

Profitable Misconduct, Corporate Governance, and Law Enforcement

Finance Working Paper N° 1068/2025

May 2026

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ECGI Working Paper Series in Finance

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We are grateful to Miriam Baer, Greg Buchak, Guiseppe Dari-Mattiaci, Amil Dasgupta, Peter DeMarzo, Dhammika Dharmapala, Michael Fishman, Scott Ganz, Louis Kaplow, Vic Khanna, Doron Levit, Amir Licht, Nadya Malenko, Ellen Podgor, Elizabeth Pollman, Jed Rakoff, Amit Seru, Roy Shapira, Chris Snyder, Jennifer Taub, Jason Yackee, and seminar participants at George Mason University, USC, Western Ontario, and participants at the 2024 Berkeley ESG conference, the 2025 American Law and Economics Association (NYU), and the 2025 NBER Law and Economics Summer Institute for valuable discussions. Sophie Molins provided helpful research assistance. The authors do not have any relevant financial interests or any conflicts of interests related to the research described in this paper.

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Abstract

This paper analyzes interactions between corporate governance and law enforcement practices, focusing on cases where deterrence is weak and harmful misconduct is profitable. We show that managerial compensation contracts often undermine enforcement efforts aimed both at the corporation and at managers, and that common enforcement policies such as discounting penalties when corporations self-report or implement compliance programs can lead to more social harm by increasing the profitability of misconduct. Our results suggest that policies designed to deter corporate misconduct must account for interactions between external governance, including laws and their enforcement, and internal governance mechanisms such as managerial compensation.

Keywords: Corporate Misconduct, Corporate Governance, Law Enforcement, Compliance, Corporate Accountability, Corporate Fraud

JEL Classifications: A12, G30, G38, K10, K40, K42

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May 28, 2026

Abstract

This paper analyzes interactions between corporate governance and law enforcement practices, focusing on cases where deterrence is weak and harmful misconduct is profitable. We show that managerial compensation contracts often undermine enforcement efforts aimed both at the corporation and at managers, and that common enforcement policies such as discounting penalties when corporations self-report or implement compliance programs can lead to more social harm by increasing the profitability of misconduct. Our results suggest that policies designed to deter corporate misconduct must account for interactions between external governance, including laws and their enforcement, and internal governance mechanisms such as managerial compensation.

1 Introduction

Corporations play a dominant role in the global economy, and so corporate governance matters greatly. Corporate governance research has focused on the agency relations between managers acting on behalf of the corporation and the shareholders impacted by managerial actions. In a well-known 1970 essay considered central to this approach, Milton Friedman argued that “the social responsibility of managers is to make as much money as possible while conforming to the basic rules of the society, both those embodied in law and those embodied in ethical custom.”¹ The stipulation that corporations and their managers comply with the rules of society highlights a critical second dimension of corporate governance: the alignment of corporate behavior with societal interest through effective laws and their enforcement.

Abundant evidence suggests that law enforcement mechanisms often fail to deter corporations from breaking the law and causing significant harm to society. Under-enforcement of the law and insufficient deterrence appear to be common in the corporate context (see e.g. Garrett, 2014; Eisinger, 2017; Taub, 2020; Coffee Jr, 2020; Rakoff, 2021). First, the level of fines imposed

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¹ “The Social Responsibility of Business is to Increase its Profits,” Milton Friedman. *The New York Times*, 1970.

or settlements agreed upon may be too small to create effective deterrence. Authorities may be concerned that large fines or significant sanctions on corporations may lead innocent stakeholders and other parties to suffer collateral harm. Limitations on fines and sanctions can also arise because political forces may protect “important” corporations.² Second, the limited liability of corporations and the option to seek bankruptcy protections that limit liabilities, including those arising from corporate misconduct, reduce the potential deterrent impact of law enforcement.³ Third, large, complex, and well-resourced corporations can make enforcement efforts by less well-resourced governments too costly and difficult, weakening deterrence. Finally, diffuse responsibility within corporations makes it difficult to identify individuals to hold accountable when corporate misconduct is detected, which further weakens deterrence.

Imposing sufficiently high penalties to deter corporate misconduct is particularly challenging when misconduct can remain undetected and persists for years. Well-known cases like Volkswagen, Purdue Pharma, and Boeing, and those involving money laundering illustrate the issues. (We describe some institutional details and examples in Appendix A.) Dyck, Morse and Zingales (2024) estimates that only a third of frauds committed by large publicly traded corporations are ever detected and that the total cost of fraud among these corporations is \$830 billion per year. Rudman et al. (2009) estimate the cost of fraud in the healthcare industry to be between \$100 billion and \$170 billion per year. The Economic Policy Institute estimated in 2017 that US workers lose over \$8 billion per year to wage theft—the largest form of theft committed in the United States.⁴ The harm from corporate misconduct is enormous, often costing lives and causing significant financial and physical hardships on many. Obvious examples include Purdue Pharma, Boeing, Volkswagen and the cum-ex tax fraud scandal.

In this paper we study the interaction between what we term *internal* and *external* corporate governance, specifically focusing on law enforcement. *Internal* corporate governance refers to policies, such as managerial compensation, aimed at aligning the actions of the corporation and those who control it with the interest of shareholders. In practice, the interest of shareholders is typically equated with maximizing the monetary value of their shares. *External* corporate governance refers to mechanisms aimed at ensuring that corporations conform with the basic rules of society.

Standard corporate governance research, which focuses on internal governance considerations involving managers, directors, and shareholders, abstracts from external governance. The implicit assumption is that external governance, which includes laws and their enforcement, protects the interests of stakeholders such as customers, employees, and citizens well enough. As discussed above, there is abundant evidence showing that this assumption is often false. We show that in such cases, effective internal governance can further undermine law enforcement and can make some commonly used enforcement policies counterproductive.

When the profits a corporation gains from misconduct exceed the expected fines or other consequences that may result from the misconduct, shareholders may view these consequences as a “cost of doing business.” As seen in many examples, successful business models may include profitable misconduct.⁵

²On political economy forces and considerations involving collateral consequences, see Karpoff, Lee and Vondracik (1999), Atkinson (2023a), Admati (2017, 2021), and Admati and Hellwig (2024).

³Admati et al. (2018) shows that indebted (already-leveraged) corporations have strong incentives to further increase their indebtedness, which can then limit the extent of subsequent fines (Atkinson, 2026). On the use of bankruptcy to manage litigation and avoid accountability, see Jacoby (2024)

⁴<https://www.epi.org/publication/employers-steal-billions-from-workers-paychecks-each-year/>.

⁵Atkinson (2023b) estimates that the largest violations of the Clean Air Act are profitable for firms even after paying fines. Findley, Nielson and Sharman (2024) establish through experiments that compliance with anti-money

In this paper, we develop a simple stylized model in which a manager chooses the level of activities that can be beneficial or harmful to society and which impact both corporate profits and social welfare. The manager responds to a stock-based compensation contract that is designed to maximize profits. If misconduct is expected to be profitable even after enforcement policies are taken into account, the compensation contract can often be structured to provide incentives for managers to engage in misconduct.⁶

Of course, it is not surprising that managers with powerful incentives to maximize profits will engage in profitable misconduct. More interesting is how managerial contracts, and the resulting harm, change in response to changes in law enforcement policies. Whereas for a given incentive contract a significant increase in fines will generally reduce the level of misconduct, we show that internal governance working in the interest of shareholders can lead to adjustments in contracts that undo much—or even all—of the potential harm-reducing effects of these increased fines. Our analysis considers various ways that the size of fines might be calibrated based, for example, on the level of ill-gotten profits, on measures of the amount of misconduct, or on the total harm caused, and for these approaches we examine the effects the “optimal” internal governance responses have on social welfare. In some cases, we show that seemingly “tougher” enforcement policies, e.g., a lower threshold for imposing fines, may actually *increase* the harm caused by the corporation.

If misconduct is profitable and shareholders view penalties as a cost of doing business, shifting liability to the specific managers responsible for the misconduct may offer a more effective path to deterrence. In some jurisdictions, targeting individual actors is the primary mode of enforcement. This institutional focus is reflected in a decade of evolving U.S. Department of Justice directives, beginning with the foundational 2015 “Yates Memo,” which conditioned corporate cooperation credit on the disclosure of all individual misconduct.⁷

We show, however, that as corporations respond to enforcement policies directed at their managers, compensation structures can be adjusted to partially or fully offset the deterrence effects of fines. For example, a corporation can increase the manager’s ex ante equity stake to raise the expected share of the profits from the misconduct and undo the effect of the fine. A corporation can also indemnify or provide insurance to shield the manager from any personal consequences of misconduct, a common practice in executive compensation.

Because detecting and investigating corporate misconduct is difficult and costly, enforcement authorities increasingly rely on policies that encourage corporations to cooperate by developing compliance programs and by providing information to authorities. Under frameworks like the Department of Justice’s Corporate Enforcement and Voluntary Self-Disclosure Policy, the govern-

laundering laws is often poor in developed nations, including the US, despite numerous nations committing to enforcing these laws. Byars (2025) points out that enforcement practices such as Deferred and Non-Prosecution Agreements can contribute to corporate recidivism. In a particularly egregious scheme dubbed *Cum-Ex*, which persisted for many years in Europe (and may still take place), numerous banks across Europe engaged in tax fraud that effectively robbed governments and their citizens of tens of billions of euros. Billions in ill-gotten profits have not yet been returned. On the fraud, see Chapter 17 of (Admati and Hellwig, 2024). Recent estimates put the total amount stolen from European citizens at about €150 billion.

⁶Efendi, Srivastava and Swanson (2007) shows that CEOs with in-the-money options are more likely to misreport earnings and Raghunandan (2021) finds evidence that some corporate executives use wage theft as a form of earnings management. Egan, Matvos and Seru (2019) shows that financial advisors found to have committed misconduct find subsequent employment relatively easily. Desai and Dharmapala (2006) shows a positive relationship between tax avoidance and high-powered managerial incentives.

⁷<https://www.justice.gov/archives/dag/individual-accountability>. This focus was underscored in a 2024 speech by Principal Associate Deputy Attorney General Marshall Miller, who noted that “when it comes to corporate criminal enforcement, Job #1 is individual accountability” (<https://www.justice.gov/opa/speech/principal-associate-deputy-attorney-general-marshall-miller-delivers-remarks-new-york-0>).

ment actively incentivizes this cooperation by offering leniency in exchange for corporate internal investigations.⁸ This approach continues to expand. In May 2025, Matthew R. Galeotti, Head of the DOJ’s Criminal Division, announced that companies that voluntarily self-report, fully cooperate, and remediate will now receive a guaranteed declination of charges.⁹ Highlighting the rationale behind this leniency, Galeotti stated: “The benefits to companies that voluntarily self-report, cooperate, and remediate have never been clearer and more certain. . . Issuing declinations for voluntary self-reports is sound policy. . . as a preventative measure to deter misconduct from happening in the first place.” More recently, the U.S. Attorney for the Southern District of New York introduced an overhauled policy indicating that corporations that self-report fraud can avoid criminal prosecution, fines, or forfeiture entirely. Under this framework, these leniency deals are available even if the misconduct was pervasive, involved senior leadership, or had already been exposed by whistleblowers and the press, provided the firm makes “reasonable best efforts” to compensate victims.¹⁰

We examine policies that offer reduced fines when corporations put in place compliance programs that increase the probability of detection or when they self-report misconduct to authorities. Importantly, the programs are voluntary and in our model corporations will continue to pursue profit-maximizing strategies. Perhaps not surprisingly, enforcement policies that offer deep discounts in fines can lead to more misconduct even if some fines are levied and even though such approaches may shorten the duration of wrongdoing. By making misconduct more profitable, these leniency and cooperation programs may lead to a greater intensity of misconduct prior to detection or self-reporting. The result may be greater overall harm relative to a base case without such programs. Given that voluntary programs designed to improve detection of profitable misconduct can backfire and substantially increase harm, the justification for providing generous terms to corporations in exchange for cooperation with authorities seems highly questionable.

Our paper relates to the optimal deterrence literature. Particularly relevant to our focus are discussions of whether to impose liability on the manager or the corporation and the choice between strict versus duty-based liability regimes.¹¹

However, rather than solving for a traditional second-best policy under a fixed set of posited frictions, our analysis focuses on the endogenous adjustments of internal governance to external enforcement regimes and variations on these. While identifying second-best policies is valuable, there is no generic guarantee that incremental moves toward these policies will improve welfare when baseline deterrence is suboptimal. We therefore take an alternative modeling approach, in which we assume that external enforcement is insufficient to deter profitable misconduct. We then study how shareholder-focused compensation structures set as part of internal governance adapt to policy changes in external governance to maintain incentives for profitable misconduct. Rather than deriving optimal policy prescriptions, which would depend in very detailed ways on specific legal and economic settings as well as informational and other frictions, our results offer a framework to understand how standard enforcement mechanisms, often well-intentioned, can backfire when internal and external governance incentives collide.

⁸<https://www.justice.gov/criminal/media/1400031/dl?inline>

⁹See “Head of the Criminal Division Matthew R. Galeotti Delivers Remarks at SIFMA’s Anti-Money Laundering and Financial Crimes Conference,” U.S. Department of Justice, May 12, 2025.

¹⁰See “Self-report fraud and walk free, New York prosecutors tell Wall Street.” Kaye Wiggins, *Financial Times* May 13, 2026.

¹¹Becker (1968) and Polinsky and Shavell (2007) provide general frameworks for the optimal deterrence literature. On the choice between corporate and managerial liability, see Kornhauser (1982), Polinsky and Shavell (1993), Argenton and van Damme (2014), and Deng, Goldman and Kahl (2024). On strict versus duty-based liability, see Newman and Wright (1990), Arlen (1994), and Arlen and Kraakman (1997).

Our paper is also related to the literature on the interaction of managerial compensation and corporate tax avoidance. Chen and Chu (2005) investigate (profitable) tax evasion in a principal-agent model.¹² Crocker and Slemrod (2005) similarly analyze contracts when profitable tax evasion is possible, and analyze how those contracts change with changes to the enforcement regime. Crocker and Slemrod show that fines on the manager are generally more effective for deterrence than fines on the corporation. Similar to our results, they show that adjustments to managerial compensation can partially offset and undermine the effect of enforcement efforts.

The remainder of the paper is organized as follows. In Section 2 we develop our formal model. Section 3 shows various ways that internal governance mechanisms can reduce or even nullify the deterrent effects of fines. It also shows how basing fines on harm caused by misconduct rather than profits that are gained can lead to more harm. Section 4 considers the role that compliance programs and self-reporting might play in deterring corporate misconduct and shows that cooperation motivated by discounts in fines can actually increase harm and reduce welfare. Section 5 offers policy recommendations and concluding remarks. Additional institutional background on corporate law enforcement is provided in Appendix A and proofs of the propositions are in Appendix B.

2 Model

We formally analyze the strategic interactions among three key actors, the corporation, its manager, and the government, which taken together determine corporate activities that affect societal welfare. The government sets external enforcement policies, including fines for harmful corporate activities that can be levied against the corporation and its manager. The corporation designs the compensation contract for its manager to maximize shareholder profits net of any fines paid by the corporation. The manager chooses levels of corporate activities based on the compensation contract and personal cost of effort. Our model captures the standard manager-shareholders agency problem as it interacts with external governance tools, specifically law enforcement, and focuses on the impact of this interaction on social welfare.

1. **Corporate Activities.** The corporation has two activities available, one that on net benefits society and the other which on net harms society. Its manager chooses the level of each activity, where x_b is the level chosen for the beneficial activity and x_h is the level set for the harmful activity. Because of resource constraints the activity levels must be chosen so that $x_b + x_h \leq 1$.
2. **Law Enforcement.** The law enforcement policies we analyze involve imposing monetary fines on the corporation or on the manager, with the fines imposed generally determined by x_h , the level of the harmful activity that is chosen. Since in practice misconduct is not always detected with certainty, incentives will be determined by the probability of detection times the fine that will be imposed if detection occurs. In Section 3 we will start by assuming that the probability of detection is exogenously given and focus on what happens for different policies determining the levels and types of fines that are imposed. To simplify the exposition we assume that detection is certain, since if detection is not certain, all of

¹²Relatedly, Desai, Dyck and Zingales (2004) study how tax enforcement may affect manager's propensity to expropriate income. Khan, Srinivasan and Tan (2017) find significantly positive relation between institutional ownership, thought to provide incentives for managers to achieve financial performance, and corporate income tax avoidance.

the results continue to hold if the levels of the fines are adjusted upward by dividing by the probability of detection. In Section 4 we discuss compliance and self-reporting programs that affect the probability of detection and so we explicitly include the probability of detection as an endogenous variable. Note that we do not assume law enforcement policies are set to achieve “optimal deterrence” under a set of costs and frictions. Instead, we analyze the impact on corporate actions and outcomes for society for a number of enforcement policies and for ranges of relevant parameters.

3. **Managerial Contract.** The corporation offers a compensation contract to the manager that has the form

$$Comp = S + \alpha \times \Pi_c, \quad (1)$$

where $S \geq 0$ is a fixed salary, $\alpha \in [0, 1]$ is the profit-sharing parameter, and Π_c is corporate profits defined below. The corporation chooses S and α to maximize its expected profits, taking into account the enforcement policy. For most of our analysis we will ignore S by assuming it is zero, as it is only needed to ensure that the manager’s participation constraint is met but does not qualitatively affect our results. We do assume that the level S cannot be contractually tied to the manager’s choice of the level of the harmful activity.¹³

4. **Corporate Profits** Total corporate profit is equal to:

$$\Pi_c(x_b, x_h, Fine_c) = \pi_b \sqrt{x_b} + \pi_h \sqrt{x_h} - Fine_c, \quad (2)$$

where $\pi_b \sqrt{x_b} + \pi_h \sqrt{x_h}$ is the component of profits earned from the corporation’s activities and $Fine_c$ is the fine (if any) levied against the corporation. Note that the corporation confronts decreasing returns when it allocates more resources to either activity.

Of course, a portion of total profits will be paid to the manager to provide incentives α will be greater than zero. Shareholders will be interested in maximizing $(1 - \alpha)\Pi_c(x_b, x_h, Fine_c)$. In many of the cases we analyze below, maximizing total profits and maximizing the shareholder’s share of profits will involve the same choice of $\{x_b, x_h\}$ so distinguishing maximizing total profits from maximizing the shareholder’s share will not matter. However, when fines are imposed on the manager (subsection 3.3), the manager and shareholders view fines differently, and so we will assume shareholders maximize their claim net of managerial compensation.

5. **Manager’s Choice of Activity Levels.** After accepting the contract, the manager chooses activity levels (x_b, x_h) to maximize his own utility, which is given by

$$U_M(x_b, x_h) = Comp - \beta \times (x_b + x_h) - Fine_m, \quad (3)$$

where $\beta \times (x_b + x_h)$ represents the disutility of effort with $\beta > 0$ and $Fine_m$ is the fine (if any) imposed on the manager based on the government’s policies. If β is very large, the shareholders will find it too expensive to compensate the manager in a way that maximizes profits. We make the assumption that:

$$\beta < \pi_b/4. \quad (4)$$

¹³In our setting, x_h captures misconduct, and contracts that specify taking an illegal action are not enforceable in court.

Under this assumption shareholders find it in their interest to motivate the manager to maximize corporate profits even when there is no profitable harmful activity available, $\pi_h = 0$.

6. Impact on Social Welfare:

The impact on social welfare caused by the corporation is equal to

$$W(x_b, x_h) = b\sqrt{x_b} - h\sqrt{x_h}, \quad (5)$$

where both b and h are positive. For most of our analysis, we take h , the harm intensity, as a fixed parameter but in Section 3.4 we consider the possibility that the corporation can control h . We will define B and H to be the total effect on welfare caused by the two activities, i.e., $B = b\sqrt{x_b}$ and $H = h\sqrt{x_h}$. Harms and benefits are measured on a net basis, so that H should be thought of as *all* of the harms caused by the harmful activity *minus* any benefits it might produce. This means that to determine the total effect the harmful activity has on welfare, we do not need to subtract $\pi_h\sqrt{x_h}$ from H , since H is already net of any benefits that might be related to profits.¹⁴ For simplicity we do not include the manager's disutility of effort in $W(x_b, x_h)$ since it is assumed to be very small relative to the other benefits and harms.¹⁵

This setup provides the foundation for analyzing how the government's enforcement policy and the corporation's internal governance, *Comp*, interact, particularly when external enforcement is weak.

3 Misconduct and Managerial Compensation

In this section we consider the effect of various enforcement policies on managerial compensation and corporate misconduct. We begin in subsection 3.1 examining the baseline case of no external enforcement and then analyze how corporations respond to fines imposed on them, or on their managers. In both cases, we consider two ways that fines might be determined. First, a variable fine based on the corporation's profits from the harmful activity. Second, a fixed fine that is imposed if the harmful activity exceeds a given level. In subsections 3.2 and 3.3 we explore what happens when these types of fines are levied against the corporation or the manager respectively. In subsection 3.4 we consider the case where the corporation can control the intensity of the harmful action, h .

¹⁴One should not assume that corporate profits should always be counted as a benefit. Consider a pharmaceutical company that markets an opioid drug in a way that thousands of people who should not take the drug become addicted (this is the harmful activity). If, when accounting for overall effects of the harmful activity on social welfare, one wants to include the corporation's profits from this activity as a benefit, one must recognize that this is more than offset by the fact that these profits are the result of customers paying for a drug they should not be taking. For this reason profits are not a benefit that should be deducted from all of the harms that occur when people become addicted to opioids.

¹⁵Since the disutility of effort is equal to $\beta \times (x_b + x_h)$ it only depends on the sum of the two activity levels. When resources are fully deployed, as will be optimal, the total disutility of effort will not vary and for this is another reason it can be ignored.

3.1 No External Enforcement

We first assume that there is no external enforcement: that is, setting $x_h > 0$ is not penalized by any fines even though it is harmful to society. Since $h > 0$, society is necessarily worse off whenever the corporation sets $x_h > 0$.

If the manager is paid only a fixed salary, he maximizes his utility by choosing $x_b = x_h = 0$. The corporation solves the basic agency problem involving effort by making compensation depend on profits.

Proposition 1. *Let (x_b°, x_h°) be the activity levels that maximize the corporation's profits when there are no fines. Then the contract $Comp = S + \alpha^\circ \times \Pi_c$ with*

$$\alpha^\circ = \frac{2\beta}{\sqrt{\pi_b^2 + \pi_h^2}} \quad (6)$$

and $S = 0$ implements (x_b°, x_h°) and is the unique linear contract that maximizes the corporation's profits.

Proof: See appendix.

Absent external enforcement, the profit-maximizing levels of both activities are positive. Proposition 1 therefore underscores the challenge at the heart of our analysis: “good” internal governance, i.e., internal governance that fully aligns the manager with the corporation, ignores the social welfare effects of the harmful activity. Specifically, whenever the marginal profits of the harmful activity are greater than those of the beneficial activity, the compensation contract gives the manager incentives to push more resources into the harmful activity. With no external governance, optimally aligning the interests of managers with shareholders can amplify the harm to society that the corporation creates. Note that since S , the fixed salary component of the manager's compensation, is a constant, it will not affect the optimal choices of x_b and x_h . For that reason we will from now on ignore the fixed salary component in most of our analysis. We will only mention salary when we discuss situations where the corporation might need to increase S to satisfy the manager's participation constraint given changes in enforcement and the manager's outside options.

The results of Proposition 1 are illustrated in the Numerical Example below. We will use this example and its parameters to illustrate most of our results.

Numerical Example. Consider a simple numerical parametrization where $\pi_b = 4$, $\pi_h = 3$, $\beta = 0.01$, $b = 6$, and $h = 15$. In this case the profit-maximizing equity share is $\alpha^\circ = 0.004$, which leads to the optimal activity levels of $x_b^* = x_b^\circ = 0.64$ and $x_h^* = x_h^\circ = 0.36$. Corporate profits are $\Pi_c = 5$, and the manager's take home pay is $(0.004)(5) = 0.02$. This compensation more than offsets his disutility of effort, which is $\beta \times (x_b^* + x_h^*) = 0.01 \times (0.64 + 0.36) = 0.01$.

From a social welfare perspective, the harm caused to third parties by the harmful activity is $H = h\sqrt{x_h} = 15\sqrt{0.36} = 9$. This is much greater than the profits the corporation makes by engaging in this activity, which are $\pi_h\sqrt{x_h} = 3\sqrt{0.36} = 1.8$, and indeed is greater than total corporate profits of 5.

3.2 The Effects of Corporate-Level Fines

We will consider two types of fines. One is a variable fine that is equal to f_c times the total profits the corporation gains from the harmful activity. The other is a fixed fine equal to F_c that is imposed whenever the corporation sets $x_h > \psi$, where ψ is some threshold greater than or equal to zero. We will show that there are major differences between fixed and variable fines in how the corporation will respond to them and their effectiveness in deterring misconduct. How fines are set in practice is complex and both fixed and variable components may be involved. To gain intuitions how these components contribute or fail to contribute to deterrence we consider them separately.

3.2.1 Variable Corporate Fine

First consider a variable fine, where the fine is proportional to the corporation's profits derived from the harmful activity. Specifically, we assume that the corporate fine is equal to $f_c\sqrt{x_h}$.

Proposition 2. *Assume the fine is $f_c\sqrt{x_h}$. Let $x_h(\alpha, f_c)$ denote the manager's choice of x_h given α and $f_c \geq 0$. Then,*

- (1) *If $f_c < \pi_h$, misconduct is still profitable, and the manager's compensation can be set to maximize total profits and the shareholder's claim on profits given that a fine must be paid. This involves setting α above α° with the result that $x_h(\alpha, f_c) > x_h(\alpha^\circ, f_c)$.*
- (2) *If $f_c \geq \pi_h$, misconduct is not profitable and the optimal x_h is 0. The optimal level of α is $2\beta/\pi_b$ so that $x_b(\alpha, f_c) = 1$ and $x_h(\alpha, f_c) = 0$.*

Proof: See appendix.

Whenever f_c is less than π_h , profits will be maximized at a positive level of x_h :¹⁶

$$x_b^* = \frac{\pi_b^2}{\pi_b^2 + (\pi_h - f_c)^2} < 1; \quad x_h^* = \frac{(\pi_h - f_c)^2}{\pi_b^2 + (\pi_h - f_c)^2} > 0. \quad (7)$$

For a given level of α the existence of the corporate fine reduces the rewards to the manager pursuing the harmful activity. The manager's equity share must be increased above α° for him to make the choices that maximize total corporate profit. The choices made also maximize the value of the shareholders' claim on profits.

To see this point more clearly, recall that given the parametrization in our Numerical Example, the corporation set the manager's equity based pay with no fine at $\alpha^\circ = 0.004$. This is captured in Row (B) of Table 1 below. Now consider the introduction of a variable fine, $f_c = 0.4$. If the corporation leaves the manager's contract unchanged, then the outcome is captured in Row (C). The fine lowers the profitability of the harmful activity, and therefore decreases the manager's equity-based compensation. Given the "tax" on the returns to effort created by the fine, the manager's privately optimal response is to reduce the harmful activity from 0.36 to 0.26. This in turn reduces corporate profits and social harm. However, now that there is a fine in place, setting equity based pay at $\alpha = 0.004$ is too low to maximize both total profits and the shareholders' claim on profits, because the corporation is no longer compensating the manager enough for

¹⁶Recall that the rate of social harm h is measured *net* of any benefits that might be related to profits. This means that a fine that fully accounts for harm will necessarily be greater than π_h when $h > 0$.

Case	Misconduct profit rate	Manager equity (%)	Good activity	Misconduct	Total profits	Shareholders' claim	Social harm
(A) Misconduct Not Profitable	0.0	0.50%	1.00	0.00	4.00	3.98	0.00
(B) Misconduct Profitable	3.0	0.40%	0.64	0.36	5.00	4.98	9.00
(C) Fine of 0.4; No Equity Adjustment	2.6	0.40%	0.64	0.26	4.53	4.51	7.65
(D) Fine of 0.4; With Equity Adjustment	2.6	0.42%	0.70	0.30	4.77	4.75	8.17

Table 1: **Variable Corporate Fines, Equity-Based Pay, and Social Harm.** This table is based on the following numerical parametrization: $\pi_b = 4$, $\pi_h = 3$, $\beta = 0.01$, $b = 6$, and $h = 15$. Row (A) shows the corporation's optimal contract when misconduct is not profitable. Row (B) shows the corporation's optimal contract with no fine. Row (C) introduces a variable corporate fine of $f_c = 0.4$ while holding the contract fixed. Row (D) reports the corporation's optimal response to the variable corporate fine.

the disutility of effort. By increasing the manager's equity based pay to 0.0042 (Row (D)), the manager once again chooses the profit-maximizing level of effort and the shareholder's claim is also maximized despite giving up some equity. This adjustment in the equity share to account for the fine increases social harm.

This point is important, because it illustrates the interaction between frictions in external enforcement and internal corporate governance considerations that affect managerial compensation. It is not simply the case that managerial compensation might incidentally give the manager incentives to engage in misconduct. Rather, when external enforcement is inadequate, the managerial contract can be adjusted to reduce the impact of the fine, *making external enforcement even less effective than it might otherwise be.*

The optimal equity-based compensation is weakly increasing in the fine. For the case where the fine is equal to $f_c \times \sqrt{x_h}$, Figure 1 shows the additional harm created by this upward adjustment of α in the context of the parametrization from our Numerical Example. Figure 1 shows that as the fine increases from 0 to π_h , the corporation adjusts α upward from 0.4% to 0.5% to address the internal governance problem. This adjustment results in more harm than would be the case had the corporation kept α at 0.4%, the optimal value when no fine is imposed. In these situations internal governance actions that align the manager's interest with the shareholders clearly work against the interests of society at large.

3.2.2 Fixed Corporate Fine

We now turn to the case of a fixed fine that is imposed on the corporation when x_h exceeds a specified threshold ψ :

Proposition 3. *Fix $\psi \in [0, 1]$ and assume a fixed fine $F_c \geq 0$ is imposed iff $x_h > \psi$. Let $\Pi^\circ = \pi_b \sqrt{x_b^\circ} + \pi_h \sqrt{x_h^\circ}$ be the corporation's profits when there are no fines, and let $\Pi^\psi = \pi_b \sqrt{1 - \psi} +$*

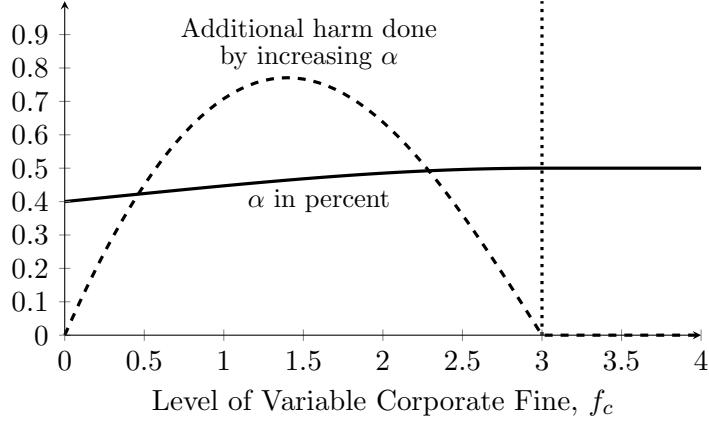


Figure 1: **Additional Harm as a function of increasing the profit percentage.** Updated optimal equity-based pay and resulting additional harm from fine-induced compensation adjustments for the parametrization $\pi_b = 4$, $\pi_h = 3$, $\beta = 0.01$, $b = 6$, and $h = 15$ for variable fines.

$\pi_h \sqrt{\psi}$. Then the corporation sets α such that

$$x_h = \begin{cases} x_h^\circ & \text{if } x_h^\circ \leq \psi, \\ x_h^\circ & \text{if } x_h^\circ > \psi \text{ and } \Pi^* - \Pi^\psi > F_c, \\ \psi & \text{if } x_h^\circ > \psi \text{ and } \Pi^* - \Pi^\psi < F_c, \end{cases} \quad (8)$$

and $x_b = 1 - x_h$. The equity share is equal to α° when $x_h = x_h^\circ$ and is equal $\alpha^\psi = 2\beta\sqrt{1-\psi}/\pi_b$ when $x_h = \psi$.

Proof: See appendix.

Proposition 3 shows that a fixed fine may be completely ineffective in reducing the level of the harmful activity. This will obviously be the case when $\psi \geq x_h^\circ$, but can also occur when $\psi < x_h^\circ$ if the fine is not too large. In that case the corporation simply treats the fine as a cost of doing business and maintains the same level of harmful activity. Only when $\psi < x_h^\circ$ and the fine is sufficiently high does the fine have an effect by causing x_h to be reduced to ψ to avoid the fine. In every case, there is a compensation contract that gives the manager the incentive to do what is optimal for the corporation.

Clearly, it would be optimal from a social welfare perspective to set the fine very high and set ψ equal to zero, but we know that the actual practice generally falls far short of that. It might seem that any steps taken in the direction of increasing F_c or lowering ψ would be welfare improving, but we now show that this is not necessarily the case. For a given level of F_c , lowering the threshold ψ can actually give the corporation stronger incentives to engage in the harmful activity and increase harm. To see this note that the decision to pay the fine is based on the difference between $\Pi^\circ = \pi_b \sqrt{x_b^\circ} + \pi_h \sqrt{x_h^\circ}$, the maximum level of profits before the fine is paid, and $\Pi^\psi = \pi_b \sqrt{1-\psi} + \pi_h \sqrt{\psi}$, the maximum level of profits when the fine is avoided. Whenever $\psi < x_h^\circ$, that difference *increases* when ψ is decreased and if the difference becomes large enough to exceed the fine, the corporation will be willing to pay the fine and increase x_h from ψ to x_h° . In other words, reducing the threshold for imposing the fine can lead to more harm.

The potential for reductions in ψ to increase harm is illustrated in Figure 2. Suppose that the corporate fine F_c is fixed at 0.25. When $\psi \geq x^\circ = 0.36$, the fine has no effect, because the

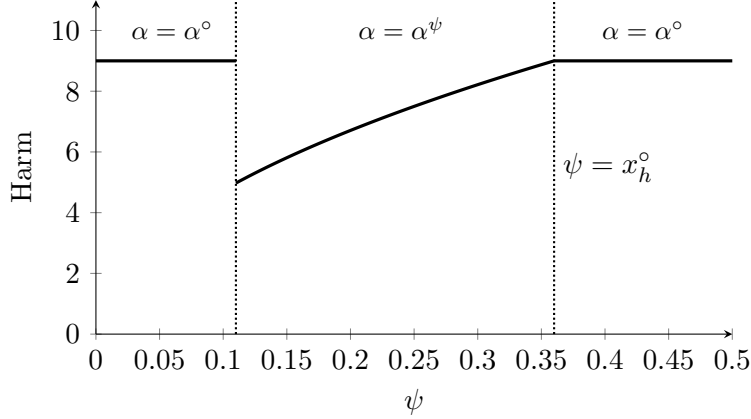


Figure 2: The level of social harm as a function of ψ , the threshold for imposing on the corporation a fixed fine F_c equal to 0.25. The underlying parameters are: $\pi_b = 4$, $\pi_h = 3$, $\beta = 0.01$, and $h = 15$, which implies that $x_h^\circ = 0.36$ and $\alpha^\circ = 0.4\%$.

corporation was already choosing a harmful activity level below the threshold for fines. When ψ is below x° but still relatively high, the loss in profits from reducing the harmful activity to the threshold level, Π^ψ , is small relative to the corporate fine F_c , so the corporation prefers to set $x_h = \psi$ and avoid paying the fine. However, as ψ is reduced, the profits the corporation forgoes by holding $x_h = \psi$ instead of choosing its unconstrained optimum x_h° (with associated profits Π°) grow larger. If ψ is below 0.10, the profit difference $\Pi^\circ - \Pi^\psi$ exceeds F_c , so it becomes strictly more profitable for the corporation to increase x_h all the way back to $x_h^\circ = 0.36$ and pay the corporate fine as a cost of doing business. In this region, tightening the liability standard by lowering ψ leads to more fines paid but also leads to *more* misconduct and *more* harm.

3.3 The Effects of Managerial Fines

As discussed earlier, imposing a sufficiently high fine on the corporation so as to make the misconduct unprofitable may not be possible or even desirable *ex post*. A large fine may lead to distress or insolvency and create various distortions and inefficiencies, and it can cause collateral harm to innocent parties such as uninvolved employees or customers. If specific individuals can be identified who have taken the harmful action on behalf of the corporations penalizing the individuals directly would appear to be a useful tool for deterrence. The US Department of Justice has repeatedly emphasized their intentions to increase individual-level liability for corporate misconduct and individual accountability is the main enforcement tool in jurisdictions such as Germany.

We now consider the effectiveness of fines imposed directly on the manager rather than on the corporation in our model. As we did for corporate fines, we will consider both variable fines and fixed fines. To keep things simple, for this section when specifying the compensation of the manager, we will ignore the constant term S , since doing so has no material effect on the analysis. As before, it may be necessary to adjust S to make sure that the manager's participation constraint is satisfied. Importantly, however, we maintain the assumption that S cannot be made contingent on the manager's choice of actions. We also restrict our attention to cases where fines are imposed only on the manager, not on both the corporation and the manager.¹⁷

¹⁷Several optimal deterrence papers have examined how to divide liability between the corporation and the

We begin by discussing how the corporation can adjust the fraction of the shares the manager receives α in response to manager-level fines. Later we consider the effects of the corporation insuring or indemnifying the manager as a way to shield the manager from the consequences of the misconduct.

3.3.1 Variable Managerial Fine

We begin with a variable fine equal to $f_m\sqrt{x_h}$ levied on the manager. As stated in Proposition 4, as long as the fine is not too large, the corporation can adjust the manager's compensation to partially offset the effects of the fine so that the manager chooses a higher level of the profitable but harmful activity.

Proposition 4. *Assume a fine of $f_m\sqrt{x_h}$ is imposed on the manager. Let $x_h(\alpha, f_m)$ be the manager's choice of x_h given (α, f_m) . There exists an $f_m^\diamond$ such that:*

- (1) *If $f_m < f_m^\diamond$, then the corporation can reduce the effect of the fine by setting $\alpha > \alpha^\circ$, which results in $0 < x_h(\alpha^\circ, f_m) < x_h(\alpha, f_m)$;*
- (2) *If $f_m \geq f_m^\diamond$, then the corporation cannot profitably reduce or eliminate the effect of the fine and it sets $\alpha = 2\beta/\pi_b$ and the manager chooses $x_h = 0$.*

Proof: See appendix.

The intuition behind Proposition 4 is that when a fine of $f_m\sqrt{x_h}$ is imposed on the manager, the harmful activity becomes less rewarding for the manager. The manager does cut back on the harmful activity, but at the level of α that the corporation establishes when there is no fine, the manager does not have the incentive to increase x_b to the point where the chosen activity levels sum to one. The manager needs a bigger fraction of the profits to motivate the profit-maximizing choices. The corporation therefore increases α , which in turn increases the attractiveness of the harmful activity for the manager and thus the chosen level x_h . Figure 3, which is based on the parameters given in our Numerical Example, illustrates this result.

Note that when a fine is imposed on the corporation, only a fraction α flows through to affect the manager, whereas a managerial fine is imposed fully on the manager and thus can potentially have a much stronger effect on the manager's incentives to choose a high level of harmful activities. A large enough (variable) managerial fine, misconduct will fully deter the misconduct.

3.3.2 Fixed Managerial Fine

We now consider a fixed fine, F_m , which we assume is imposed directly on the manager if the manager sets x_h greater than ψ . The manager's maximization problem when facing the fixed fine is:

$$\begin{aligned} \max_{x_b, x_h} & (\alpha \times (\pi_b\sqrt{x_b} + \pi_h\sqrt{x_h}) - F_m \times I_{x_h > \psi} - \beta \times (x_b + x_h)) \\ \text{s.t. } & x_b + x_h \leq 1 \end{aligned} \tag{9}$$

manager (Polinsky and Shavell, 1993; Argenton and van Damme, 2014; Deng, Goldman and Kahl, 2024). In our model, imposing liability on both the manager and corporation would generally increase deterrence. However, the results of this section coupled with the previous section show the steps that corporations could take to modify the manager's incentive contract may mean that the deterrence achieved by leveling a fine on both the manager and a fine on the corporation will be no greater than just leveling the fine on the corporation.

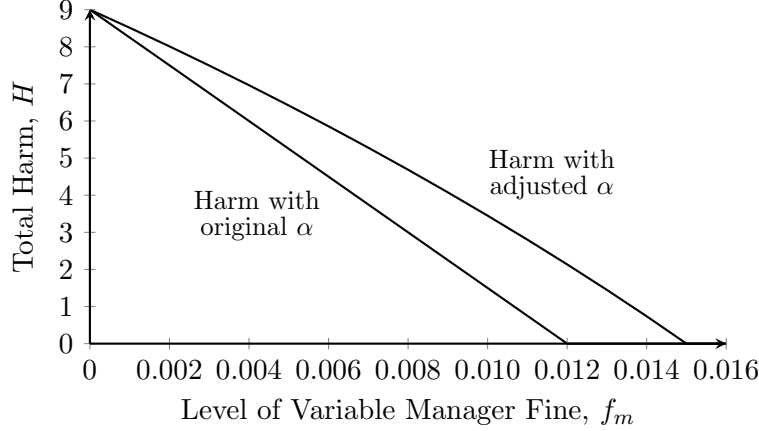


Figure 3: **Harm as a Function of a Variable Manager Fine and Equity Adjustment.** The plot shows the level of harm for a given level of a fine for both the original level of $\alpha = 0.004$ and for the optimal level of α for the parametrization $\pi_b = 4$, $\pi_h = 3$, $\beta = 0.01$, $b = 6$, and $h = 15$. This shows that the increase in managerial compensation leads to greater levels of harm.

where $I_{x_h > \psi}$ is the indicator function, which is equal to 1 when $x_h > \psi$ and is 0 otherwise.

Define U° to be the manager's utility when his equity share is α° , the activity levels are set equal to the profit-maximizing levels for the corporation, and the manager pays the fine if $x_h^\circ > \psi$. Define U^ψ to be the manager's utility when $\alpha = \alpha^\circ$ and $x_b = x_b^\circ$ but the manager avoids the fine by setting x_h equal to ψ .

$$U^\circ = \alpha^\circ \times (\pi_b \sqrt{x_b^\circ} + \pi_h \sqrt{x_h^\circ}) - F_m \times I_{x_h^\circ > \psi} - \beta \times (x_b^\circ + x_h^\circ) \quad (10)$$

$$U^\psi = \alpha^\circ \times (\pi_b \sqrt{x_b^\circ} + \pi_h \sqrt{\psi}) - \beta \times (x_b^\circ + \psi). \quad (11)$$

Note that when $x_h = \psi$, it is still optimal for the manager to set x_b equal to x_b° when $\alpha = \alpha^\circ$.

Proposition 5. *Assume that a fixed fine equal to $F_m > 0$ is directly imposed on the manager whenever $x_h > \psi$. Then*

- (1) *If $U^\circ \geq U^\psi$, the fine will have no effect. The manager will continue to set $x_h = x_h^\circ$.*
- (2) *If $U^\circ < U^\psi$, the fine may or may not have an effect.*
 - (a) *If the fine is not too large there will be an equity share for the manager α^{adj} that is greater than α° and less than 1, such that the manager with that equity share will maximize total corporate profits. If α^{adj} is not too large, it will be in the interest of the shareholders to make the adjustment. In this case the fine will have no effect and the level of harm will not be reduced.*
 - (b) *If there is no $\alpha^{adj} < 1$ that leads the manager to maximize corporate profits or if α^{adj} is so high that the shareholders are worse off making the adjustment, it will be optimal for the shareholders to set α equal to $2\beta\sqrt{1-\psi}/\pi_b$ which means that the manager will choose activity levels $\{x_b, x_h\} = \{1-\psi, \psi\}$ and avoid the fine. Only in this case will the fine have an effect.*

Proof: See appendix.

As was true with the corporate fixed fine, the managerial fine has no effect when $x_h^\circ \leq \psi$. In cases where $x_h^\circ > \psi$, the fine may be small enough that the manager will continue to set x_h equal to x_h° under the compensation contract that is optimal when there are no fine even though the manager must pay the fine. Under case (2) if F_m is not too large, the shareholders may find it in their interest to increase the manager's stake to α^{adj} to restore the incentives to maximize total corporate profits. However, in many cases this will be too costly for the shareholders since they must give up too large a portion of profits to bring this about.

To see how costly it can be for the shareholders to respond to a fixed managerial fine by adjusting α , consider the case of the corporate fixed fine that is illustrated in Figure 2. In that case F_c was equal to 0.25 and as shown in the figure when $\psi = 0.05$, the choice will be to set x_h equal to x_h° . The fine will be simply be seen as a cost of doing business and have no effect. Increasing F_c to a level much higher than 0.25 would produce a better outcome but, as discussed above, there are many reasons, such as fears of collateral harm, that limit the size of the fines imposed on the corporation.

Now consider what occurs when instead of a fixed fine of 0.25 imposed on the corporation, a fixed fine of 0.04 is directly imposed on the manager. This is a big managerial fine as it is *twice* the compensation the manager receives under the optimal compensation contract when there is no fine. When $\psi = 0.05$, the manager's α must be increased from 0.4% to almost 9.3% to restore incentives to set x_h equal to x_h° . This essentially means that the shareholders are giving up 0.44 in profits, i.e., $(0.093 - 0.004) \times 5.0$, to cover the manager's fine of 0.04. This is extremely costly; indeed it is much costlier than the corporate level fine of 0.25. The reason why it is so costly is because when α is increased to α^{adj} the manager gets a huge increase in compensation on *all* profits the corporation earns, not just the incremental profits realized by increasing x_h from ψ to x_h° . It can be shown that the costs to shareholders substantially exceeds the amount of the fine even when the fine is not very large.¹⁸

Instead of increasing α in response to enforcement through managerial fines, shareholders will almost always prefer to offset the manager's fine by promising cash payments to cover the fine to adjusting the equity-based compensation. We have assumed throughout that it would be illegal to make cash payments to the manager contingent on him engaging in misconduct, but including insurance and indemnification in managerial compensation contract may not be subject to these limitations. As we discuss below, these are mechanisms through which corporations undermine law enforcement directed at managers and reduce or nullify their potential deterrent impact.

3.3.3 Insurance and Indemnification

In the analysis in 3.3.1 and 3.3.2 of fines levied against the manager, we assumed that the corporation can only respond by changing α , the equity component of the manager's compensation. It will almost always be less costly for the shareholders to commit to pay the full amount of any fines imposed on the manager for engaging in misconduct that is profitable for the shareholders. Since the manager will not pay the fine, he will make the same choices he would make if no fines were imposed. This will be true no matter how the fine is calculated as long as the manager is fully covered.

¹⁸For example, when F_m is only 0.005, the shareholders must given up almost six times that in their profits to motivate the manager by adjusting his equity share.

In practice, managerial contracts routinely include provisions for substantial insurance and indemnification (Schwab and Thomas, 2006).¹⁹ Whereas it is not generally possible to insure managers against criminal charges, corporations can—and regularly do—insure and indemnify managers when managers face civil liability, and in some cases help them defend against criminal liability directly or indirectly. Indemnification effectively turns a managerial fine into a (often relatively small) corporate fine.²⁰ This observation illustrates again our general point: if law enforcement is imperfect, internal governance may be designed to exploit those imperfections and often in ways that are not all that costly for the corporation.²¹

The US Department of Justice has emphasized an increased focus on individual-level liability. In other jurisdictions (e.g., Germany), enforcement actions tend to focus on individuals and sanctions imposed on the corporation are limited. A narrow reading of the propositions 4 and 5 suggests that this approach could lead to better deterrence. By imposing liability directly on the manager, the government might achieve the same amount of deterrence with a much lower fine. However, this logic clearly depends on the manager not being protected by indemnification and insurance. Since indemnification and insurance are pervasive in managerial (and director) compensation, the benefits of relying more on managerial fines is extremely questionable. This illustrates the danger of ignoring internal governance responses to external enforcement mechanisms.

Of course, beyond imposing fines the state may be able to pursue criminal charges against the manager, which in serious cases may result in jail time. While the corporation might increase managerial pay to partially compensate for criminal penalties and make the manager willing to take this risk, the deterrence effects could be strong. However, in considering the potential for criminal prosecution to deter corporate misconduct, it should be noted that in most cases the bar for conviction is high. Governments have often been reluctant to prosecute executives for corporate misconduct and unsuccessful in achieving convictions and jail sentences when they do (Buell, 2024; Eisinger, 2017; Rakoff, 2021).²²

The difficulty in creating deterrence through criminal prosecution is partly due to the fact that corporations can and may well act to weaken these deterrent effects if they can reduce the likelihood of the manager being charged. When setting internal governance policies, it is in the corporation’s interest, to the extent it finds the misconduct profitable, to shield the manager from any legal consequences in order to realign the interests of the manager with the corporation. An example discussed in section A is Volkswagen, which paid to settle criminal charges against two executives, and the role of insurance and indemnification to shield against civil liabilities. As

¹⁹For example Alphabet has “entered into an indemnification agreement with each of our directors and executive officers. The indemnification agreements, our certificate of incorporation, and bylaws require us to indemnify our directors and executive officers to the fullest extent permitted by Delaware law.”

²⁰Indemnification involves the corporation paying the expense, whereas insurance involves a third party paying the expense. While there are some minor difference between the incentives provided by the two, we will treat them as equivalent for this section.

²¹It is important to note, of course, that insurance and indemnification also serve the important role of protecting managers and directors from frivolous lawsuits. Under Delaware Corporate Law, coverage must exclude any “deliberate criminal or deliberate fraudulent act” or “knowing violation of law,” DGCL 145(g). However, this exclusion only applies when the loss is established by a “final, non-appealable adjudication in the underlying proceeding in respect of the claim,” which rarely occurs. Mullin and Snyder (2010) formally model some roles that indemnification might play. They show that if the government can mistakenly prosecute innocent managers, indemnification can be beneficial if it transfers that risk from risk-averse agents to risk-neutral principals.

²²The recent cases of Elizabeth Holmes of Theranos or Sam Bankman-Fried of FTX are the exception that proves the rule. In both cases, the corporations were closely held startups that went into bankruptcy, and their outspoken CEOs provided unusually strong evidence that enabled prosecutors to achieve convictions.

discussed in Eisinger (2017), it is common for US corporations to cover high-cost legal defense for executives and for executives to coordinate their defense strategies with those of the corporation.

Throughout our analysis we have assumed that the manager experiences the same disutility of effort in pursuing either the beneficial or the harmful action at a given level. It could be objected that some managers may have moral qualms about the harmful action and experience more disutility in pursuing it. If the disutility associated with the harmful action is increased by these moral qualms, the manager will choose to pursue it at a lower level for any given compensation contract. However, just as the corporation can increase the manager's equity stake to induce him to engage in the harmful activity when the manager faces fines, the corporation can potentially adjust compensation to overcome some of the manager's moral qualms. While hiring managers with moral convictions can help improve social welfare, a corporation completely focused on profits would try to avoid hiring such a manager.

3.4 An Extension: When the Corporation Can Control the Rate of Harm

Up to this point we have assumed that the fine is based on the corporation's harmful activity level, x_h , either through variable or fixed fines. In this section we consider the possibility that the fine is explicitly based on the total harm caused, i.e., $H = h\sqrt{x_h}$. When the corporation only chooses the level of x_h , all the results of section 3.2 will essentially be the same if fines are based on $h\sqrt{x_h}$ instead of profits $\pi_h\sqrt{x_h}$ in the case of variable fines or to whether the harm exceeds some fixed level of harm $h\sqrt{\psi}$ in the case of fixed fines. In this section we assume that the corporation can reduce the harm not only by reducing x_h but also by taking *mitigation* actions that reduce the rate of harm, h . With this change it makes a significant difference how fines are defined. This is because tying the fine to total harm $h\sqrt{x_h}$ would potentially give the corporation incentives to lower both h and x_h .

Note that when fines are tied only to profits realized from misconduct or the level of x_h , there would be no incentive to reduce h . However, as we show below, when fines are insufficiently high, basing fines on $h\sqrt{x_h}$ can perversely increase the *total amount* of harm that occurs and reduce social welfare. This occurs even though the corporation is motivated to take actions that reduce the *rate* of harm h . To show this we consider the case where the fine is variable and imposed at the corporate level at an amount equal to $f_c \times h\sqrt{x_h}$. We assume that if the corporation takes no mitigating actions, the rate of harm be h_0 but by potentially incurring some costs the corporation can reduce the level to h_k with $h_0 > h_1 > h_2 > \dots > h_K > 0$. We begin by assuming that the actions that reduce the rate of harm are costless. The corporation's objective function is:

$$\max_{x_b, x_h, k} \left(\pi_b \sqrt{x_b} + (\pi_h - f_c \times h_k) \sqrt{x_h} \right) \quad \text{s.t.} \quad x_b + x_h \leq 1, \quad x_b, x_h \geq 0 \quad (12)$$

It is quite clear that when there is no cost to reducing the rate of harm, the corporation will choose k to minimize h_k , since this minimizes the fine imposed for any given level of x_h . Will this increase social welfare?

Consider the Numerical Example we have used throughout with $f_c = 0.15$. The baseline rate of harm is $h_0 = 15.0$, but the corporation can take mitigating actions to reduce harm by 10% or 20%. Thus, the possible rates of harm are $\{h_0, h_1, h_2\} = \{15.0, 13.5, 12.0\}$. Clearly, if x_h is held fixed, then reducing the rate of harm from 15.0 is unambiguously beneficial for society. However, the corporation's choice of mitigation also affects the corporation's optimal choice of x_h . The upper panel of Figure 4 shows the corporation's profits as a function of x_h for the three levels of h_k . The vertical lines indicate the profit-maximizing levels of x_h . Note that since in this example

mitigation clearly increases the level of profits, the corporation will be willing to incur some costs in reducing h as long as these costs are not too high.

Observe that since mitigation leads to lower fines for any given level of x_h , the profit-maximizing level of x_h increases with mitigation. Of course, at the same time, mitigation decreases the total harm caused at any *given* level of x_h . The lower panel of Figure 4 shows that given the corporation's profit maximizing incentives, the total harm, $h_k\sqrt{x_h}$, will increase when mitigation is possible. The dashed lines show the profit-maximizing levels of x_h for each level of h_k , and it is easily seen that the corporation's choice of x_h for each h_k means that total harm will increase as the corporation reduces the rate of harm. In this case, tying fines to harm increases the total harm caused relative to the base rate of $h_0 = 15.0$.

To understand the intuition behind this result it is useful to consider the intensive and extensive margins that determine the total harm. The rate of harm, h_k , defines the intensive margin, while the level of the harmful activity, x_h , defines the extensive margin. Making the fine depend on total harm, which in our model is $H = h_k\sqrt{x_h}$, encourages the corporation to choose a lower rate of harm, which moves the intensive margin in a socially beneficial direction. However, reducing the rate of harm means that the profitability of the activity, $\pi_h - f_c \times h_k$, increases, which leads the corporation to increase the level of the harmful activity x_h along the extensive margin. The total harm depends on how much the increase on the extensive margin offsets the intensive margin reduction. It is quite possible for total harm to increase.

We have assumed that mitigation is not costly. However, since profits increase when the rate of harm is reduced, it is clear that the corporation will be quite willing to take costly mitigating actions to reduce h to 13.5 or 12.0 as long as these actions are not too costly.

In an ideal world, f_c would be high enough to fully deter the harmful activity so that the corporation would set $x_h = 0$. However, when enforcement is weak and fines fall below these levels, tying fines directly to harm can produce the unintended consequence of actually increasing the total harm. This perverse outcome is not a mere knife-edge curiosity. Instead, whenever monetary sanctions are set too low, it is quite possible that the effect of well-intended policies will increase harm and decrease social welfare, underscoring again that the core problem is inadequate penalties.

4 Cooperation and Discounted Fines

Our analysis has so far considered a single period in which the total amount of harm was completely determined by the rate of harm h and the level of harmful activity, x_h . We also assumed that any misconduct was detected with certainty. This setting was sufficient for exploring how the deterrent effect of fines can be reduced by actions taken by the corporation, particularly ones that change the incentives of the decision-making manager.

In reality, corporate misconduct is rarely an event that occurs just once, but instead typically involves many decisions made over a long period of time. This means that a major determinant of harm is how long the harm remains undetected and is allowed to persist. Harms can remain hidden from both law enforcement and from victims for many months or years. Detection of misconduct often relies on chance events such as plane crashes, whistle-blowers speaking out, or media investigation (see, e.g., Dyck, Morse and Zingales (2010) on fraud). Some misconduct is only uncovered when a corporation defaults on debt obligations or files for bankruptcy (for example, as in the cases of Enron, Madoff, Theranos, and FTX).

Since detection and investigations are difficult and costly, authorities often encourage corporations to put in place compliance programs that would contribute to earlier or more detection.

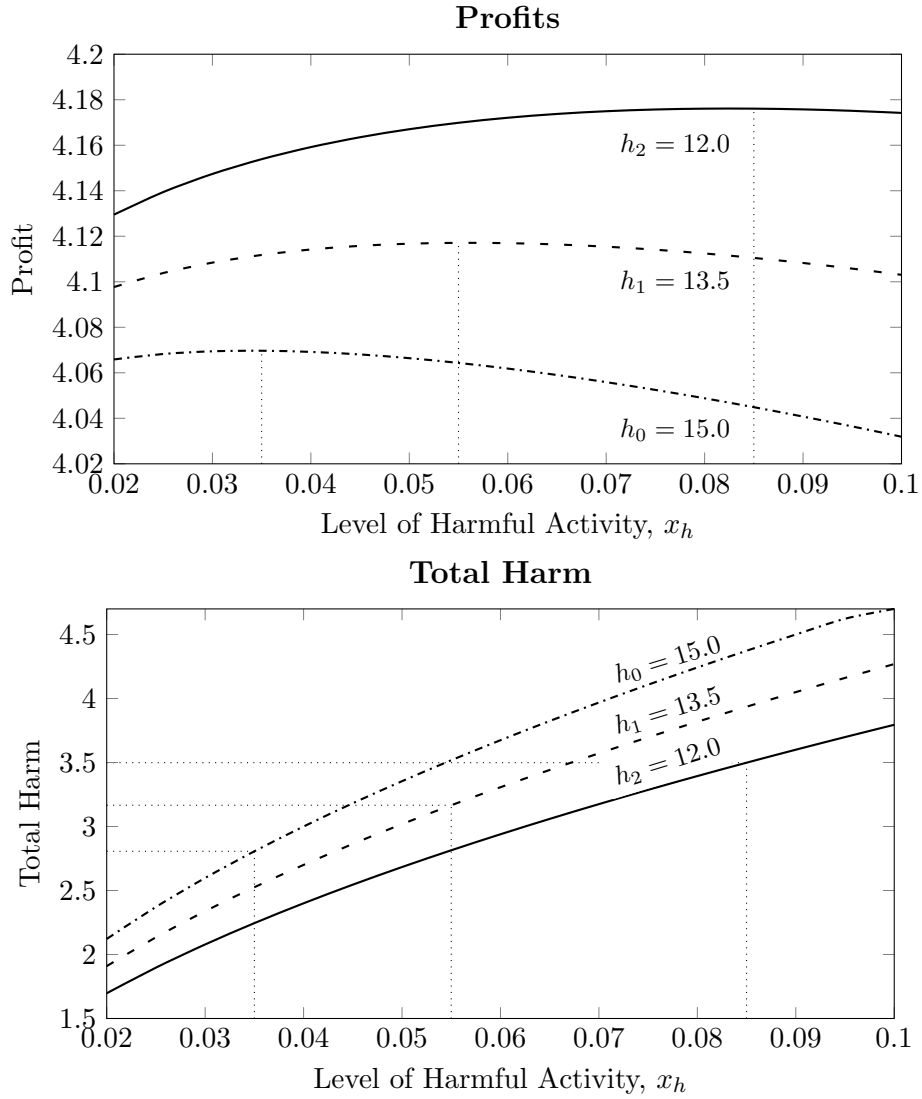


Figure 4: **Profits and Harm as a Function of a Harmful Activity with Mitigation.** For the parameters $\pi_b = 4$, $\pi_h = 3$, $\beta = 0.01$, $b = 6$, and $f_c = .15$, the upper plot shows corporate profits for $h_0 = 15.0$, $h_1 = 13.5$ and $h_2 = 12.0$ as a function of the harmful activity. The lower plot shows the total level of harm as a function of the harmful activities for the three rates of harm. The dashed vertical lines correspond to the profit maximizing levels of x_h .

They also encourage corporations to self-report misconduct to authorities. This encouragement takes the form of offering corporations discounted fines and reductions in other penalties and sanctions. To examine this possibility we develop in this section a multi-period model where in each period the probability of the harmful activity being detected is less than 1. We consider two ways that have been proposed or are already used in practice to increase the probability of detection and reduce the duration of harm.

The first approach that we examine involves encouraging corporations to voluntarily adopt a compliance program in return for reductions in fines when misconduct is detected. We assume adopting such a compliance program brings about changes in internal monitoring and increases in transparency that ultimately mean misconduct is more likely to be detected by the authorities. The second approach is an extreme form of this idea, where the corporation self-reports the misconduct, again motivated by a reduction in fines. If the reduction in the fine is significant enough to make self-reporting desirable for the corporation, the probability of detection is equal to 1 when self-reporting takes place. As throughout our analysis, our focus is on cases where the corporations and its shareholders benefit from the misconduct while society is harmed.

In the next two subsections we will analyze compliance programs and self-reporting in a multi-period setting. We restrict our attention throughout our analysis to the case where the corporation is subject to the variable fine f_c , and we modify the model in the following manner:

1. **Timing.** There is an infinite number of periods indexed $k = 1, 2, \dots$. Profits and the monetary value of harms occurring in period k are discounted to the present by δ^k with $\delta < 1$.
2. **Probability of Detection.** At the start of each period there is an exogenously given probability $\bar{p}$ that the corporation's misconduct will be detected if it has engaged in any misconduct and has done nothing to increase the probability of detection. (The specific steps the corporation can take to increase the probability of detection are discussed in Sections 4.1 and 4.2 respectively.)
3. **Fines.** If misconduct is detected at the start of period k , the corporation pays a fine based on current value of its total accumulated profits up through period $k - 1$:²³

$$F_k = f_c \sqrt{x_h^*} \times \frac{1 - \delta^{k-1}}{\delta^{k-1}(1 - \delta)}. \quad (13)$$

4.1 Voluntary Compliance Programs

In this subsection we extend the multi-period model to take into account the possibility that authorities offer discounts in fines to corporations that choose to implement compliance programs. Our model captures the idea that (1) some aspects of compliance programs are voluntary, (2) compliance programs will genuinely increase the probability of detection and a fine being incurred, and (3) implementing compliance programs can lead to discounts in fines. When we refer to voluntary compliance programs, the interpretation will include the anticipated reduction in fines.

We have three main results in this section. First, because voluntary compliance programs reduce the rate of the fine, they will generally increase x_h , the levels of the harmful activity in any period. Second, the effects of voluntary compliance programs on the expected total harm caused

²³We are assuming that when misconduct is detected, the fine imposed at that time is based on the *current* value at that time of all profits that were received by the corporation due to the misconduct. This means that the fine on profits received j periods before detection is grossed up by a factor of $1/\delta^j$.

by the misconduct are generally ambiguous — the programs may either increase or decrease total harm. Third, when the opportunity to engage in misconduct is only available in one period (rather than every period), offering discounts for voluntary compliance programs will never reduce the harm caused and can actually increase the harm.

Specifically, we add the following two assumptions to the multi-period model above to model compliance programs that improve detection of misconduct in exchange for discounted fines upon detection:

1. **Choice of Compliance Program.** The corporation can voluntarily implement a compliance program that *increases* the detection probability from $\bar{p}$ to some level $p \in (\bar{p}, 1)$.
2. **Discounted Fine.** If the corporation implements $p > \bar{p}$, the government reduces the fine from F_k to $(1 - D(p)) \times F_k$, where $D(p)$ equals 0 when $p = \bar{p}$ and is increasing over the range $p > \bar{p}$.

Note that we assume that the size of the discount increases in the effectiveness of the compliance program that the corporation implements in facilitating detection of misconduct. Implementing a voluntary compliance program presents the corporation with a tradeoff. If the corporation implements a program, it will increase the probability of detection, which *decreases* the expected number of periods the corporation can earn profits from misconduct. However, the discounts that motivate that program reduce the effective fine imposed on the corporation for any given level of misconduct, which *increases* the profitability of misconduct in any period wrongdoing has not been detected. This effect leads the corporation to increase the level of misconduct x_h above what it would be with no discount. There is thus an “extensive margin” and an “intensive margin” that work in opposite directions. Whether the program increases social welfare depends on which dominates. Critically, the program is *voluntary*, so the corporation will only implement the program if it expects to profit.

We first consider the conditions under which a corporation will voluntarily adopt a program. Define Π^M to be the maximum per-period profits the corporation can earn if it can engage in misconduct and the fine discount is $D(p)$:

$$\Pi^M = \pi_b \sqrt{x_b^*(D(p))} + \left(\pi_h - (1 - D(p))f_c \right) \sqrt{x_h^*(D(p))}, \quad (14)$$

where the optimal activity levels are functions of $D(p)$ and are equal to:

$$x_b^*(D(p)) = \frac{\pi_b^2}{\pi_b^2 + (\pi_h - (1 - D(p))f_c)^2}; \quad x_h^*(D(p)) = \frac{(\pi_h - (1 - D(p))f_c)^2}{\pi_b^2 + (\pi_h - (1 - D(p))f_c)^2}. \quad (15)$$

Note that in the infinite multi-period setting we are analyzing, the misconduct will be detected with probability 1 at some point as long as $\bar{p} > 0$. Thus, the corporation assumes that fines will be paid with certainty.

Since by assumption, $\pi_h > f_c$, we know that $\pi_h > (1 - D(p))f_c$ and $x_h^*(D(p)) > 0$. It follows that for any $D(p) \in [0, 1]$, $\Pi^M > \pi_b$, where π_b is the profit the corporation will earn if it does not engage in misconduct. So the optimal strategy for the corporation will be to engage in misconduct until it is detected, regardless of whether or not the corporation introduces a voluntary discount program.

Begin by noting that since $D(p) > 0$ whenever the corporation adopts a compliance program, it follows that for all $p > \bar{p}$:

$$x_h^*(D(\bar{p})) = \frac{(\pi_h - f_c)^2}{\pi_b^2 + (\pi_h - f_c)^2} < \frac{(\pi_h - (1 - D(p))f_c)^2}{\pi_b^2 + (\pi_h - (1 - D(p))f_c)^2} \equiv x_h^*(D(p)). \quad (16)$$

That is, introducing discounts for voluntary compliance programs *always* increases the per-period choice of the harmful activity. The only way introducing discounted fines in exchange for compliance programs can be socially beneficial is if the increased level of harmful activity is more than offset by the increased probability of detection.

The discounted value of the corporation's expected profits from engaging in misconduct is:

$$\sum_{k=1}^{\infty} \delta^k (1-p)^k \Pi^M + \sum_{k=1}^{\infty} \delta^k p (1-p)^{k-1} \left(\Pi^M + \frac{\delta \pi_b}{1-\delta} \right). \quad (17)$$

The first sum is the discounted value of all the profits earned in periods when the misconduct is not detected. The second sum accounts for periods when the misconduct is detected and the corporation gets both its final payoff from misconduct, Π^M , and the continuation value of the future stream on profits with no misconduct, $\delta \pi_b / (1 - \delta)$. The expected value in (17) can be simplified to:

$$\frac{\delta}{1 - \delta(1-p)} \times \Pi^M + \frac{\delta p}{1 - \delta(1-p)} \times \frac{\delta \pi_b}{1 - \delta}. \quad (18)$$

The present value of social harm based on the expectation of all misconduct is

$$\text{Present Value of Expected Harm} = \frac{\delta h \sqrt{x_h^*(D(p))}}{1 - \delta(1-p)}. \quad (19)$$

It can now be seen that the option of implementing a voluntary compliance program has an ambiguous effect on the expected harm. The increase the probability of detection, which makes earlier detection more likely, will reduce the denominator and, all else equal, reduce social harm. However, the discount in the level of the fines imposed when p is increased will increase the profitability of the harmful action, thereby increasing x_h^* and thus the numerator. If the effect of the increased probability of detection dominates, then voluntary compliance programs will reduce social harm. If instead the effect of the increase in the harmful action dominates, then voluntary compliance programs will exacerbate social harm. Regardless of the effect on the overall social harm, *voluntary* compliance programs lead to an increase in corporation's expected net profits from misconduct. If this were not true, the corporation would not voluntarily implement the program.

Equation (19) leads directly to the following proposition.

Proposition 6. *Offering a discount for the implementation of voluntary compliance programs has an ambiguous effect on total social harm.*

To illustrate the consequences of this ambiguity, consider the parameters in our Numerical Example used throughout ($h = 15$, $\pi_b = 4$ and $\pi_c = 3$). Assume that $\delta = 0.90$ and that the base-rate probability of detection is $\bar{p} = 0.4$. The corporation can take actions to increase p , and for every 0.05 in increase in p the fine is discounted by an additional 10%, but the maximum discount is 40%.

Table 2 shows the effect of various voluntary compliance programs when the fine is $f_c = 2$. The first row of the table shows the outcome if the corporation does not adopt a compliance program and the probability of detection remains at 40%. Each subsequent row shows a different level of compliance program that translates to an increased detection probability. As p increases, the expected duration of harm goes down, but the level of the harmful activity increases. The corporation chooses p to maximize its profits. In this example, $p^* = 0.6$, for which the corporation receives the maximum 40% discount on its fines. Even though the compliance program cuts the expected duration of profitable misconduct by a third, it leads the corporation to increase the harmful activity by nearly three fold, which more than doubles the corporation’s profits from misconduct.

p	Expected Duration of Harm	Discount on Fine	x_h^*	Profits Above No Misconduct	Expected Harm	Expected Harm If Mandatory
0.40	2.500	0%	0.059	0.241	7.118	–
0.45	2.222	10%	0.083	0.314	7.682	6.484
0.50	2.000	20%	0.109	0.389	8.109	5.953
0.55	1.818	30%	0.138	0.466	8.427	5.503
0.60	1.667	40%	0.168	0.543	8.656	5.116
0.65	1.538	40%	0.168	0.508	8.087	4.780

Table 2: **Voluntary Compliance and Social Harm** ($f_c = 2.0$). This table illustrates the effect of voluntary compliance programs on the expected duration of misconduct, optimal activity levels, corporate profits, and total expected harm.

Importantly, the compliance program increases the level of misconduct, corporate profits, and social harm because it is *voluntary*. That is, the corporation chooses the detection probability to maximize profits given the enforcement policy. If instead the corporation were *required* to implement a compliance program that resulted in a 60% probability of detection (without benefiting from a discount), the expected harm would be much lower, as can be seen in the last column of the table. Critically, therefore, it is the voluntary nature of the compliance program, which uses the discounts to provide incentives for the corporation, that can make relying on corporations to increase the probability of detection counterproductive.

Some enforcement policies in the real world capture the idea of a mandatory compliance programs. For example, power plants have mandatory hourly reporting requirements for key pollutants, and rather than being rewarded for having a functioning reporting regime, they are penalized for not having one in place. However, most corporations are not subject to such specific compliance and reporting requirements. Our results show that simply reducing fines in order to motivate corporations to detect and disclose misconduct with higher probability can makes matters worse if the misconduct benefits shareholders.

Voluntary compliance programs do not always increase social harm. In Table 3 we assume that the baseline fine level is lower, specifically that $f_c = 1$. In this case, the corporation’s profit-maximizing choice is again to set $p = 0.6$, entitling it to the 40% discount. The corporation will once again respond to the fact that the fine is lower by increasing the level of the harmful activity. Because the baseline fine is so much lower in this example, however, the gain from the discount is much lower than when the baseline fine was $f_c = 2$, so the harmful activity level increases by much less. In this case, therefore, the benefits from reducing the duration of the misconduct outweigh the costs of increasing the harmful activity level, so that the expected harm is lower. Again, a

mandatory compliance program with no discounts would be much better—and increasing the fine would be better still, as seen in Table 2.

p	Expected Duration of Harm	Discount on Fine	x_h^*	Profits Above No Misconduct	Expected Harm	Expected Harm If Mandatory
0.40	2.500	0%	0.200	0.924	13.125	—
0.45	2.222	10%	0.216	0.923	12.426	11.955
0.50	2.000	20%	0.232	0.925	11.829	10.977
0.55	1.818	30%	0.248	0.929	11.310	10.147
0.60	1.667	40%	0.265	0.935	10.853	9.433
0.65	1.538	40%	0.265	0.873	10.140	8.814

Table 3: **Voluntary Compliance and Social Harm** ($f_c = 1.0$). This table illustrates the effect of voluntary compliance programs on the expected duration of misconduct, optimal activity levels, corporate profits, and total expected harm.

It is also possible that the discounts offered are such that, relative to the exiting fine, the corporation will not voluntarily adopt a compliance program. Table 4 shows the same parameters with a fine of $f_c = 0.5$. In this case, the corporation will leave $p = \bar{p} = 0.4$, because the benefit of the discount on the fine is too small relative to the corporation’s costs from the lower expected duration of misconduct.

p	Expected Duration of Harm	Discount on Fine	x_h^*	Profits Above No Misconduct	Expected Harm	Expect Harm If Mandatory
0.40	2.500	0%	0.281	1.403	15.554	—
0.45	2.222	10%	0.289	1.325	14.370	14.168
0.50	2.000	20%	0.297	1.261	13.377	13.009
0.55	1.818	30%	0.305	1.207	12.531	12.025
0.60	1.667	40%	0.313	1.162	11.801	11.180
0.65	1.538	40%	0.313	1.085	11.026	10.445

Table 4: **Voluntary Compliance and Social Harm** ($f_c = 0.5$). This table illustrates the effect of voluntary compliance programs on the expected duration of misconduct, optimal activity levels, corporate profits, and total expected harm.

This analysis also calls into question the “best” policy choices. Offering discounts for voluntary compliance programs has no effect when the fines are already very low ($f_c = 0.5$), and has a small beneficial effects when fines are somewhat low ($f_c = 1$). However, when fines are relatively high ($f_c = 2.0$), offering discounts for voluntary compliance programs significantly increases social harm. That is, in the context of this example, offering discounts to encourage compliance programs is only justifiable if fines are set much too low. If that is the case, it would be better to simply increase the fines.

Ultimately, because voluntary compliance programs affect social harm on two margins, it is hard to make any accurate predictions about whether they can be expected to increase or decrease social harm.

Whereas in the above discussion we examined a multi-period model of misconduct, in some cases a one-period model is sufficient because the misconduct is a “one-off” opportunity available

to the corporation in a single period. Then we have the following stark result:

Proposition 7. *If the opportunity for misconduct is only available in a single period, compliance programs will either have no effect on the level of harm or will increase the level of harm.*

Proof: See appendix.

The intuition behind this result is straightforward. In a situation where the harm can only occur in one period, any increase in the probability of detection only increases the chance the corporation will pay the fine — it does nothing to reduce the *duration* of the harmful activity. The expected fine the corporation faces is $p \times (1 - D(p)) \times f_c$. The corporation will choose to engage in the voluntary compliance program only if there is a $p > \bar{p}$ such $p \times (1 - D(p)) \times f_c < \bar{p} \times f_c$. If no such p exists, the corporation will not voluntarily implement the compliance program and the possibility of implementing the program will have no effect. If there is a $p > \bar{p}$ that reduces the expected fine, the corporation will gladly implement the voluntary compliance program and increase x_h since doing so will make the misconduct more profitable net of the discounted fine. In this case the voluntary compliance program has the effect of *increasing* social harm.

Our discussion of compliance programs has focused on the corporation rather than manager. However, our results from Section 3 show that the corporation can, and will, adjust the manager’s compensation to align the manager’s decisions with the corporation’s profit calculations. If the corporation finds that “good” compliance (i.e., a higher p accompanied by a large discount) increases profits, it can generally ensure that the manager’s profit-based pay provides the incentives needed to choose the profit maximizing strategy. As with any external enforcement mechanism, the final outcome is determined by the corporation’s private trade-off between the cost of misconduct delivered through fines and sanctions and the profitability of harmful activity.

Finally, in our analysis of compliance programs in this section, we have assumed that they are effective in increasing the probability of detection. However, in some cases the corporation may create the *appearance* of an effective compliance program without meaningfully increasing the probability of detection as we assume in our model. In this case the compliance program will almost certainly increase harm since the discount will increase x_h which increases the numerator of (equation with harm) but will have little if any effect on increasing the denominator, since it does not materially decrease the expected duration of the harm.

4.2 Self-Reporting Programs

We now turn to enforcement policies that encourage corporations to self-report past misconduct by promising a reduction in fines. In the model of self-reporting we discuss below, we assume that in any period in which the corporation does not report its misconduct the probability of detection is fixed at an exogenously given level $\bar{p}$. If the corporation chooses to self-report in a given period, the probability of detection in that period jumps to 100%. In the voluntary compliance program we analyzed above the corporation makes a one time decision at the beginning whether or not to participate in the program. With self-reporting, the corporation must decide each period whether to admit its misconduct and pay a reduced fine or stay silent and gamble that it can get away with the misconduct for additional periods without being detected and having to pay the full fine.

Our results in this section mirror those of Section 4.1. First, discounts for self-reporting increase the corporation’s incentives to engage in the harmful activity. Second, the effect of offering discounts for self-reporting on the total harm caused by misconduct is generally ambiguous—self-reporting programs may either increase or decrease the total amount of harm caused. Third, when

misconduct is chosen only once (rather than every period), offering discounts for self-reporting will sometimes increase but never decrease harm.

We assume that at the beginning of each period the corporation can self-report misconduct that occurred in prior periods and we assume that all misconduct is reported. The corporation then will pay a *discounted* fine based on the current value of the profits it earned in prior periods due to misconduct. If the corporation does not self-report at the beginning of the period, then with probability $\bar{p}$, its prior misconduct will be detected and it will be required to pay the full amount of the fine. After the misconduct is either self-reported or by chance detected, the corporation cannot engage in any misconduct in that period or in any future period. If it does not self-report and misconduct is not detected this period, the corporation can continue to engage in and earn profits from the harmful activity until some future period when the misconduct is either self-reported or by chance detected. Formally, we add the following assumptions to the multi-period model:

1. **Self-Reporting.** At the beginning of each period k , the corporation can choose whether or not to self-report. If it self-reports, it reveals all misconduct from prior periods $1, \dots, k-1$ and must set $x_h = 0$ for period k and all subsequent periods. It will be required to pay a fine in period k equal to $(1-D)F_k$.
2. **Keeping silent.** If the corporation does not self-report in period k , then there is probability $\bar{p}$ that all its misconduct is revealed in another way. If misconduct is revealed, it again must set $x_h = 0$ for period k and all subsequent periods. In this case, however, it must pay the full fine of F_k . If the corporation is “lucky” and its misconduct is not revealed, something that occurs with probability $1 - \bar{p}$, it can engage in misconduct in period k , setting $x_h = x_h^*$ and earning higher profits than when $x_h = 0$.

To understand when the corporation finds it optimal to self-report, note first that the value of self-reporting in period k is:

$$\text{Report}(k) = \frac{\pi_b}{1-\delta} - (1-D) \times F_k. \quad (20)$$

Upon self-reporting, the corporation receives the period k present value of profits that are earned without engaging in misconduct from period k onward (the first term) but gets the benefit of paying the *discounted* accumulated fine (the second term).

The value of staying silent in period k and self-reporting in the subsequent period is:

$$\text{Silent}(k) = \bar{p} \times \left(\frac{\pi_b}{1-\delta} - F_k \right) + (1-\bar{p}) \left(\Pi(x_b^*, x_h^*) + \delta \times \text{Report}(k+1) \right). \quad (21)$$

If the corporation stays silent and gambles it will not be detected, then with probability $\bar{p}$ its misconduct is detected and it loses that gamble. It must pay the full fine and gets the present value of profits attained without engaging in misconduct thereafter (the first term). However, with probability $1 - \bar{p}$ it wins the gamble and evades detection. When undetected it can generate higher profits in that period equal to $\Pi(x_b^*, x_h^*)$, and then, assuming it self-reports the next period, gets the value of self-reporting in period $k+1$ discounted to period k .

The corporation will self-report in the first period k that $\text{Report}(k) > \text{Silent}(k)$. Note that as long as both $\bar{p}$ and D are greater than zero, this condition will be satisfied for some k since F_k grows without bound. Because the corporation will always self-report at some point, the expected fine from misconduct is smaller for a given choice of x_h under a self-reporting regime. It follows

that the corporation will always choose a higher level of the harmful action when discounts in fines for self-reporting are offered than when no discounts are offered. That is, because of the discount, self-reporting regimes always increase the corporation's level of harmful activity. Just as is true with the voluntary compliance programs, self-reporting operates on two margins. It increases the corporation's per-period level of the harmful activity, but decreases the expected duration of the harmful activity, which is socially beneficial. Once again the effects are ambiguous

Proposition 8. *Offering a discount for self-reporting has an ambiguous effect on total social harm.*

To see how self-reporting can either reduce or increase social harm, consider the Numerical Example we have used above: $h = 15$, $\pi_b = 4$, $\pi_h = 3$, $\delta = 0.90$, and $\bar{p} = 0.4$. Consider first the case where fine rate f_c is equal to 2.0 and the corporation receives a 50% discount in the accumulated fine if it self-reports. Panel (A) of Figure 5 shows the corporation's expected profits above what it would have realized if it never engages in misconduct (i.e., set $x_h = 0$ for all k) as a function of self-reporting in period k . In other words, these are the extra profits it obtains by engaging in misconduct and then self-reporting at a given period. The horizontal dashed line represents the corporation's expected profits if no discount is offered for self-reporting, in which case the corporation will engage in misconduct until it is caught.

The first period the corporation can self-report is period 2, when it reports its misconduct in period 1. Relative to never self-reporting, this increases the corporation's profits. However, from its perspective it pays for the corporation to gamble in period 2 and stay silent since a strategy of self-reporting in period 3 yields higher expected profits. In fact, this strategy yields the highest expected profits — staying silent and self-reporting in period 4 (and any subsequent period) is dominated by self-reporting in period 3, which is what the corporation will do.

Panel (B) of Figure 5 shows x_h^* , the amount of harm the corporation would do each period for the various self-reporting strategies it might follow. Note that x_h^* declines as the self-reporting period is put further in the future since staying silent longer increases the expected fine rate since the corporation is gambling more on not being discovered. The probability that it will be detected before it self-reports and be required to pay the full fine increases with each additional period it gambles on its misconduct not being discovered. The dashed line is the per-period level of misconduct the corporation would choose if no discount were offered for self-reporting so that the corporation will never self-report. The vertical line at 3 indicates the corporation's profit-maximizing choice of self-reporting period and harm.

Finally, Panel (C) of figure 5 shows the expected level of harm associated with each self-reporting strategy. The horizontal dashed line is the expected level of harm if no discounts for self-reporting are offered. Note that the self-reporting program would be beneficial if it meant that the corporation only engaged in misconduct in period 1 and self-reported in period 2. The reason is that, although the corporation sets x_h higher, the harm only persists for one period. However, as Panel (A) shows, the optimal strategy is for the corporation to self-report in period 3. Because the harm is expected to persist longer, self-reporting in period 3 increases the expected harm. Harm would be even greater if the corporation self-reports in period 4, because of the increased expected duration of harm. However, doing so results in lower profits than self-reporting in period 3 and thus is not the chosen strategy. The expected harm then declines if the corporation were to follow the suboptimal strategy of reporting in periods 5 and onward. These are due to the interplay between the reduction in x_h that comes with self-reporting later that is shown in Panel (B) and the increase in the expected duration of the harm.

The discussion above shows how a self-reporting regime can increase the harm caused. Table

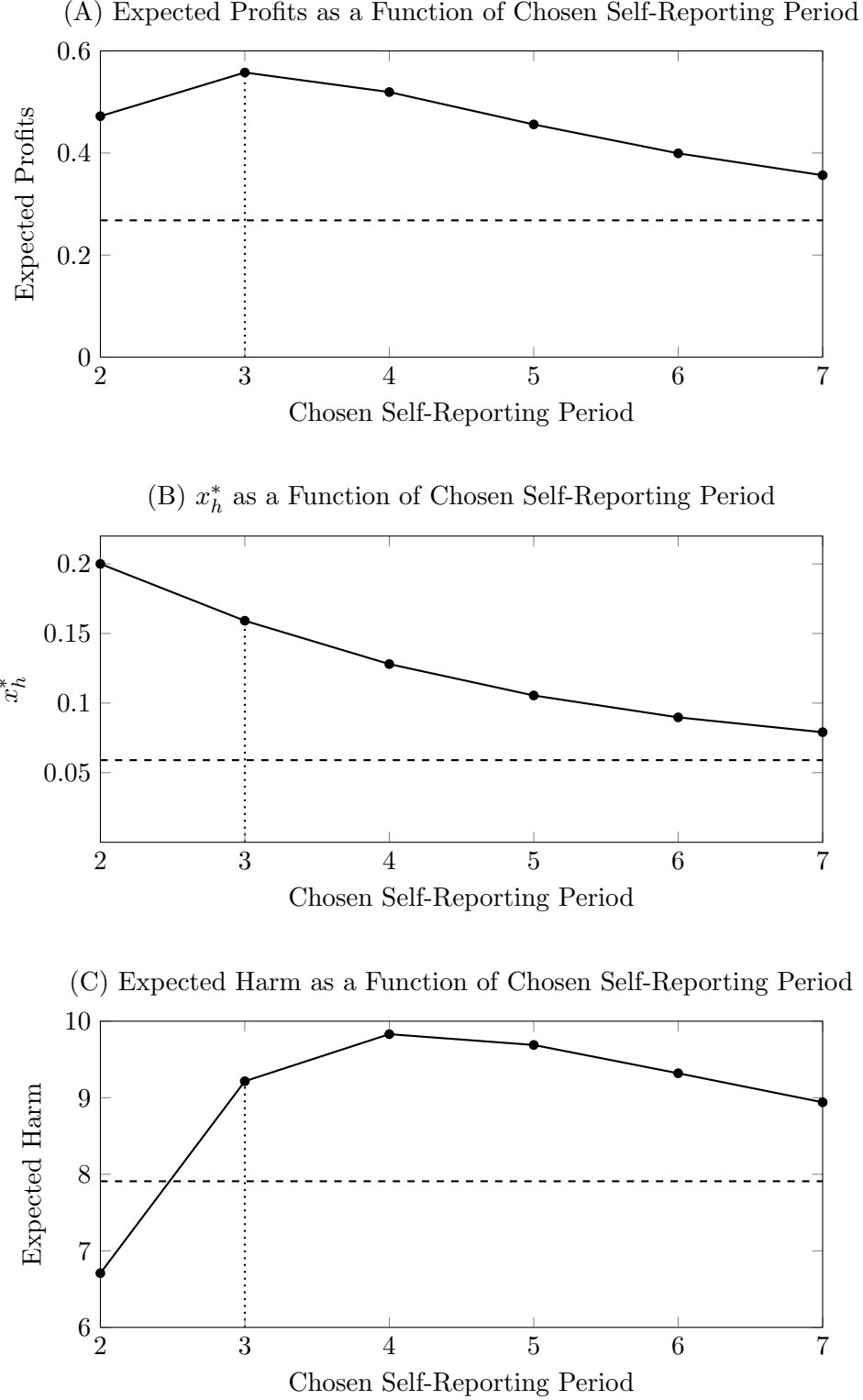


Figure 5: **Self-Reporting.** For the parameters $h = 15$, $\pi_b = 4$, $\pi_h = 3$, $\delta = 0.90$, $\bar{p} = 0.4$, $f_c = 2$, and $D = .5$. Panel (A) shows the corporation's expected profits from choosing a particular self-reporting period, maximized here at 3. Panel (B) shows the corporation's optimal choice of x_h as a function of the choice of self-reporting period. Panel (C) shows the total expected harm as a function of the chosen self-reporting period. In all three graphs, the dashed lines indicate the level when no discounts for self-reporting are offered.

Fine Rate	Self-Reporting Discount	x_h^*	Self-Reporting Period	Profits From Misconduct	Harm
2.0	0%	0.059	NA	0.268	7.909
2.0	50%	0.159	3	0.558	9.216
2.0	90%	0.254	3	0.971	11.636
1.0	0%	0.200	NA	1.026	14.583
1.0	50%	0.230	5	1.111	14.312
1.0	90%	0.278	4	1.293	14.475
0.5	0%	0.281	NA	1.559	17.283
0.5	50%	0.285	8	1.570	17.190
0.5	90%	0.299	6	1.616	17.025

Table 5: **The Effect of Self-Reporting Discounts on Misconduct and Social Harm.** This table reports the corporation’s profit-maximizing self-reporting period, per-period level of misconduct (x_h^*), net profits, and total expected social harm across different baseline fine rates and leniency discounts.

5 shows the corporation’s choice of the level of the harmful activity and self-reporting period as a function of the underlying fine rate (2.0, 1.0, and 0.5) and self-reporting discount (0%, 50%, and 90%). Figure 5 and the discussion above is based on a fine rate of 2.0 and a self-reporting discount of 50%, shown in row two. The third row of Table 5 shows that a self-reporting discount of 90% would cause far more social harm than not offering a discount at all when the $f_c = 2$.

Now consider a fine rate of 0.5. When there is no discount for self-reporting, the first row shows that the corporation engages in the profit-maximizing level of misconduct until misconduct is detected. The second row of the table considers a 50% discount for self-reporting. The lower fine rate (0.5 instead of 2.0) means that a 50% reduction results in lower benefits to the corporation of self-reporting. This means that the corporation waits longer, and does not self-report until period 8. Moreover, because it is unlikely that the corporation will actually make it to period 8 (there is a 97.2% chance that the corporation will be caught before that), the corporation increases x_h , but by much less than when the fine was 2.0. The final column of the table shows that the effect of a 50% self-reporting discount is that the benefits from the decreased expected duration of harm are greater than the costs of increased x_h , so that total expected harm goes down. A 90% discount would lower it even further.

Table 5 also calls into question the “best” real-world policy choices. Offering discounts when fines are low (0.5 or 1.0 in this case) has a small beneficial effect on reducing social harm. Offering discounts when fines are relatively high (2.0) significantly increases social harm. In the context of this example, self-reporting regimes are only justifiable if fines are set much too low. If that is the case, it would be much better to simply increase fines.

Because discounts for self-reporting work on two margins, predicting their effects in a particular situation seems to require much more knowledge than those designing policies are likely to have. This makes it even more difficult—if not impossible—to say whether a general policy would increase or decrease social harm.

Whereas in the above we considered a multi-period model of misconduct, in some cases a one-period model is sufficient because the misconduct is a “one-off” opportunity available to the corporation for a single period. In this case, we have the following result that, like Proposition 7 is stark.

Proposition 9. *If the misconduct opportunity will only be available in a single period, offering*

a discount for self-reporting never reduces the harm caused from the misconduct and may in fact increase the harm.

Proof: See appendix.

The intuition is straightforward. Self-reporting is always voluntary, so corporations will only self-report when the fine following the self-reporting is less than the expected fine from not reporting. If the discount is not large enough to encourage self-reporting it will have no effect. If instead it is large enough to encourage self-reporting, it will lower the expected costs of misconduct, so the corporation will increase the level of the harmful activity.

Kaplow and Shavell (1994) also looks at self-reporting, although in a different context than the one we examine. In the situations they analyze they find that self-reporting can be beneficial because it potentially lowers enforcement costs. We have not explicitly incorporated enforcement costs into our analysis. It is clear that if those costs are significant, they should be accounted for in assessing the *total* welfare implications of various approaches since enforcement costs do reduce welfare. What our analysis shows is that any assumed reductions in enforcement costs must be weighed against the potential for the counterproductive increases in harm that can occur when significant discounts are promised to encourage self-reporting. Since these harms can be significant, it should not be assumed that self-reporting programs can be justified simply on the basis of reducing enforcement costs.²⁴

In some cases, the effect of self-reporting by corporations is to move penalties off of the corporation and on to individuals. Indeed, this is the motivation of much of the DOJ’s enforcement policies in the US. However, if self-reporting transfers liability onto the manager, the corporation can simply adjust the manager’s compensation structure as we showed in Section 3.3. In fact, as we discussed in Section A, it is extremely rare for high-level managers to face liability. Key decision makers in the corporation may not bear any costs when capturing the discount if they are able to “throw under the bus” employees who are purported to be “bad apples,” as happened in the Boeing case discussed in section A.

5 Concluding Remarks

We have shown that when law enforcement is weak, standard corporate governance practices may make imperfect law enforcement even less effective. When misconduct is profitable, corporations can proactively undermine—and often fully offset—the deterrent impact of fines imposed directly on the corporation or on managers acting on corporation’s behalf. We have also shown that providing incentives for corporations to cooperate with enforcement authorities by offering significant reductions in penalties in return for establishing voluntary compliance programs or self-reporting misconduct may increase the amount of harm that corporations cause.

Our results highlight the limitations of imposing financial penalties on the corporation when those penalties are constrained by the law or limited by concerns about the collateral consequences of heavy fines. One approach that might allay concerns about collateral damage would require corporations to issue new equity to pay fines so that shareholders, and not other stakeholders or other parties, are most affected (Atkinson, 2026). Financial consequences may also have limited effectiveness in deterring misconduct given the ability of corporations to avoid liability through

²⁴Relatedly, Motta and Polo (2003) show that offering leniency for a cartel member who reports on other cartel members can make enforcement more effective in some cases, but also may foster collusion by lowering the expected cost of misbehavior.

strategic bankruptcy. Removing the tax subsidies of corporate debt would also limit corporations' ability to avoid liability (Jacoby, 2024; Admati and Hellwig, 2024). Future research should examine ways to limit the use of bankruptcy and other strategies that can shield corporations and their decision makers from the consequences of their decisions and undermine deterrence.

Throughout our analysis we assumed that internal governance policies are primarily designed to ensure that decisions are made to maximize profits and the share price, and we examined how this type of internal governance affects the deterrence effectiveness of various law enforcement policies. Various ideas have been proposed such as using ESG (Environmental, Social and Governance) targets and declarations of corporate purpose to reduce the overwhelming focus on maximizing share valuation and potentially promote the welfare of others. We are very skeptical that these approaches can play a significant role in reducing harmful misconduct as long as corporate objectives are mainly focused on increasing share value. We are not aware of any compelling evidence showing that ESG targets have brought about meaningful social benefits. Nevertheless, it is important to study any potential changes to internal governance that might reduce harm. Even if the focus of internal governance is changed to put less emphasis on profit maximization, our analysis suggests that interactions between internal and external governance will remain important and the design of external governance policies should take them into account.

We have focused on the incentives of corporate leaders since, as decision makers, they often play key roles in determining whether and how corporate misconduct occurs and how it might be prevented. Enforcement efforts aimed at corporate directors and executives would seem to offer opportunities to deter misconduct. As we have observed, however, corporations can sometimes neutralize financial penalties directed at leaders through indemnification and insurance. Since it is more difficult for corporations to shield individuals from the consequences of criminal convictions, perhaps the most powerful way to deter serious corporate misconduct is to impose criminal liability on individuals in leadership roles. Leaders who are able to ensure compliance with the law but benefit from misconduct must be held accountable. They should not be allowed to use "willful ignorance" strategies to shield themselves.

Requiring changes to internal governance mechanisms is another possible approach to deterring corporate misconduct. For example, the board of directors plays a central role in internal governance, and it has a duty to ensure the corporation obeys the law. Finding ways to create incentives for the board to fulfill its duties in this regard is worth further study.²⁵

Whereas our model considers a corporation with a single manager, large corporations have hierarchies with many layers of decision makers and complex flows of information. The Wells Fargo fraudulent accounts scandal illustrates how aggressive incentive structures put in place by corporate leaders can drive widespread misconduct among low-level employees. Further research is needed to address how to increase deterrence in cases where misconduct is determined by the incentives of many decision-making agents in a corporation. This would include exploring ways to strengthen the effectiveness of whistleblower policies.

Our analysis focused on cases where law enforcement is weak. Of course, enforcing laws only benefits society when the laws are appropriately written in the public interest. External governance is less effective, and enforcement of the law can even be harmful, when the laws are distorted away from the public interest. It is well known that corporations can, through lobbying

²⁵For example, Pfleiderer (2020) shows how misconduct could be better deterred by requiring, especially in cases of recidivist corporations, that the board of directors include a director who substantially benefits when the corporation does not incur fines for misconduct but receives no benefit from increases in corporate profits. This would result in a director with high-powered incentives to expose and halt corporate misconduct, which would enhance external enforcement.

and other mechanisms, influence how laws are written and how they are enforced. A better understanding of how internal corporate governance affects social welfare requires accounting for the numerous ways that corporations interact with governments and influence external governance.

Ultimately, our findings challenge a view that seems to be implicitly held in much of the research conducted in corporate governance and corporate finance. In that view, shareholder value maximization and legal compliance are seen and treated as distinct and unrelated problems. Standard finance theory assumes that optimal contracting maximizes social welfare because external laws effectively price externalities. We show that once realistic imperfections in enforcement are taken into account, the assumption that optimal contracting maximizes social welfare collapses. Instead, the very mechanisms designed to mitigate agency conflicts within the corporation often exacerbate the conflict between the corporation and society. Standard governance practices can transform corporate efficiency into a driver of social harm.

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A Institutional Background and Illustrative Examples

There are many laws that place restrictions on what corporations can do and establish requirements for what they must do.²⁶ In the US, corporations can be held criminally liable for breaking certain laws, including for any crime committed by any of their employees in the scope of employment.²⁷ Laws are accompanied by enforcement mechanisms that specify who might take action, as well as the process of adjudication and any consequences if a corporation breaks the law. In most cases the consequences of enforcement actions brought against corporations are determined by out-of-court settlements, which include Deferred Prosecution Agreements (DPAs), Non-Prosecution Agreements (NPAs), and civil settlements.²⁸ The extensive use of DPAs and NPAs in the US, which has increased dramatically in the last two decades, has been criticized as ineffective for deterrence.²⁹

Corporations obviously cannot be incarcerated. The maximum criminal and civil penalties for a corporation may also be quite small, as illustrated by the case of PG&E’s criminal cases (discussed below) and by restrictions on corporate penalties in Germany and elsewhere. Given that fines are often formulaic, they often fail to account reliably for either the social harm or the private benefits the corporation gained from the misconduct (Alexander and Cohen, 2015). As discussed earlier, authorities may significantly reduce fines and other sanctions on corporations because of concerns about the potential collateral consequences or for other reasons. In addition, fines may be insufficiently adjusted to account for the time value of money given the often substantial lag between the occurrence of misconduct and the payments of fines (Atkinson, 2023*b*).

As discussed in the introduction, fines and other sanctions may be substantially reduced for a corporation charged with misconduct if the corporation had established a compliance program and is otherwise seen to be cooperating with authorities. Both the US Sentencing Guidelines and Department of Justice Policy call for substantial reductions for corporations that self-report or have effective compliance programs. Cooperation with authorities can also enable corporations to avoid prosecution or having to plead guilty to misconduct, thus avoiding costly private litigation and reducing substantially the costs to the corporation of misconduct.

Providing incentives for corporations to help law enforcement through voluntary compliance and self-reporting is a common approach by the US Department of Justice (DOJ). In a May 2025 speech, for example, the Head of the Criminal Division emphasized the generous benefits companies can obtain from voluntary self-reporting, and specifically promised that such cooperation will lead in most cases to the DOJ declining to file any charges. Related practices were recently announced by the Serious Fraud Office in the UK. As mentioned, our analysis shows that one cannot assume that these programs necessarily help reduce the harm to society from corporate

²⁶Corporate law, under which corporations are created, focuses on the rights and responsibilities of directors, executives and shareholders. Securities laws aim to protect investors and in doing so help corporations raise funding. The legal environment in every jurisdiction in which a corporation operates includes numerous other rules. These include those concerning property, contract, bankruptcy, antitrust, torts, tax, labor, environmental, consumer protection, civil rights, anti-discrimination, anti-bribery, anti-money laundering, human rights, and speech. Some sectors such as banking, utilities, defense, food and drugs, aviation, mining, housing and media, also have specialized rules to ensure safety and to protect the public.

²⁷This “vicarious liability” refers to the doctrine of respondeat superior, see Thomas (2021) for a discussion of the issues controversies related to corporate criminal liability and the vicarious liability doctrine. In other jurisdictions (most notably Germany), it is essentially impossible to charge corporations of crimes.

²⁸Two sources on corporate misconduct and their legal consequences for corporations are the Corporate Prosecution Registry (<https://corporate-prosecution-registry.com/>) and the Corporate Violation Tracker (<https://violationtracker.goodjobsfirst.org/>).

²⁹See Garrett (2014) Garrett (2020), Taub (2020), Rakoff (2021), and Byars (2025).

misconduct. The voluntary nature of this cooperation can backfire and actually increase harm when misconduct is profitable.

Our model is mostly aimed at capturing the effects of law enforcement by public authorities. In some cases private actors, including victims of corporate misconduct and shareholders who claim to have suffered losses, can sue the corporation and its officers and directors. Shareholders can sue in a number of ways. For example, they can sue under US securities laws that are meant to ensure proper disclosures. Such lawsuits are viewed by many as highly inefficient and not an effective way to deter securities fraud (see e.g., Bratton and Wachter, 2011). Corporate law also allows shareholders to sue directors and officers for failure of oversight, but shareholders have little incentive to file such lawsuits in cases where misconduct is profitable and the shareholders actually benefit. Lawsuits by shareholders against directors and officers are often dismissed if it is established that the corporation had a “sufficiently” effective compliance program (Shapira, 2024).

Whereas lawsuits can be brought against the corporation and its officers by other stakeholders, the right to take legal action against corporations is often limited. For example, customers and employees routinely sign away their legal rights and agree to use opaque private arbitration processes to settle claims against corporations (Estlund, 2017). The US Supreme Court has also limited corporate liability in a variety of ways (Pollman, 2021). Even when private enforcement actions are deemed successful, misconduct may still be profitable (see, e.g., Shapira and Zingales, 2023). Overall, private enforcement actions generally have quite limited value in the deterrence of corporate misconduct.

For the type of profitable misconduct this paper focuses on, it is exceedingly rare for individuals, particularly for directors and executives, to face meaningful criminal liability. Buell (2024) examines recent cases and shows that the government has been largely unsuccessful in most of these cases, partly because of the high bar necessary to show personal intent to commit crimes. Eisinger (2017) and Rakoff (2021) conjecture that the focus on corporate settlements and the reluctance to bring cases against individuals since the early 2000 are likely related to constrained resources and to the career incentives of prosecutors.

Managers also tend to be shielded from civil liability in cases of corporate misconduct. Given the way laws are written and given the ubiquitous use of insurance and indemnification, officers and directors, who are the key decision makers, rarely face meaningful consequences for corporate misconduct (Black, Cheffins and Klausner, 2005; Baker and Griffith, 2019).

Another possibility in cases where misconduct and harm are particularly salient is that corporations, or their executives and board members, incur reputational losses that affect their profits or future opportunities. Given the frequency at which corporate misconduct occurs, the deterrent effects of reputational losses appear to be limited.

Some of the key issues around law enforcement and corporate misconduct are illustrated through the three well-known cases of Pacific Gas and Electric, Boeing, and Volkswagen, corporations that broke laws and caused great harm. We discuss these cases briefly below. Similar elements can be seen in many other examples, such as General Motors, HSBC, Purdue Pharma, many banks involved in Cum-Ex tax fraud, and others.

Pacific Gas and Electric (PG&E) is a publicly traded Northern California Utility.³⁰ Following a 2010 explosion of a gas pipeline that killed eight people and injured 58, a jury found PG&E guilty of five violations of the Natural Gas Pipeline Safety Act in late 2016. The corporation paid only a \$3 million fine. The sentence required PG&E to maintain a monitor for five years of probation starting in January 2017.

³⁰Blunt (2022) gives more details on the history of PG&E.

In 2017 and 2018, wildfires caused enormous harm and many deaths throughout California. In June 2020, PG&E pleaded guilty to 84 counts of manslaughter related to criminal negligence caused by its poorly maintained equipment that played a major role in the 84 deaths associated with the 2018 fire. The company paid only \$3.4 million (\$41,667 per lost life), which amazingly was the maximum penalty that could be imposed. The presiding judge noted that a natural person found guilty of 84 manslaughter charges would normally be sentenced to 90 or more years in jail. No individual associated with PG&E was charged with any crimes either in the context of the 2010 explosions or related to the 2018 fire.

When PG&E’s monitorship for the federal crimes related to the 2010 explosion ended in January 2022, the federal judge overseeing PG&E expressed strong criticism of the company’s behavior, noting that during the five-year probation, PG&E was responsible for multiple catastrophic wildfires, leading to significant loss of life and property damage. The judge described PG&E’s actions as a “crime spree.” The company continued to face litigation, agreeing in April 2022 to pay more than \$55 million to avoid criminal prosecution for two major wildfires sparked by its aging power lines in 2019. A civil lawsuit against former PG&E executives and board members in 2022 was settled for \$117 million, fully covered by the Directors and Officers liability insurance paid for by PG&E.

PG&E was able to reduce its legal liabilities towards victims through Chapter 11 bankruptcy, while shareholders retained positive equity. This case illustrates how bankruptcy can be used strategically as a way for corporations to manage litigation risk, as well as how it can lead to inefficient and unjust outcomes for victims of misconduct or tort harm.³¹

Another revealing example involves safety issues at Boeing, a US corporation long considered a “national champion.” In selling its 737 Max planes Boeing made false statements to the Federal Aviation Authority and to purchasing airlines about safety and the training necessary for pilots to fly the new plane. Two plane crashes, one in 2018 and the other a few months later in 2019, resulted in 346 deaths. After the first crash, Boeing’s CEO asserted that the plane was safe, and it continued to operate for some time in the US and other countries (Robison, 2022).

In 2021, the Department of Justice (DOJ) settled charges with Boeing in a Deferred Prosecution Agreement (DPA). Whereas the headline figure was \$2.5 billion, less than 10% of the total amount was a criminal penalty. The rest of the settlement consisted of \$1.77 billion to be paid to airline companies that had bought the planes and \$500 million to establish a fund for crash victims. The settlement, which was coupled with Boeing’s promise to improve its compliance program, has been criticized by legal experts (see e.g. Coffee, 2022). However, Boeing continued to be plagued with safety issues and after the DOJ determined that it violated its promises under the settlement agreement, Boeing pleaded guilty in July 2024 to a felony charge of conspiring to defraud the federal government, and it agreed to pay \$487.2 million and to further strengthen its compliance and safety programs. Yet, in May, 2025 the DOJ announced a Non-Prosecution Agreement that did not include a felony guilty plea. As a judge approved the agreement in November 2025, he noted that he had no authority to deny the request to dismiss the charges even as he disagreed with DOJ that doing so is in the public interest.

Boeing received “cooperation credits” when negotiating penalties with DOJ both on the basis of promising better compliance and by also promising to cooperate with DOJ regarding potential law violations by its employees. It ostensibly made an effort to meet the latter commitment by providing information that led to criminal charges against former test pilot Mark Forkner on four counts of wire fraud. A jury in federal district court in Texas deliberated less than two hours

³¹Jacoby (2024) discusses the problems with how US bankruptcy process and its implementation treat victims, and Admati (2025) mentions the case of PG&E, described in more detail in Blunt (2022).

before finding Mr. Forkner not guilty on any of the counts. Had the DOJ relied on its own investigation to find individuals who may have been responsible for Boeing’s misconduct, it may have been able to hold higher level executives accountable.³²

As for Boeing’s directors, a shareholder lawsuit against them related to Boeing’s oversight of the 737 MAX’s design and development was settled for \$237.5 million. However, the company took pains to note that “the settlement will be entirely paid by insurers rather than by Boeing or by its officers and directors.”

In the so-called Dieselgate scandal, Volkswagen, the German car manufacturer, used special sensing equipment and software (called the “defeat device”) to fraudulently manipulate the results of emissions tests on vehicles that it sought to market as “clean diesel.” These deceptions resulted in VW vehicles emitting 40 times the legal limit of nitrogen oxides during normal driving, causing smog, respiratory disease and premature deaths. Volkswagen started using the “defeat device” in 2006 and over the years it was fraudulently used on many millions of cars of different models sold in many countries. It was not until 2014 that a team of researchers at West Virginia University uncovered evidence that created suspicions about Volkswagen meeting the clean air standards. As authorities started investigating, Volkswagen did not come forward but instead denied the allegations. Its executives destroyed evidence and sought to cover up the misconduct, and they tried for a long time to falsely put the blame a small group of low-level employees (Ewing, 2017).

Enforcement actions against Volkswagen and some of its executives and other agents started in the US in 2015, but reactions to the scandal in Europe were very slow to emerge. The severity of the penalties and sanctions has varied greatly across jurisdictions.³³ Some cases have not been resolved, including against the former CEO. In some cases charges were brought against relatively low level employees considered by some to be scapegoats. At the same time, Volkswagen shielded two executives by paying €9 million (about \$10 million) to settle *criminal charges* against them for market manipulation related to the scandal. It later collected €270 million from their Directors and Officers Insurers to cover expenses associated with their legal problems. To this day, millions of diesel cars emitting dangerous levels of nitrogen oxides continue to be on the road in Europe.

B Proofs of the Propositions

Proof of Proposition 1: The total profit maximization problem is

$$\max_{x_b, x_h} (\pi_b \sqrt{x_b} + \pi_h \sqrt{x_h}) \quad \text{s.t.} \quad x_b + x_h \leq 1, \quad (\text{A1})$$

and the profit maximizing levels with no fines are:

$$x_b^\circ = \frac{\pi_b^2}{\pi_b^2 + \pi_h^2}; \quad x_h^\circ = \frac{\pi_h^2}{\pi_b^2 + \pi_h^2}. \quad (\text{A2})$$

Given compensation $Comp = S + \alpha \times (\pi_b \sqrt{x_b} + \pi_h \sqrt{x_h})$, the manager’s utility maximization problem is:

³²For an extensive (and highly critical) discussion of the Deferred Prosecution Agreement in the Boeing case, and of the case against Mr. Forkner, see Coffee (2022). On the Yates memo that directs DOJ to seek individuals and promises credits for corporations who provide information about individuals, its impact and the potential problems it raises, see Oded (2016), Copeland (2014), Copeland (2016) and Garrett (2020).

³³For more discussion of the consequences in the first few years, see Ewing (2017) and Welch Jr (2019).

$$\max_{x_b, x_h} (S + \alpha \times (\pi_b \sqrt{x_b} + \pi_h \sqrt{x_h}) - \beta \times (x_b + x_h)) \quad \text{s.t.} \quad x_b + x_h \leq 1. \quad (\text{A3})$$

If the manager's share of total profits is set equal to $\alpha^\circ \equiv 2\beta/\sqrt{\pi_b^2 + \pi_h^2}$ the manager's optimization problem becomes:

$$\max_{x_b, x_h} \left((1 - \alpha)S + \frac{2\beta}{\sqrt{\pi_b^2 + \pi_h^2}} \times (\pi_b \sqrt{x_b} + \pi_h \sqrt{x_h}) - \beta \times (x_b + x_h) \right) \quad \text{s.t.} \quad x_b + x_h \leq 1. \quad (\text{A4})$$

The first order conditions for an optimum are:

$$\frac{\beta \pi_b}{\sqrt{\pi_b^2 + \pi_h^2}} \times \frac{1}{\sqrt{x_b}} - \beta = 0 \implies x_b = \frac{\pi_b^2}{\pi_b^2 + \pi_h^2} \equiv x_b^\circ \quad (\text{A5})$$

$$\frac{\beta \pi_h}{\sqrt{\pi_b^2 + \pi_h^2}} \times \frac{1}{\sqrt{x_h}} - \beta = 0 \implies x_h = \frac{\pi_h^2}{\pi_b^2 + \pi_h^2} \equiv x_h^\circ \quad (\text{A6})$$

Thus, the manager's choices for x_b and x_h maximize the total corporate profits from the activities.

The proposition also holds if the maximization problem is to maximize profits *net* of what the manager receives through the profit sharing defined in his compensation contract as long as $\alpha < 1/2$. This is because shareholders' share of profits will be equal to:

$$(1 - \alpha) \left(\frac{\alpha \pi_b^2}{2\beta} + \frac{\alpha \pi_h^2}{2\beta} \right), \quad (\text{A7})$$

which is increasing in α if $\alpha < 1/2$. Substituting the value of α° , this condition holds if:

$$\frac{2\beta}{\sqrt{\pi_b^2 + \pi_h^2}} < \frac{1}{2} \quad \text{or} \quad \beta < \frac{\sqrt{\pi_b^2 + \pi_h^2}}{4}. \quad (\text{A8})$$

Our assumption that $\beta < \pi_b/4$ guarantees that this condition is met, since $\pi_b < \sqrt{\pi_b^2 + \pi_h^2}$. Thus, α° is the equity share for the manager that maximizes both total corporate profits and the profits that shareholders receive. ■

Proof of Proposition 2: The fine transforms the corporation's profit maximization problem into:

$$\max_{x_b, x_h} (\pi_b \sqrt{x_b} + (\pi_h - f_c) \sqrt{x_h}) \quad \text{s.t.} \quad x_b + x_h \leq 1. \quad (\text{A9})$$

For any level of fine the solution is

$$x_b^* = \frac{\pi_b^2}{\pi_b^2 + (\max(\pi_h - f_c, 0))^2}; \quad x_h^* = \frac{(\max(\pi_h - f_c, 0))^2}{\pi_b^2 + (\max(\pi_h - f_c, 0))^2} \quad (\text{A10})$$

For $f_c \geq \pi_h$, we have $x_b^* = 1$ and $x_h^* = 0$. Otherwise, we have $x_h^* > 0$ and the harmful activity is not fully deterred. If the fraction of the profits the manager receives in his compensation is adjusted to

$$\alpha = \frac{2\beta}{\sqrt{\pi_b^2 + (\max(\pi_h - f_c, 0))^2}}. \quad (\text{A11})$$

the manager will have the incentive to choose the optimal levels in (A10).

To ensure this contract maximizes shareholder value, it must be that $\alpha < 1/2$. Note that α is maximized when the denominator is minimized, which occurs when $\pi_h - f_c = 0$. In this case, $\alpha = 2\beta/\pi_b$. Given the assumption that $\beta < \pi_b/4$, it follows that $\alpha < 1/2$ for all $f_c \geq 0$. Thus, the shareholders always prefer to implement this contract to induce full effort rather than restricting the manager's activity levels. ■

Proof of Proposition 3: Let $\Pi^\circ = \pi_b\sqrt{x_b^\circ} + \pi_h\sqrt{x_h^\circ}$ be the corporation's maximized total profit when there are no fines. Let $\Pi^\psi = \pi_b\sqrt{1-\psi} + \pi_h\sqrt{\psi}$, which is equal to the profits realized when the harmful activity is set at the threshold that does not lead to a fine and the level of the beneficial activity is set equal to $1 - \psi$. There are three cases to consider:

Case 1: $x_h^\circ \leq \psi$

Case 2: $x_h^\circ > \psi$ and $\Pi^\circ - \Pi^\psi > F_c$

Case 3: $x_h^\circ > \psi$ and $\Pi^\circ - \Pi^\psi \leq F_c$

In case 1 the optimal level of the harmful activity falls below the threshold for a fine so the corporation will obviously choose that level. In case 2, the optimal level is above the threshold for a fine, but the corporation makes higher profits even after paying the fine than what it would have made if it set $x_h = \psi$ and avoided the fine. So again the corporation will choose the same level of the harmful activity as it would have chosen without a fine. In case 3 the fine is large enough to make $\Pi^* - F_c$, the maximum profits that can be attained by setting $x_h = x_h^\circ$ and paying the fine, smaller than the profit that can be attained when $x_h = \psi$ and no fine is imposed.

To give the manager incentives to do what maximizes profits, it is clear that in cases 1 and 2 the same compensation contract can be used as when there are no fines levied, i.e., $Comp$ is equal to S plus α times corporate profits (offset by any payment of a fine) where $\alpha = 2\beta/\sqrt{\pi_b^2 + \pi_h^2}$. (It may be necessary to adjust the value of S in case 2 to ensure that the manager's compensation is worth at least his best outside opportunity since profits are diminished by the fine.) In case 3

the compensation contract must be adjusted so the manager has the incentive to set $x_b = 1 - \psi$ since the harmful activity will be capped at $x_h = \psi$.

This observation implies that α must be set so that the following first order condition for a maximum holds:

$$\frac{\alpha\pi_b}{2\sqrt{1-\psi}} - \beta = 0 \quad \Rightarrow \quad \alpha = \frac{2\beta\sqrt{1-\psi}}{\pi_b}. \quad (\text{A12})$$

Finally, note that the assumption $\beta < \pi_b/4$ ensures that $\alpha^\psi < 1/2$, since $\sqrt{1-\psi} \leq 1$, so the shareholders always find this contract profitable. Thus in every case the manager can be motivated to maximize profits. ■

Proof of Proposition 4: With the existence of the fine, the manager's profit maximization problem becomes:

$$\begin{aligned} \max_{x_b, x_h} (\alpha \times (\pi_b\sqrt{x_b} + \pi_h\sqrt{x_h}) - f_m\sqrt{x_h} - \beta \times (x_b + x_h)) \\ \text{s.t.} \quad x_b + x_h \leq 1 \end{aligned} \quad (\text{A13})$$

The first order conditions for the maximization problem and the maximizing values of x_b and x_h are:

$$\begin{aligned} \frac{\alpha\pi_b}{2\sqrt{x_b}} - \beta = 0 \quad \Rightarrow \quad x_b^* = \left(\frac{\alpha\pi_b}{2\beta} \right)^2 \\ \frac{\max(\alpha\pi_h - f_m, 0)}{2\sqrt{x_h}} - \beta = 0 \quad \Rightarrow \quad x_h^* = \left(\frac{\max(\alpha\pi_h - f_m, 0)}{2\beta} \right)^2 \end{aligned} \quad (\text{A14})$$

The corporation maximizes profits when α is set so that $x_b + x_h = 1$. This requires that

$$\alpha^{\text{adj}} = \frac{\pi_h f_m + (4\beta^2 (\pi_b^2 + \pi_h^2) - \pi_b^2 f_m^2)^{1/2}}{\pi_b^2 + \pi_h^2} \quad (\text{A15})$$

This solution for α^{adjusted} only applies if it satisfies $\alpha^{\text{adjusted}} \times \pi_h > f_m$. When this is violated, the optimal solution for the corporation is to set $\alpha = 2\beta/\pi_b$, in which case the manager will choose $x_b = 1$ and $x_h = 0$.

Over the range where $\alpha^{\text{adj}} \times \pi_h > f_m$, α^{adj} will be higher than the α that the corporation sets when there is no fine, which means that the adjustment leads to more harmful activity than would be the case without the adjustment, since as can be seen in (A14), x_h^* is increasing in α . This means that the fine causes an adjustment in the manager's compensation that increases the level of the harmful activity beyond what it would be if no adjustment were made. ■

Proof of Proposition 5: In case (1) the manager's utility maximizing decision is to set $\{x_b, x_h\} = \{x_b^\circ, x_h^\circ\}$ so the fine has no effect. For case (2) let $\Pi^\circ = \pi_b\sqrt{x_b^\circ} + \pi_h\sqrt{x_h^\circ}$, $\Pi^\psi =$

$\pi_b\sqrt{1-\psi} + \pi_h\sqrt{\psi}$, $\alpha^\psi = 2\beta\sqrt{1-\psi}/\pi_b$ and $\alpha^{adj} = F_m/(\Pi^\circ - \Pi^\psi)$. If $\alpha^\psi \leq \alpha^{adj} \leq 1$, then the corporation can raise the manager's equity stake to α^{adj} and the manager will be just indifferent between avoiding the fine and generating profits equal to Π^ψ and incurring the fine and generating higher profits equal to Π° . The difference between $\alpha^{adj} \times \Pi^\circ$ and $\alpha^{adj} \times \Pi^\psi$ is just sufficient to offset the fine. The shareholders will be willing to increase the manager's equity stake to α^{adj} only if $(1 - \alpha^{adj})\Pi^\circ \geq (1 - \alpha^\psi)\pi^\psi$. ■

Proof of Proposition 7: Because the corporation voluntarily decides whether and how much to invest in a compliance program, the corporation in effect solves:

$$\begin{aligned} \max_{x_b, x_h, p} \quad & (\pi_b\sqrt{x_b} + \pi_h\sqrt{x_h}) - p \times (1 - D(p)) \times f_c\sqrt{x_h} \\ \text{s.t.} \quad & x_b + x_h \leq 1, \quad p \geq \bar{p}. \end{aligned} \tag{A16}$$

Just as before, the manager's compensation contract $Comp$ is set to induce the activity levels (x_b^*, x_h^*) the corporation finds optimal.

Of course, a higher probability of detection p coupled with the original fine f_c would more effectively deter misconduct. However, the discount $D(p)$ lowers the fine imposed on the corporation, and thus it may the corporation's *expected* cost of misconduct. Define:

$$\Phi(p) \equiv p[1 - D(p)] \tag{A17}$$

to be the *expected fine factor*, since taking into account of the discount the expected fine will be $\Phi(p) \times f_c$. For any given $x_h > 0$, the corporation maximizes (A16) by minimizing the expected fine factor, $\Phi(p)$. This leads to two possibilities.

Case 1. Suppose that $\min_p \Phi(p) = \bar{p}$. That is, the expected fine factor for any possible level of p is never lower than $\bar{p}$, the exogenous probability of detection. This means that the discount received from choosing p is not large enough to offset the increased probability of detection, which in turn implies that

$$\pi_h - f_c\Phi(p) \leq \pi_h - \bar{p}f_c, \text{ for all } p \in [\bar{p}, 1]. \tag{A18}$$

In this situation, the adoption of a compliance program weakly decreases the net return from the harmful activity. The corporation will therefore not adopt a compliance program in this situation, and the probability of detection will remain at $\bar{p}$.

Case 2. Suppose $\Phi(p)$ is minimized at $p^* > \bar{p}$. In this case the compliance program is effective

in providing an incentive for the corporation to take actions that increase the probability of detection. The expected fine factor is less than $\bar{p}$ because the discount in the fine more than outweighs the increased probability of detection. In the end this *increases* the profitability of the harmful activity since

$$\pi_h - \Phi(p^*) \times f_c > \pi_h - \bar{p} \times f_c. \quad (\text{A19})$$

Thus in case 2 the voluntary compliance program *decreases* social welfare. ■

Proof of Proposition 9: If the government does not use self-reporting and $D = 0$, then the corporation chooses:

$$x_h^* = \frac{(\pi_h - f_c)^2}{\pi_b^2 + (\pi_h - f_c)^2} \quad (\text{A20})$$

Now consider if the government attempts to reduce harm by choosing some $D > 0$. Consider three cases:

1. $D = 1 - p$. In this case, there will be no effect because the expected fine from self-reporting is the same as the expected fine from not self-reporting. Harm remains unchanged.
2. $D < 1 - p$. In this case the corporation will not self-report because it increases the expected fine.
3. $D > 1 - p$. In this case the corporation will self-report. Moreover, because the effective fine is reduced by $D \times f_c \sqrt{x_h}$, the corporation will increase x_h . ■

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