook and Fischel 1991). Companies may include mandatory indemnification in their corporate charters or bylaws.⁴ According to a recent survey, 98 percent of U.S. firms with over 500 shareholders had D&O insurance (Tillinghast-Towers Perrin 2002).

As broad as indemnification and D&O insurance coverage is, there are exceptions to the coverage that deserve comment. In particular, state laws forbid indemnification and D&O insurance coverage in the case of willful criminal misconduct (Harrington and Niehaus 1998). Stone (1980) argues that such *de jure* exclusions do not prevent *de facto* coverage for willful criminal misconduct. First, a number of federal crimes require only limited or no proof of intent or knowledge. State laws specify that conviction for such crimes “shall not, of itself, create a presumption that the person did not act in good faith” (Stone 1980, p. 49). Second, indemnification payments do not need to be reported to government authorities. The case may be handled by a legal counsel who himself is an agent of the firm. It is in the spirit of our model, which has type-I and type-II errors regarding whether a criminal act has been committed, to suppose that there are type-I and

³This paper will often use the term “corporate crime” quite broadly and hence loosely. In particular, here we ignore the distinction between criminal and civil liability.

⁴See for example, Dow Chemical Company, a Delaware Corporation. www.dow.com/corpgov/bylaws/indem.htm.

type-II errors regarding the employee's knowledge and intent when committing the act. Indeed, it would not be unreasonable to suppose that these latter errors would be larger in magnitude than the former. One can view the question of what standard is required to prove the willfulness of criminal conduct and thereby to prevent indemnification as a subtle variant of the question we analyze, whether indemnification should be prevented. For promises to indemnify or to make D&O insurance payments to have any credibility, the standard of proof for willfulness would need to be sufficiently high.⁵

The debate over indemnification has been particularly active recently. Securities and Exchange Commission (SEC) Chairman William Donaldson reviewed recent enforcement actions against corporate fraud and malfeasance.

Of course, the fight against corporate fraud requires resolve in the boardroom and at all levels of government. I'm concerned about companies that, under permissive state laws, indemnify their officers and directors against disgorgement and penalties ordered by law enforcement agencies, including those brought by the Commission. In my mind, this just isn't good public policy. This is an area in which we may need to consider ways to bring about reform.⁶

Several recent settlements with the SEC contain the requirement that the defendant not seek indemnification or insurance payments to cover the fines. Since most settlement agreements do not involve admission of wrongdoing, insurance coverage would be available, absent the provision in the settlement. SEC Commissioner Harvey Goldschmid indicated that

It's critical when we take money for a civil penalty, which involves a serious wrong, the money not circle back into the hands of those who have been involved in the wrongdoing. ... This is a critically important policy change to create appropriate deterrence and accountability.⁷

⁵Black, Cheffins, and Klausner (2003) address liability facing outside directors acting in good faith. Outside directors are much less likely to be involved in self-dealing. Black, Cheffins, and Klausner (2003) note that although nominal liability exists for such outside directors, in practice indemnification and D&O insurance makes actual liability quite small.

⁶Chairman William H. Donaldson, "Remarks Before the New York Financial Writers Association," June 5, 2003, www.sec.gov/news/speech/spch060503whd.htm

⁷Robert Schmidt, "SEC wants Settlements in which Defendants Pay Own Fines," *Chicago Sun Times*, June 17, 2003, p. 49.

On the issue of corporate disclosure, then Treasury Secretary Paul O'Neill suggested requiring CEOs to certify their company financial statements and barring D&O insurance for claims arising out of inadequate disclosure, in "all cases, whether there is a wrongdoing or whether there is a wrongful statement."⁸

The plan of this paper is as follows. Section 2 reviews the literature. Section 3 presents the formal model. In Sections 4 and 5 we consider, in turn, two benefits of targeting employees for corporate-crime sanctions. First, we show that adding employee sanctions can increase the strength of deterrence if the presence of a judgment-proof firm. Second, we show that adding employee sanctions can maintain the same level of deterrence with a lower chance enforcement errors would lead to the shutdown of honest firms. The issues surrounding indemnification are considered in Section 6. Section 7 concludes.

2 Literature Review

There is a large literature examining corporate crime or corporate torts in a principal-agent framework. As noted in the Introduction, much of the literature is concerned with the question of when the firm should be made liable in addition to the employee, who should obviously be liable, a question related to the issue of vicarious liability. In our model, the crime benefits the firm, and the employee only commits the crime if the firm gives him the requisite incentives. We are interested in the unique conditions under which the employee should be liable in addition to the firm, which should obviously be liable. Our paper is thus closer to the formal analyses of employee liability by Kornhauser (1982), Segerson and Tietenberg (1992), Polinsky and Shavell (1993), and Privileggi, Marchese, Cassone (2001).

Kornhauser (1982), Segerson and Tietenberg (1992), and Polinsky and Shavell (1993) consider the case of a corporate tort. The employee and perhaps the firm invest in care to prevent an

⁸Bob Davis, "O'Neill Wants Stiffer Penalties for CEOs," *Wall Street Journal*, February 4, 2002, p. A2.

accident. The authors find that the government authority should target the employee for sanctions when the government is better at monitoring care and/or when the government is better at levying sanctions because of its ultimate threat of imprisonment. Our model is quite different. We consider a possibly willful corporate crime which the firm induces the employee to commit through the design of the incentive scheme. In cases in which the government's targeting the employee produces a strict social benefit in these previous papers, the firm obtains no benefit from indemnifying the employee. Indeed, Polinsky and Shavell (1993) demonstrate cases in which the firm prefers higher government sanctions for employees. By implication, there is no need for the government to forbid indemnification. In our setting, the firm would benefit from indemnifying the employee for a broad range of employee fines because indemnification reduces the cost of inducing the employee to commit the crime. Whether the government authority should prevent indemnification then is a non-trivial policy question that can be analyzed in our setting.

Privileggi, Marchese, and Cassone (2001) have a model which, similar to ours, has the firm earn a strict benefit from the employee's crime. Their analysis is fairly informal. In their model, the level of the fine is exogenous (and can only be levied on one party or the other, so joint firm-employee liability is not allowed). The assumption of exogenous sanctions is required for their results to be non-trivial; otherwise, because they do not have limited liability in their model, crime could be perfectly deterred with sufficiently high sanctions. Indemnification is exogenously ruled out in their model, whereas it is one of the main focuses of our analysis.

A number of the ideas we develop formally in this paper were first noted in law review articles by Stone (1980) and Kraakman (1984). The authors note that firm limited liability provides a rationale for the government's targeting the employee with sanctions. The authors note that type-I errors can lead to undue risks on employees of honest firms if employees are targeted for sanctions and their indemnification forbidden. The authors note that preventing indemnification can help secure the cooperation of employees in prosecuting the firm. These papers do not have models; our contribution is to provide a formal economic model and analysis. With our formal analysis,

we provide additional reasons why targeting the employee can provide social benefits beyond the judgment-proofness of the firm: we show that it can increase the efficiency of deterrence by increasing the burden of sanctions on criminal firms relative to honest firms, thereby reducing the likelihood honest firms are forced to shut down in the face of high sanctions. We show that a suggested benefit of preventing indemnification does not survive formal scrutiny: while preventing indemnification increases the burden of a given employee sanction on a criminal firm, it increases the burden on an honest firm even more so. As a result, preventing indemnification is generally socially inefficient. This same line of reasoning allows us to clarify why increased fines are not a perfect substitute for securing the cooperation of employees in prosecuting the firm and thus why preventing indemnification can be of social value in this narrow context.

The important role of limited liability in our analysis connects our paper to the large literature on the problem of the judgment-proof firm, including, for example, Shavell (1986, 1987, 2000, 2004), Beard (1990), Pitchford (1995), Heyes (1996), Jost (1996), Boyd and Ingberman (1997), Boyer and Laffont (1997), Polborn (1998), and Hiriart and Martimort (2004). Even more broadly, the three-tiered structure, with the government authority operating above the principal-agent relationship between the firm and employee, connects our paper to the literature on hierarchies, beginning with Tirole (1986). Our consideration of the complex interplay between simultaneous limits to firm and employee liability is a contribution to these literatures.

Our result that preventing indemnification helps secure the cooperation of the employee to increase the chances of successful prosecution of the firm is reminiscent of the work of Arlen (1994), Chu and Qian (1995), and Arlen and Kraakman (1997). They show that partially forgiving firm sanctions can increase the firm's incentive to monitor the employee when such monitoring can increase the likelihood of uncovering criminal acts by employees. In both our work and theirs, the analysis is somewhat delicate because it is not obvious the "cooperating" party would want to trade off a lower sanction for an increased chance of prosecution.⁹

⁹Related issues arise in the literature on plea bargaining (e.g., Reinganum 1988 and Kobayashi 1990), on self-

In our work, the identity of the “cooperating” party is the opposite of theirs, the employee rather than the firm. The costs and benefits of securing cooperation are different in our model. Most importantly, our insight that forbidding indemnification plays a key role in allowing the government to trade reduced sanctions for cooperation did not appear in these previous papers.

It is worth emphasizing that our model differs from the articles cited in this section in its focus on type-I and type-II enforcement errors, which among other things allows for the possibility of a social benefit of indemnification. Our model allows the government to choose both the level of fines and the allocation between firm and employee arbitrarily. Our model is also novel in the generality of its specification of firm and employee limited liability. Both can have limited liability simultaneously, and the limits to liability can be any real value. Since in the real world limited liability corporations are staffed by limited liability employees, our modelling approach helps characterize this empirically relevant environment. To our knowledge, ours is the first formal analysis of the question of whether indemnification should be prohibited.

3 Model

The model has three players. Within the firm, there is a principal and an agent. The principal is the residual claimant of profit who designs the agent’s incentive scheme. The agent carries out activities within the firm, including the possibility of committing a criminal act. There are several interpretations of the principal-agent labels in our model. In one interpretation, the firm’s shareholders occupy the role of the principal and the firm’s management the role of the agent. In another interpretation, one in which shareholders play only a passive role, the role of the principal is taken over by the management and a rank-and-file worker occupies the role of the agent. To cover all these cases, we will call the principal simply the “firm” and the agent simply

reporting (e.g., Malik 1993, Kaplow and Shavell 1994, Innes 1999), and on the use of leniency programs in the prosecution of cartels (e.g., Spagnolo 2000a, 2000b, Aubert, Rey, and Kovacic 2003, Ellis and Wilson 2003, and Motta and Polo 2003). Our formal model best captures crimes undertaken within a single firm, so the wrongdoer has no ability to implicate co-conspirators in other firms.

the “employee”. The third player in the model is a government authority, the court, which sets and enforces sanctions against corporate crime.

The employee chooses action $a \in \{0, 1\}$, an indicator for whether a crime is committed ($a = 1$) or not ($a = 0$). Let $c \geq 0$ be his cost of committing the crime, including any physical effort required plus any psychic costs of violating a personal ethical code. The firm earns gross return $r \geq 0$ if no crime is committed and $r + b$ if a crime is committed, so that $b \geq 0$ is the firm’s gross benefit from the crime. The crime generates external social harm h . Assume $h \geq b - c$, implying that the first-best policy is to deter crime. We will often (though not always) take h to be so large that the court wishes to prevent crime at all costs (even at the cost of causing the firm to exit entirely).

The employee’s wage w can be conditioned on the firm’s return. Let \underline{w} be the wage payment conditional on return r and \bar{w} that conditional on return $r + b$. Note that, since the wage can be conditioned on the firm’s return, and since there is no uncertainty regarding the firm’s return, the wage can effectively be conditioned on the criminal act a . Of course the model could be enriched to allow the firm’s return to be a random variable the distribution of which is improved (in the sense of first-order stochastic dominance) by the criminal act, but the present assumption of a deterministic return serves to simplify the analysis without much loss of insight.

The court makes type-I and type-II errors in enforcing corporate-crime laws. Let $\sigma_I \in (0, 1)$ be the probability the court makes a type-I enforcement error, i.e., it convicts when no corporate crime was committed. Let $\sigma_{II} \in (0, 1)$ be the probability the court makes a type-II enforcement error, i.e., it fails to convict when a corporate crime was committed. Table 1 lays out these enforcement probabilities along with their complements. Assume $\sigma_I + \sigma_{II} < 1$, implying both that the probability of not convicting is greater if a crime was not committed ($1 - \sigma_I > \sigma_{II}$) and that the probability of convicting is greater if a crime was committed ($\sigma_I < 1 - \sigma_{II}$). Errors σ_I and σ_{II} are exogenously given. Conditional on conviction, the court levies sanction (fine) $s_f \geq 0$ against the firm and $s_e \geq 0$ against the employee. These sanctions are an endogenous choice for the

Table 1: Enforcement Probabilities

	Crime Not Committed	Crime Committed
Court Does Not Convict	$1 - \sigma_I$	σ_{II}
Court Convicts	σ_I	$1 - \sigma_{II}$

court. The employment contract may specify that the firm indemnifies the employee for losses due to the sanction. Let s_i be this indemnification payment, i.e., a payment from the firm to the employee conditional on conviction. In general, employment contracts could specify reverse payments from the employee to the firm ($s_i < 0$) or specify indemnification in excess of the sanction ($s_i > s_e$). In our setting, there is no loss of generality in constraining $s_i \in [0, s_e]$.

As is usual in the corporate-crime literature, we will assume the court cannot use the wage scheme to infer whether a crime was committed in equilibrium. This may be because the wage scheme is part of an implicit contract unobservable to the court, or else because the contract and contracting environment are too complicated for the court to make such inferences. In our analysis of the optimality of prohibiting indemnification, we will sometimes allow the court to observe whether the employment contract specifies indemnification and to constrain $s_i = 0$.

The firm is risk neutral. The employee is risk averse. Let $u : \mathbb{R}^+ \rightarrow \mathbb{R}^+$ be the employee's utility over monetary payments, with $u(0) = 0$, $u' > 0$, and $u'' < 0$. Assume the employee's overall utility is additively separable in u and c , the cost of crime if one is committed.

Crucial for our analysis is a careful modeling of parties' limited liability. Assume the whole gross benefit from corporate crime b can be liquidated and used to pay obligations due the court

(s_f) and employee (w and s_i). Additionally, the firm has ℓ_f liquifiable assets available to pay obligations. These liquifiable assets may come in part from the gross return from operating in the current period r and in part from retained earnings from past (unmodeled) operations. Depending on the relationship between ℓ_f and r , a number of cases can be accommodated: $\ell_f = r$ implies the whole of r can be liquidated to pay obligations but that there are no other liquifiable assets; $\ell_f > r$ implies there are assets in addition to r that can be liquidated; $\ell_f < r$ implies the firm can “consume” some of r (say paid out as dividends if the “firm” represents shareholders or paid out as high salaries and perks if the “firm” represents management) before paying its obligations and thus protect some of its return from seizure. In cases in which the firm does not have sufficient resources to pay its obligations, the firm is bankrupt and the following priority of claims established: the sanction s_f has priority, then the wage w , then the indemnification payment s_i .

The employee’s whole wage w and indemnification s_i can be liquidated to pay its sanction s_e . The employee also has additional liquifiable assets $\ell_e \geq 0$. The employee’s best option outside the firm pays a wage normalized to zero. If he takes this outside option, he consumes his liquifiable assets ℓ_e , implying that his reservation utility is $u(\ell_e)$. An alternative interpretation is that the employee has no monetary assets besides payments from the firm, but he can still have his utility reduced below the reservation level $u(\ell_e)$ by non-monetary punishments such as prison. Given utility is bounded below by $u(0) = 0$, the gap between $u(\ell_e)$ and 0 indicates the severity of the non-monetary punishments, perhaps constrained by laws against cruel and unusual punishment or other social conventions.

The timing of the model is as follows. First the court sets the sanctions s_f and s_e . These are observed by the firm. The firm then sets the employment contract $(\underline{w}, \bar{w}, s_i)$. The employee decides to accept the contract or pursue his outside option. Conditional on signing the contract, the employee then chooses whether or not to commit the crime, a . The state of the world determining whether the court convicts is realized, returns are realized, sanctions assessed, and

wage and indemnification payments made.

4 Detering Crimes of Judgment-Proof Firms

4.1 Firm's Optimal Contracting Problem

Given sanctions s_f and s_e , following Grossman and Hart (1983), we will separate the firm's optimal-contracting problem into two stages. In the first stage, we will solve for the optimal incentive-compatible and individually-rational contract $(\underline{w}, \bar{w}, s_i)$ implementing $a = 0$ (no crime) and that implementing $a = 1$ (crime). In the second stage, we will compare these contracts and select the one yielding higher profit.

If the firm wishes to induce the employee not to commit a crime, its expected profit is

$$r - \sigma_1 \min(s_f + s_i + \underline{w}, \ell_f) - (1 - \sigma_1) \min(\underline{w}, \ell_f). \quad (1)$$

The firm's gross return is r if no crime is committed. If the court makes a type-I enforcement error, the firm pays out $s_f + s_i + \underline{w}$, unless this exceeds its liquifiable assets ℓ_f , in which case it is liable only for ℓ_f . If the court does not make a type-I error, the firm just pays the wage \underline{w} , again subject to the limit that this payment not exceed the firm's liquifiable assets ℓ_f .

The employee's expected surplus is

$$\begin{aligned} & \sigma_1 u \left(\max \left(0, \ell_e - s_e + \min(s_i + \underline{w}, \max(0, \ell_f - s_f)) \right) \right) \\ & + (1 - \sigma_1) u(\min(\underline{w}, \ell_f) + \ell_e). \end{aligned} \quad (2)$$

If the court makes a type-I enforcement error, the employee receives a payment of $\underline{w} + s_i$ from the firm if it is not liquidity-constrained and $\max(0, \ell_f - s_f)$ if it is. The employee puts this payment together with its other liquifiable assets ℓ_e and pays s_e if it has sufficient funds. Otherwise it

pays as much as it can and ends up with no income. If the court does not make a type-I error, the employee receives a payment of $\min(\underline{w}, \ell_f)$ from the firm, which he consumes along with his liquifiable assets ℓ_e . For the contract to be individually-rational, the employee's surplus in (2) must exceed his reservation utility $u(\ell_e)$. In sum, the firm's optimal contract inducing the employee not to commit a crime is the triple $(\underline{w}^*, \bar{w}^*, s_i^*)$, where (\underline{w}^*, s_i^*) maximizes (1) subject to the constraint that (2) exceeds $u(\ell_e)$, and where $\bar{w}^* = 0$. Setting $\bar{w}^* = 0$ turns out to be sufficient to ensure incentive-compatibility, i.e., to ensure the employee prefers not to commit the crime.

If the firm wishes to induce the employee to commit a crime, its expected profit is

$$r - (1 - \sigma_{II}) \min(s_f + s_i + \bar{w} - b, \ell_f) - \sigma_{II} \min(\bar{w} - b, \ell_f). \quad (3)$$

This expression is similar to (1) except the probabilities of court enforcement are different, the wage may be different, and the return b has been added to states in which the firm is not liquidity-constrained (when the firm is liquidity constrained, since b is liquifiable by assumption, all of b can be used to pay the firm's obligations).

The employee's expected surplus is

$$\begin{aligned} & (1 - \sigma_{II}) u \left(\max \left(0, \ell_e - s_e + \min(s_i + \bar{w}, \max(0, \ell_f + b - s_f)) \right) \right) \\ & + \sigma_{II} u(\min(\bar{w}, \ell_f + b) + \ell_e) - c. \end{aligned} \quad (4)$$

This expression is similar to (2). The only differences, besides the different wage \bar{w} and the different probabilities of court enforcement, are the addition of b to the liquifiable assets the firm can use to pay the employee and the subtraction of c , the employee's cost of committing the crime. For the contract to be individually-rational, the employee's surplus in (4) must exceed his reservation utility $u(\ell_e)$. In sum, the firm's optimal contract inducing the employee to commit a crime is the triple $(\underline{w}^{**}, \bar{w}^{**}, s_i^{**})$, where (\bar{w}^{**}, s_i^{**}) maximizes (3) subject to the constraint that

(4) exceeds $u(\ell_e)$, and where $\underline{w}^{**} = 0$. Setting $\underline{w}^{**} = 0$ turns out to be sufficient to ensure incentive-compatibility, i.e., to ensure the employee prefers to commit the crime.

Upon substituting the terms from the optimal contracts into (1) and (3), we see that the firm optimally induces the employee not to commit the crime if

$$r - \sigma_I \min(s_f + s_i^* + \underline{w}^*, \ell_f) - (1 - \sigma_I) \min(\underline{w}^*, \ell_f) \quad (5)$$

exceeds

$$r - (1 - \sigma_{II}) \min(s_f + s_i^{**} + \bar{w}^{**} - b, \ell_f) - \sigma_{II} \min(\bar{w}^{**} - b, \ell_f) \quad (6)$$

and induces the employee to commit the crime if (6) exceeds (5).

4.2 Unlimited Firm Liability

In this subsection, we highlight the importance of the firm's being judgment-proof for our results. We will show that if the firm's liability is sufficiently unconstrained, the court can deter corporate crime efficiently with a sufficiently high firm sanction. There is no need for more complicated sanction schemes, and in particular no gain from targeting the employee with sanctions.

Assume for simplicity $r = \ell_f$, i.e., all of the firm's return from operating can be liquidated to pay its obligations. We have the following proposition, proved in the Appendix.

Proposition 1. *Suppose $r = \ell_f > b/[1 - \sigma_I - \sigma_{II}]$. Then the court can deter corporate crime with no deadweight loss.*

The proof hinges on the fact that sufficiently high sanctions can deter criminal behavior as long as there is no barrier to levying the sanctions. If ℓ_f is sufficiently high, the firm's judgment-proofness is not a barrier to levying sufficiently high sanctions.

4.3 Limited Firm Liability

In this subsection, we will show that if the firm's liability is limited, courts can deter more crime and enhance social welfare by targeting the employee in addition to targeting the firm. For simplicity, assume $r = \ell_f = 0$, i.e., the firm has no assets to pay its obligations (besides the return from crime if it is committed, b). We have the following proposition. The proof, which relies on brute-force algebra, is provided in the Appendix.

Proposition 2. *Assume $r = \ell_f = 0$. If $u(b + \ell_e) - c/\sigma_{II} < u(\ell_e)$, the court can deter corporate crime whether or not it can target the employee with sanctions in addition to the firm. If $u(b + \ell_e) - c/\sigma_{II} > u(\ell_e)/\sigma_{II}$, the court cannot deter crime whether or not it can target the employee. If*

$$u(b + \ell_e) - \frac{c}{\sigma_{II}} \in \left(u(\ell_e), \frac{u(\ell_e)}{\sigma_{II}} \right), \quad (7)$$

then the court can deter crime if and only if it targets the employee. The court's ability to target the employee enhances welfare since it is socially beneficial to deter the crime.

The intuition behind the proposition is that the firm's limited liability constrains how severely it can be punished with direct sanctions. By additionally targeting the employee, the court can increase the cost of crime to the firm by increasing the wage it must pay the employee conditional on committing the crime or else his individual-rationality constraint would be violated.

The set of parameters satisfying (7) is empty unless $\ell_e > 0$. If $\ell_e = 0$, $u(\ell_e) = 0 = u(\ell_e)/\sigma_{II}$. Thus, for targeting the employee to be beneficial, it must be that the employee has assets beyond payments from the firm it is liable for, or the court has the possibility of administering additional non-monetary punishments. If the employee does not have this additional liability, targeting the employee does not have any additional value.

5 Avoiding Shutdown of Honest Firms

In this section, we demonstrate another benefit of sanctioning employees for corporate crime. We will depart from our previous extreme assumptions that either $r > b/[1 - \sigma_I - \sigma_{II}]$ or $r = 0$ and

instead assume r takes on some intermediate value. If r is some intermediate value, the court has to balance its desire to deter crime against the possibility that particularly severe deterrence schemes may not only prevent crime but cause the firm's exit, preventing the realization of r , which is a social benefit as well as a private benefit to the firm. The firm's shutdown decision was not a relevant consideration for social welfare in the previous section. In the case $r > b/[1 - \sigma_I - \sigma_{II}]$, the firm would not shut down for any finite sanctions, no matter how large. In the case $r = 0$, the firm may shut down, indeed we saw it was in the previous section for some parameters, but since the firm's operation produces no social benefit, its shutdown was not a concern.

Successful deterrence schemes in this setting deter crime but do not induce the firm to exit. Such schemes need to "hit the firm harder" if it commits the crime than if it does not. Employee sanctions can perform relatively better than firm sanctions in this regard by interacting with the employee's limited-liability constraint. The court can set such a high employee sanction that all the employee's assets are seized if there is a corporate crime conviction. Since the employee must be paid a higher wage to induce him to commit the crime, the employee has more assets available to seize if a crime is committed than not, and so the employee sanction "hits" relatively harder if a crime is committed.

In order to turn the focus away from judgment-proof firms studied in the previous section, assume $\ell_f = \infty$, so the firm has no liability constraints and can pay any finite sanctions. Assume r is finite, so the firm will have a non-trivial decision about whether to operate if the sanctions are sufficiently high. We have the following proposition.

Proposition 3. *There exist cases in which, if the court is limited to firm sanctions, the court can only deter crime by forcing the firm to shut down; but if the court can sanction the employee, the court can deter crime without forcing the firm to shut down. Employee sanctions can thus increase the efficiency of deterrence schemes.*

Note that employee sanctions provide the benefit revealed in Proposition 3 whether or not the court prohibits indemnification *de jure*. To see this, note that, since the limited-liability constraint

binds for the employee of the honest firm, increasing the employee sanction does not affect the honest firm's profit. Indeed, the employee sanction can be increased without bound and still not cause the honest firm to shut down. For a sufficiently high employee sanction, the firm would choose not to indemnify the employee even if it were allowed to, since the indemnification payments would simply be seized to pay the employee sanction and not provide the employee with any benefit.

Employee sanctions increase the efficiency of deterrence in Proposition 3 because, even though the nominal fine paid by the employee is the same whether or not a crime is committed, the actual fine paid by the employee is higher if a crime is committed. A similar effect could be obtained by conditioning the nominal fine on the employee's income. For example, Conard (1972) advocates capping the employee's liability by his after-tax net income from the firm in the year of violation. In our model, if the fine were set equal to this cap, the fine would increase with the commission of a crime.

6 Preventing Indemnification

As discussed in the Introduction, whether firms should be allowed to indemnify employees for corporate crime sanctions is an important issue for public policy. In this section, we provide a theoretical analysis of the policy. In our basic model, it appears to be generally true that it is inefficient for the court to prevent indemnification. Intuition behind this conjecture is provided in Subsection 6.1. How then can the policy of preventing indemnification be rationalized? In Section 6.2 we extend the model to allow for the possibility that prosecutors seek the cooperation of the employee. We derive an example in which preventing indemnification encourages the employee's cooperation with prosecutors, increasing the probability the firm is convicted for the corporate crime, reducing the attractiveness of crime. This allows the court to deter crime with lower fines, reducing the probability that an honest firm is bankrupted by a type-I enforcement

error (a similar benefit to what we saw in Section 5).

6.1 Inefficiency Result

One might think that preventing indemnification is beneficial in our basic model for the following reason. Preventing indemnification effectively adds a constraint to the contracting problem between the firm and employee and thus makes contracting less efficient. This can improve deterrence if the efficiency of the contract inducing crime is reduced relatively more than the one inducing no crime. One might be led to think this is true since the probability indemnification payments are made is higher if a crime is committed (since the probability of conviction is higher) than not. Intuition along these lines was suggested by Stone (1980), Kraakman (1984), and Privileggi, Marchese, and Cassone (2001).

In fact, the opposite is true, as Figure 1 shows. A bit of explanation is in order to understand the figure, an indifference curve diagram where the axes correspond to employee income in the two states of the world (no conviction, conviction). The employee's indifference curve at his reservation utility is given by the boldly drawn curve. The downward sloping dotted lines, labeled F' , F'' , and F''' , are indifference curves for the firm. The firm's indifference curves are linear since the firm is risk neutral; the employee's is convex since he is risk averse. The employee's indifference curves reflect increasing utility as one moves out from the origin; the opposite is true for the firm since the employee's income is increased by payments from the firm.

Without sanctions, firm optimum involves full insurance for the employee, and a wage sufficient to get agent to reservation utility, reflected by point B . Suppose the court imposes sanction s_e , paid of course only if the firm is convicted. Without any compensation relative to the initial firm optimum, this moves the outcome from point B to A in the figure. The length of segment AB equals s_e . Of course A cannot be part of an equilibrium with sanctions since the employee's individual-rationality constraint is violated. The employee needs to be moved back to his reserva-

tion utility reflected by the dark indifference curve. If firm is unconstrained in how it moves the employee back to his reservation utility, the cheapest way to do this is to indemnify the employee directly, moving along the vertical line back up to point B . The indemnification payment, s_i , equals s_e , and both are equal the length of segment AB . Note that, measured in terms of firm surplus, a move from A to B is the same as a move from A to C since B and C are on the same indifference curve for the firm F'' . The length of AC is $\sigma_I s_e$ in Panel A and $(1 - \sigma_{II}) s_e$ in Panel B. The math and the graphs tell us that AC is longer in Panel B than in Panel A. This is indeed where the deterrent effect of sanctions is coming from: they are paid with higher probability if a crime is committed. If the government constrains the firm not to indemnify the employee, the firm must return the employee back to his reservation utility via the wage. This is a movement along a 45-degree line (equal increase in income in all states). Moving back to the employee's reservation utility along a 45-degree line from A produces the new point D .

To summarize, sanctioning the employee and preventing his indemnification is captured by a move from A to D . As argued above, sanctioning the employee and allowing his indemnification is captured by a move from A to C .

The difference between Panel A (no crime committed) and Panel B (crime committed) is that the slope of the employee's and firm's indifference curves are steeper in Panel A than in Panel B. In Panel A, segment AD is almost twice the length of AC . Thus it is very costly to the firm to compensate the employee for a sanction through the wage rather than through direct indemnification if no crime is committed. In Panel B, by contrast, segment AD is hardly longer than AC . Thus, it is not very costly to compensate the employee through the wage rather than direct indemnification for a sanction if a crime is committed.

Hence, Figure 1 demonstrates that, for a given sanction scheme, it is inefficient for the court to prevent indemnification since it increases the cost of operating if the firm is honest, increasing its likelihood of exit, more than it increases the firm's cost of being dishonest. As noted, for any enforcement scheme allowing indemnification, the court can devise one which prohibits in-

demnification producing an equivalent outcome. We conjecture that this second scheme typically involves not sanctioning the employee. Thus there will typically not be a strict benefit from preventing indemnification, and often a strict loss from preventing indemnification if the (not necessarily optimal) scheme involves positive employee sanctions.

6.2 Cooperation with Prosecutors

In this section, we provide a rationale for preventing indemnification in an extension of the basic model in which the government authority or court also has a prosecuting function. In this extension, the prosecutors can use the cooperation of the employee to increase the probability the firm is convicted. We will maintain the probabilities σ_I and $1 - \sigma_{II}$ but reinterpret them as probabilities the court initiates an investigation of the crime rather than the probability of conviction. Conditional on an investigation being initiated, the probability of conviction is $\alpha \in (0, 1)$ if the employee does not cooperate with the prosecutors and one if he does. (It is sufficient to assume only that cooperation increases the probability of conviction; assuming it increases the probability from $\alpha < 1$ to one is a pedagogical simplification.) One can interpret cooperation by the employee as revealing a piece of hard information proving the crime, a “smoking gun”. Consistent with this interpretation, the employee can only cooperate if a crime has actually been committed; if the court has committed a type-I enforcement error by investigating an honest firm, it is impossible for the employee to increase the probability of conviction by cooperating since there is no “smoking gun” to reveal. Combining the probability of investigation with the probability of conviction conditional on investigation, the unconditional probability of conviction equals $\sigma_I \alpha$ if no crime was committed, $(1 - \sigma_{II})\alpha$ if a crime was committed and the employee does not cooperate with prosecutors, and $1 - \sigma_{II}$ if a crime was committed and the employee cooperates with prosecutors.

Even if crime is deterred in equilibrium, so the employee’s cooperation is not actually used

along the equilibrium path, the employee's cooperation off the equilibrium path, following the commission of a crime, increases the probability of conviction, reducing the appeal of the crime in the first place. Prosecutors induce the employee to cooperate by promising a lower sanction $\tilde{s}_e \in [0, s_e)$ in return for cooperation. If the firm fully indemnifies the employee, the prosecutors' strategy will not work since the employee will not care about reducing the sanction. The court thus needs to prevent full indemnification to induce the employee to cooperate. There are two ways for the court to do this. One is simply to set the employee sanction so high that the firm chooses not to indemnify the agent even if it were allowed to. Setting a high employee sanction may be inefficient if this increases the wages an honest firm needs to pay so much that honest firms shut down in equilibrium. If the shutdown of honest firms is a concern, it may be efficient for the court to prohibit indemnification directly.

In the proof of the following proposition, we provide an example in which it is strictly efficient for the court to prohibit indemnification directly. The example takes the case of an infinitely risk averse employee. Prohibiting indemnification endogenously through high employee sanctions (rather than exogenously through an explicit rule) results in the shutdown of an honest firm since it cannot afford to pay a wage sufficient to offset the sanction and return the employee to his reservation utility. The court needs to prohibit indemnification exogenously through an explicit rule. The parameters are chosen in the example so that the increase in probability of conviction with the cooperation of the employee is sufficient to deter the firm from crime.

Proposition 4. *There exist cases in which it is strictly efficient for the court to prevent indemnification.*

7 Conclusion

Even ahead of the most recent corporate scandals, a significant body of research had studied the structure of personal and enterprise liability for individuals and firms guilty of wrongdoing. The

present paper strongly complements the existing literature by formally modelling underexplored issues.

The results have indicated the nature of the tradeoffs the social planner must confront when attempting to deter corporate crime involving potentially judgment-proof participants. Moreover, the economic issues involved in whether or not corporate indemnification should be prohibited have been explored.

In further work we will adapt the model to consider the distinction between direct corporate indemnification and (third-party) D&O insurance. The present paper has assumed direct indemnification for simplicity. As Holderness (1990) notes, D&O insurance has the benefit of having another party, the insurance company, as a monitor to ensure the payouts are for acts taken in good faith. Our further work will also consider the costs of D&O insurance relative to indemnification.

Appendix

Proof of Proposition 1: Let $r = \ell_f > b/[1 - \sigma_I - \sigma_{II}]$. We will show that by setting sanctions $s_f = b/[1 - \sigma_I - \sigma_{II}]$ and $s_e = 0$, the court can deter corporate crime with no deadweight loss.

If the firm wishes to induce the employee not to commit the crime, it will optimally set $\underline{w}^* = \bar{w}^* = s_i^* = 0$. The employee earns $u(\ell_e)$ from this contract, so his individual-rationality constraint is satisfied. The assumptions imply $s_f < \ell_f$. Hence expression (1) implies the firm earns

$$r - \sigma_I s_f. \quad (A1)$$

If the firm wishes to induce the employee to commit the crime, it will earn no more than

$$r + b - (1 - \sigma_{II})s_f. \quad (A2)$$

To see this, expression (A2) is the value of the firm's objective function (3) substituting zero for the payments to the employee: $\bar{w} = s_i = 0$. Of course, to induce the agent to expend $c \geq 0$ to commit the crime, the firm must pay the employee a non-negative amount (indeed, strictly positive if $c > 0$), so (A2) is an upper bound on the firm's profit.

The firm prefers the employee not to commit the crime if (A1) exceeds (A2), or, rearranging,

$$s_f \geq \frac{b}{1 - \sigma_I - \sigma_{II}}. \quad (A3)$$

Condition (A3) is satisfied by the court's sanction $s_f = b/[1 - \sigma_I - \sigma_{II}]$.

To show that there is no deadweight loss in equilibrium, we need to verify that the firm does not have an incentive to shut down. We showed the firm's equilibrium profit is (A1). This is positive since $r > b/[1 - \sigma_I - \sigma_{II}] = s_f$, implying $r > \sigma_I s_f$. *Q.E.D.*

Proof of Proposition 2: Assume $r = \ell_f = 0$. Since $h > b - c$ and since $r = 0$, it is efficient for the court to deter crime regardless of the consequences, in particular, regardless of whether this leads to a shutdown of firm operations.

First, we will solve for equilibrium when the court is constrained to target only the firm. Under this constraint, it is optimal for the court to set $s_f = \infty$ and $s_e = 0$. If the firm wishes to induce the employee not to commit a crime, the most it can earn is zero, using the contract $\underline{w}^* = \bar{w}^* = s_i^* = 0$. If the firm wishes to induce the employee to commit a crime, the wage \bar{w} must satisfy individual-rationality for the employee, which, upon substituting our parametric assumptions into (4) and noting $s_i^* = 0$ at an optimum, reduces to

$$(1 - \sigma_{II}) u(\ell_e) + \sigma_{II} u(\min(b, \bar{w}) + \ell_e) - c \geq u(\ell_e). \quad (A4)$$

The lowest wage satisfying (A4) is optimal:

$$\min(b, \bar{w}^{**}) = u^{-1}\left(u(\ell_e) + \frac{c}{\sigma_{II}}\right) - \ell_e. \quad (A5)$$

For a solution \bar{w}^{**} to (A5) to exist requires

$$b \geq u^{-1}\left(u(\ell_e) + \frac{c}{\sigma_{II}}\right) - \ell_e \quad (A6)$$

and for the firm to earn strictly more than with no crime the inequality in (A6) must be strict. Rearranging (A6) and treating it as a strict inequality,

$$u(b + \ell_e) - \frac{c}{\sigma_{II}} > u(\ell_e). \quad (A7)$$

In sum, if (A7) holds, the corporate crime cannot be deterred targeting the firm alone. If the inequality in (A7) is reversed, crime can be deterred by targeting the firm alone.

Next we will analyze equilibrium when the court is allowed to target the employee along with the firm. It is optimal for the court to set $s_f = s_e = \infty$. If the firm wishes to induce the employee not to commit a crime, the most the firm can earn is zero. To see this, note that if $\ell_e = 0$, the firm can obtain zero with the contract $\underline{w}^* = \bar{w}^* = s_i^* = 0$. If $\ell_e > 0$, the firm can obtain zero by shutting down. As an aside, the firm is forced to shut down since it has no assets to make a positive payment to the employee, but a positive payment would be required to satisfy the employee's individual-rationality constraint given the sanction $s_e = \infty$. If the firm wishes to induce the employee to commit a crime, the wage payment $\min(\bar{w}, \ell_f + b)$ must satisfy the employee's individual-rationality constraint:

$$(1 - \sigma_{II}) u(0) + \sigma_{II} u(\min(\bar{w}, b) + \ell_e) - c \geq u(\ell_e). \quad (A8)$$

Rearranging, and noting the optimal payment will force (A8) to hold with equality,

$$\min(\bar{w}^{**}, b) = u^{-1}\left(\frac{u(\ell_e) + c}{\sigma_{II}}\right) - \ell_e. \quad (A9)$$

For a solution \bar{w}^{**} to (A9) to exist requires

$$b \geq u^{-1}\left(\frac{u(\ell_e) + c}{\sigma_{II}}\right) - \ell_e. \quad (A10)$$

Condition (A10) must hold as a strict inequality for the firm to benefit strictly from having the crime committed. Rearranging the strict inequality,

$$u(b + \ell_e) - \frac{c}{\sigma_{II}} > \frac{u(\ell_e)}{\sigma_{II}}. \quad (A11)$$

In sum, if (A11) holds, corporate crime cannot be deterred targeting both the firm and employee. If the reverse inequality holds, corporate crime can be deterred targeting both the firm and employee. Putting conditions (A7) and (A11) together gives the statement of the proposition. *Q.E.D.*

Proof of Proposition 3: Let $\epsilon' > 0$ and $\epsilon'' > 0$. Assume, first,

$$b = (1 - \sigma_I - \sigma_{II}) \frac{r}{\sigma_I} + u^{-1}(u(\ell_e) + c) - \ell_e + \epsilon'. \quad (\text{A12})$$

Assume, second,

$$\sigma_{II} \leq \frac{u(\ell_e) + c}{u \left(\epsilon' + u^{-1}(u(\ell_e) + c) + \frac{1}{\sigma_I} \left[u^{-1} \left(\frac{u(\ell_e)}{1 - \sigma_I} \right) - \ell_e + \epsilon'' \right] \right)}. \quad (\text{A13})$$

This parameter configuration will provide the example we need to prove the proposition.

Suppose the court sanctions the firm, not the employee. If the firm induces the employee not to commit the crime, the optimal contract is $\underline{w}^* = 0$, $\bar{w}^* = 0$, $s_i^* = s_e = 0$. Substituting these contractual terms into the firm's profit function (1) implies the firm earns

$$r - \underline{w}^* - \sigma_I(s_f + s_i^*) = r - \sigma_I s_f. \quad (\text{A14})$$

If the firm induces the employee to commit a crime, its optimal contract is $\underline{w}^{**} = 0$, $\bar{w}^{**} = u^{-1}(u(\ell_e) + c) - \ell_e$, and $s_i^{**} = s_e = 0$. The wage \bar{w}^{**} satisfies the employee's individual-rationality constraint—that (4) exceed $u(\ell_e)$ —with equality. Substituting these contractual terms into the firm's profit function (3) implies the firm earns

$$\begin{aligned} & r + b - \bar{w}^{**} - (1 - \sigma_{II})(s_f + s_i^*) \\ &= r + b - u^{-1}(u(\ell_e) + c) + \ell_e - (1 - \sigma_{II})s_f. \end{aligned} \quad (\text{A15})$$

Now, if $s_f > r/\sigma_I$, (A14) implies the firm will shut down rather than operate without committing a crime. If $s_f \leq r/\sigma_I$, then, in view of assumption (A12), (A15) can be shown to weakly exceed ϵ' . But $\epsilon' > 0$, implying the expression in (A15) is positive. In sum, the court cannot both deter crime and keep the firm operating.

Next, suppose the court can sanction the employee. Suppose the court sets

$$s_f = \frac{1}{\sigma_I} \left[r - u^{-1} \left(\frac{u(\ell_e)}{1 - \sigma_I} \right) + \ell_e - \epsilon'' \right] \quad (\text{A16})$$

$$s_e = \infty. \quad (\text{A17})$$

We need not inquire into whether the court can improve upon the sanctions in (A16) and (A17); it suffices to show that this deterrence scheme, in combination the prohibition of indemnification, produces a better outcome than in the previous paragraph. Consider first the optimal contract inducing the employee not to commit a crime. To satisfy individual rationality,

$$\sigma_I u(\max(0, \ell_e - s_e + \underline{w} + s_i)) + (1 - \sigma_{II}) u(\underline{w} + \ell_e) \geq u(\ell_e). \quad (\text{A18})$$

The optimal contractual terms satisfying (A18) are $s_i^* = 0$ and

$$\underline{w}^* = u^{-1}\left(\frac{u(\ell_e)}{1 - \sigma_I}\right) - \ell_e. \quad (\text{A19})$$

Substituting these contractual terms into firm profit function (1) implies the firm earns $r - \underline{w}^* - \sigma_I s_f$, which, substituting for s_f from (A16) and for \underline{w}^* from (A19), can be shown to equal $\epsilon'' > 0$. Hence the firm earns positive profit from no crime.

Consider the firm's optimal contract inducing crime. Similar to the calculations behind (A19), it can be shown that the optimal wage is

$$\bar{w}^{**} = u^{-1}\left(\frac{u(\ell_e) + c}{\sigma_{II}}\right) - \ell_e. \quad (\text{A20})$$

The firm earns

$$r + b - \bar{w}^{**} - (1 - \sigma_{II})s_f \quad (\text{A21})$$

$$= u^{-1}(u(\ell_e) + c) + \epsilon' - u^{-1}\left(\frac{u(\ell_e) + c}{\sigma_{II}}\right) + \left(\frac{1 - \sigma_{II}}{\sigma_I}\right) \left[u^{-1}\left(\frac{u(\ell_e)}{1 - \sigma_I}\right) - \ell_e + \epsilon'' \right] \quad (\text{A22})$$

$$< u^{-1}(u(\ell_e) + c) + \epsilon' - u^{-1}\left(\frac{u(\ell_e) + c}{\sigma_{II}}\right) + \frac{1}{\sigma_I} \left[u^{-1}\left(\frac{u(\ell_e)}{1 - \sigma_I}\right) - \ell_e + \epsilon'' \right] \quad (\text{A23})$$

where (A21) holds by substituting the optimal contractual parameters into firm profit function (3), (A22) holds by substituting from (A16) and (A20), and (A23) holds since $\sigma_{II} > 0$ and $u^{-1}(u(\ell_e)/(1 - \sigma_I)) - \ell_e + \epsilon'' > 0$. By (A13), (A23) is non-positive. Hence the firm's profit is negative if it induces the crime, less than the $\epsilon'' > 0$ it earns if it does not. The firm does not shut down since its profits from operating given it does not commit a crime are positive. *Q.E.D.*

Proof of Proposition 4: Assume the employee is infinitely risk averse. That is, his utility over risky income equals that received in the lowest-income state, in our case the state in which he has to pay a sanction for the crime. Assume the firm is not liability-constrained, $\ell_f = \infty$. Assume

$$b - c < r \left(\frac{1 - \alpha\sigma_I - \sigma_{II}}{\alpha\sigma_I} \right) \quad (\text{A24})$$

and

$$b - c > r \left(\frac{1 - \sigma_I - \sigma_{II}}{\sigma_I} \right). \quad (\text{A25})$$

The parameter configuration in (A24) and (A25) will give us the example needed to prove the proposition. The set of parameters satisfying (A24) and (A25) is nonempty. The right-hand sides can be nested as follows:

$$r \left(\frac{1 - x - \sigma_{II}}{x} \right), \quad (\text{A26})$$

where $x = \alpha\sigma_1$ in (A24) and $x = \sigma_1$ in (A25). But (A26) is strictly decreasing in x , so the right-hand side of (A24) exceeds the right-hand side of (A25) since $\alpha\sigma_1 < \sigma_1$.

Suppose the court prevents indemnification. Suppose further the court sets $s_e = \epsilon$, $\tilde{s}_e = 0$, and $s_f = (r - \epsilon)/(\alpha\sigma_1)$, where

$$\epsilon < \left(\frac{1 - \alpha\sigma_1 - \sigma_{II}}{1 - \sigma_{II}} \right) r - \left(\frac{\alpha\sigma_1}{1 - \sigma_{II}} \right) (b - c). \quad (\text{A27})$$

Consider the optimal contract not inducing crime. The employee's individual-rationality constraint (2) must hold, which, since the agent is infinitely risk averse, reduces to $\ell_e + \underline{w} - s_e \geq \ell_e$. Therefore, the optimal contract is $\underline{w}^* = s_e = \epsilon$ and $\bar{w}^* = s_i^* = 0$. The firm earns

$$\begin{aligned} & r - \underline{w}^* - \alpha\sigma_1 s_f \\ &= r - \epsilon - \alpha\sigma_1 \left(\frac{r - \epsilon}{\alpha\sigma_1} \right) \\ &= 0. \end{aligned}$$

Thus the firm weakly gains from operating.

Consider the optimal contract inducing crime. Since $\tilde{s}_e = 0 < \epsilon = s_e$, the employee cooperates with prosecutors. The employee's individual-rationality constraint (4), given he is infinitely risk averse, is $\ell_e - \tilde{s}_e + \bar{w} \geq \ell_e + c$, implying $\bar{w}^{**} = \tilde{s}_e + c = c$. In addition, $\underline{w}^{**} = s_i^{**} = 0$. The firm earns

$$\begin{aligned} & r - \bar{w}^{**} + b - (1 - \sigma_{II})s_f \\ &= r - c + b - \left(\frac{1 - \sigma_{II}}{\alpha\sigma_1} \right) (r - \epsilon) \\ &< r - c + b - \left(\frac{1 - \sigma_{II}}{\alpha\sigma_1} \right) \left[r - \left(\frac{1 - \alpha\sigma_1 - \sigma_{II}}{1 - \sigma_{II}} \right) r + \left(\frac{\alpha\sigma_1}{1 - \sigma_{II}} \right) (b - c) \right] \\ &= 0. \end{aligned}$$

The second line holds by substituting for \bar{w}^{**} and s_f , the third line by (A27), and the last line by algebra. Thus, the firm earns more from the optimal contract not inducing crime than from that inducing crime, implying crime is deterred in equilibrium if indemnification is prevented.

We next show that if indemnification is allowed, either the firm shuts down or crime is not deterred. Consider the optimal contract inducing no crime. The firm sets $\underline{w}^* = \bar{w}^* = 0$ and $s_i^* = s_e$. The firm earns

$$\begin{aligned} & r - \underline{w}^* - \alpha\sigma_1(s_f + s_i^*) \\ &= r - \alpha\sigma_1(s_f + s_e). \end{aligned}$$

The firm shuts down unless $s_f + s_e \leq r/(\alpha\sigma_1)$.

We will show the highest such sanctions, $s_f + s_e = r/(\alpha\sigma_1)$, are insufficient to deter crime. Consider contracts inducing crime. We will not need to solve for the optimal one, but just find one

giving the firm positive profit. By fully indemnifying the employee, he is induced (weakly) not to cooperate with the prosecutors. The following contract satisfies employee individual rationality (4) for an infinitely risk averse employee and fully indemnifies the employee: $\underline{w}^{**} = 0$, $\bar{w}^{**} = c$, and $s_i^{**} = s_e$. From this contract, the firm earns

$$\begin{aligned}
 & r - \bar{w}^{**} + b - (1 - \sigma_{II})\alpha(s_f + s_i^{**}) \\
 &= r + b - c - (1 - \sigma_{II})\alpha(s_f + s_e) \\
 &= r + b - c - \left(\frac{1 - \sigma_{II}}{\sigma_I} \right) r \\
 &> 0.
 \end{aligned}$$

The second line holds by substituting for \bar{w}^{**} and s_i^{**} , the third by substituting the highest fines subject to the firm's breaking even if it is honest $s_f + s_e = r/(\alpha\sigma_I)$, and the last by (A24). Hence, crime cannot be deterred if indemnification is prevented without forcing honest firms to shut down. *Q.E.D.*

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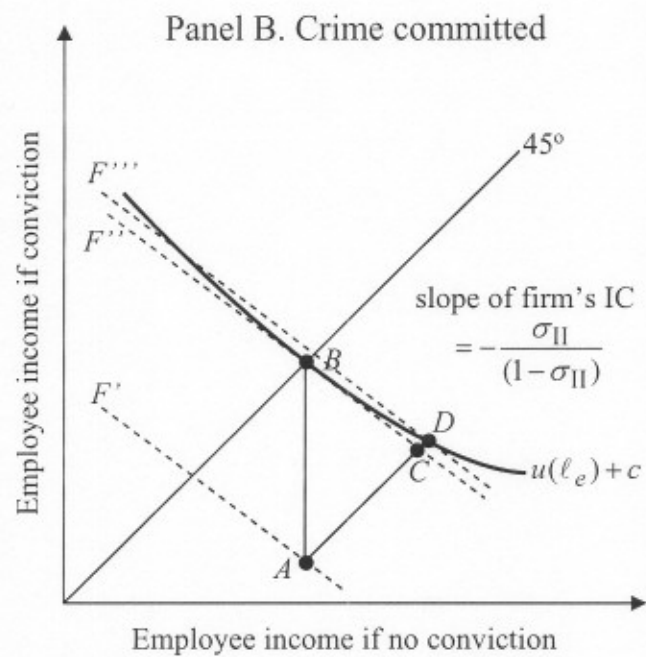
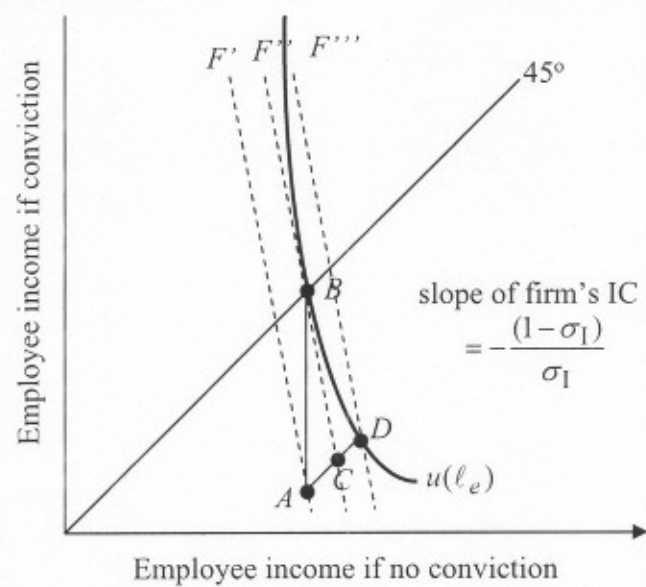


Figure 1. Preventing indemnification harms firm more if crime not committed.