Corporate Sanctions and Capital Structure

Nathan Atkinson*

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Abstract

Corporate sanctions are meant to deter bad behavior and to compensate victims. Yet the imposition of sanctions may lead to negative consequences including missed debt payments, job losses, and insolvency. In this article I show that *how* a corporation pays sanctions has important implications for deterrence, compensation, and collateral consequences. With debt in place, shareholders pay sanctions through selling assets rather than through issuing securities, shifting some of the incidence of the sanctions onto creditors and imposing collateral consequences on workers. I show that shareholders can benefit from social-welfare decreasing corporate malfeasance even when detection is certain and the sanctions are equal to the harm caused. Furthermore, the presence of standard restrictive debt covenants does not solve the problem. I propose that officials mandate that firms issue equity to pay sanctions, and show that this eliminates the tradeoff between the benefits and costs of sanctions and better aligns the interests of corporations and society.

*ETH Zurich Center for Law & Economics. Thank you to Anat Admati, Abhay Aneja, Steven Callander, Scott Ganz, Paul Pfleiderer, Mitch Polinksy, George Triantis, Bob Weisberg, and seminar participants at George Mason Law School, Oxford Faculty of Law, and the Stanford Law and Economics Free Lunch for helpful comments and discussions. Contact: nate.atkinson@gess.ethz.ch.

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1 Introduction

Corporate sanctions are meant to deter bad behavior and to compensate victims of corporate misconduct. But in the pursuit of these goals, the imposition of sanctions can lead to a variety of collateral consequences including missed debt payments, job losses, and insolvency. Decision makers therefore face an apparent tradeoff. Large sanctions may be necessary to adequately deter corporations and provide compensation, but the imposition of large sanctions may lead to undesirable consequences. On the other hand, while small sanctions will limit collateral consequences, they may lead to insufficient deterrence and undercompensation.

In this paper I show that this apparent tradeoff only arises because corporations have discretion over *how* to pay sanctions. With debt in place, shareholders favor selling assets to pay sanctions. By increasing leverage and the riskiness of the firm, asset sales shift some of the cost away from shareholders and onto creditors, thereby undermining deterrence. Furthermore, asset sales lead to immediate job losses for the employees associated with those assets, and the corporation's increased leverage threatens all employees' future employment. Given the prospect of asset sales, decision makers face the difficult choice of how to balance the benefits and costs of imposing sanctions.

But while shareholders favor paying sanctions through asset sales, other corporate stakeholders and society more broadly would be better served if corporations paid sanctions through equity issuances. Unlike asset sales, equity issuances impose the full incidence of sanctions on shareholders. And because equity issuances simply dilute the holdings of shareholders, they have no effect on the corporation's assets, debt, leverage, or employment. I argue in this paper that decision makers should mandate that corporations pay sanctions through issuing equity. Mandating equity issuances removes the tradeoff between the costs and benefits of sanctions and better aligns the interests of corporations and society.

In this paper I provide a framework for understanding the impacts of how a corporation pays sanctions. The choice between issuing equity, issuing debt, and selling assets has profound implications for deterrence, compensation, and collateral consequences. The remainder of the paper is organized as follows. In the next section I discuss the literatures on corporate sanctions and capital structure. In particular, I show that while the literature on corporate sanctions has explored the effects of the principal-agent relationship that arises in firms, it has overlooked the importance of the debt-equity conflict as it applies to corporate malfeasance.

In Section 2, I consider the ways in which a corporation can pay sanctions and the effects of that choice on shareholders, creditors, and employees. I show that shareholders prefer to sell assets, imposing costs on creditors and leading to job losses for employees. In Section 3, I consider the choice facing a sanctioning decision maker. I show that shareholders can profit from malfeasance even when sanctions are equal to the harm caused, and detection is certain. In order to achieve optimal deterrence, sanctions must be greater than the harm caused. But because the imposition of standard monetary sanctions leads to collateral consequences, decision makers face a difficult tradeoff.

Asset sales benefit shareholders at the expense of other corporate stakeholders and society more generally. In Section 4, I develop the proposal that officials mandate that

sanctions be paid through equity issuances. Doing so achieves proper deterrence by imposing the full incidence of sanctions on shareholders, and eliminates the collateral costs to creditors and employees. I further discuss the practical aspects and potential concerns of implementing a mandatory equity issuance.

Up through Section 5, I consider the choice of how to pay sanctions under standard debt covenants that prevent shareholders from looting the firm. In Section 5, I consider covenants more generally. I first show that standard covenants generally do not provide recourse for creditors of a firm that sells assets to pay sanctions. Next, I consider the effects of restrictive debt covenants that allow creditors to accelerate debt payments if the firm sells assets. I show that these covenants will generally only provide modest protection for creditors, and that when they do protect creditors, they can exacerbate collateral consequences. Section 6 concludes.

In the accompanying appendix, I develop a reduced form model of corporate sanctions and capital structure, and I prove the key results of the paper. In the main paper, I use numerical examples to illustrate the key results. Where a statement in the paper has an associated formal proposition, I italicize the statement in the main body of the paper and give the relevant reference to the model.

1.1 Background and Related Literature

1.1.1 Corporate Sanctions

The primary reasons for corporate sanctions are deterrence and compensation.[1] From this perspective there is little theoretical distinction between civil and criminal corporate liability.[2] I therefore broadly refer to bad corporate actions as *malfeasance* any legal judgments against a corporation as *sanctions*.

Optimal deterrence entails choosing sanctions for harmful actions that maximize social welfare, taking into account that actors will anticipate sanctions. When enforcement is certain, optimal deterrence is achieved when sanctions imposed on the decision maker are equal to the harm caused (Bentham, 1789). This induces actors to internalize the harm that they cause, so that they only take harmful actions when those actions increase social welfare.

When actors are individuals, those that make a decision, those that benefit from the

[1]Theories of punishment can be widely separated into consequentialist and retributive theories (Duff and Hoskins, 2018). Consequentialist theories structure punishment to achieve socially desirable outcomes, while retributive theories view punishment as a means of giving wrongdoers their just deserts. The literature is generally skeptical of applying the retributive theory of punishment to corporations (Byam, 1982; Khanna, 1995). More colorfully, Alschuler (2009) argues that attributing blame to a corporation is no more sensible than attributing blame to a dagger, a fountain pen, a Chevrolet, or any other instrumentality of crime. Furthermore, while there are other consequentialist goals such as rehabilitation, these are secondary aims (Byam, 1982).

[2]Judge Learned Hand recognized in United States v. Nearing, 252 F. 223 (S.D.N.Y. 1918) that "there is no distinction in essence between the civil and the criminal liability of corporations."There are of course important characteristics that differentiate corporate civil and criminal liability, including procedural protections (e.g. evidentiary standards), sentencing guidelines, enforcement powers, and message sending. But for the main analysis I will make no distinction between civil and criminal liability.

decision, those that pay sanctions, and those who bear the costs of those sanctions are one and the same person. However, in a corporate context, managers make decisions, a variety of corporate stakeholders may or may not benefit from the decision, sanctions are often imposed on "the corporation", and a variety of stakeholders bear the costs of those sanctions. This complicates the analysis of deterring corporate malfeasance.

Given that corporations are legal fictions, one option is to only impose sanctions on those real persons at the corporation who engaged in malfeasance, rather than the corporation as a whole. While imposing liability on the agent who engaged in malfeasance induces the agent to internalize some of the harm caused, the problem of agent insolvency severely limits the effectiveness of personal liability (Sykes, 1983). The potential insolvency means that the expected loss to the agent is less than the harm caused, undermining deterrence. While criminal liability and imprisonment may be useful to overcome personal insolvency, many acts of malfeasance do not rise to the standard of criminal liability. Furthermore, even if corporate agents are able to pay sanctions, it is often difficult to identify culpable individuals involved in corporate malfeasance.[3]

Given that personal liability is often insufficient for deterring bad corporate actions, liability may be imposed on the corporation itself. By imposing liability on the corporation, the shareholders who control and benefit from the corporations' actions should in principle monitor its employees to ensure that they obey the law. The potential agency conflict between a firm's beneficiaries and its employees has defined the literature on corporate malfeasance. Newman and Wright (1990) consider how principals can design employment contracts to reduce agents' incentives to engage in malfeasance. Polinsky and Shavell (1993) study the benefits of imposing liability both on employees and the corporation, while Shavell (1997) explores how corporate liability should be structured given that profit-maximizing corporations have limited ability to penalize their employees. And Arlen (1994) shows that imposing liability on corporations may actually undermine the monitoring of employees by corporations. However this research overlooks the importance of debt in the organizational structure of corporations.

To achieve proper deterrence, shareholders must bear the costs of sanctions. They elect boards of directors, who in turn appoint managers to run corporations. As the residual claimants to the firm's income, shareholders are those that profit from corporate malfeasance. And while shareholders may exert limited control, boards of directors are frequently treated as agents for shareholders, and there is wide agreement that firms should be run in the financial interests of their shareholders (Hansmann and Kraakman, 2001).[4] In the absence of imposing costs on shareholders for corporate malfeasance, there is no reason to believe that shareholders will want the firm to obey the law. Sanctions should be used to align the interests of shareholders with society. And in order to properly align shareholders with society, shareholders need to bear the full incidence of corporate sanctions.

[3]This is exemplified by the Deepwater Horizon disaster. The disaster arose after years of cutting corners at British Petroleum rather than from any discrete decision. Many large corporate accidents arise from the combination of many small contributing factors (Dekker, 2016).

[4]However, see Atkinson (2019) for a discussion of alternative goals.

1.1.2 Capital Structure

Capital structure refers to how a firm uses debt and equity to fund its operations. In their foundational work, Modigliani and Miller (1958) showed that changing the way that a firm's cash flows are paid out to creditors and shareholders does not in and of itself change the value of the firm. A firm's leverage changes how the firm's cash flows are shared between creditors and shareholders, but does not change the total amount of cash flow. While a firm's capital structure does not by itself affect the value of the firm, numerous other frictions may affect the value of the firm and the choice of capital structure, including agency costs (Jensen and Meckling, 1976); information frictions (Myers and Majluf, 1984); existing debt (Myers, 1977); and tax subsidies and bankruptcy costs (Kraus and Litzenberger, 1973; Scott, 1976). In this paper, I begin by considering the effect of sanctions in the frictionless world of Modigliani and Miller (1958) before discussing the effect of frictions in Section 6. In considering how shareholders' preferences can be harmful to creditors, this paper relates closely to Admati et al. (2018), who show that shareholders will resist leverage reductions regardless of how large the potential gain to the firm is, because any benefits from decreasing leverage are entirely captured by creditors.

Creditors who anticipate expropriation will rationally take actions to protect themselves. The foundational theory around debt covenants was developed by Jensen and Meckling (1976) and extended by Myers (1977) and Smith and Warner (1979). This theory recognizes the principle conflicts between shareholders and creditors: shareholders would like to liquidate firm assets to pay dividends (unauthorized distributions); investing in higher-risk assets (asset substitution); funding negative net present value projects (over-investment); forgoing projects that benefit creditors (under-investment); and issuing higher-priority debt (claim dilution). Because creditors recognize shareholders' incentives to expropriate creditors, shareholders will voluntarily impose covenants that restrict their ability to expropriate wealth. While Nini et al. (2012) find that 10-20% of firms violate a covenant in any given year, this paper shows that even restrictive covenants provide only partial protection from shareholders' ability to transfer wealth away from creditors through asset sales.

However, while covenants provide protection for creditors, they are necessarily incomplete, and it is often desirable to leave shareholders with some discretion to take actions that benefit all stakeholders. Particularly relevant to this paper, a *restricted payments* covenant limits a corporation's ability to sell assets and use those proceeds to make payments in the form of dividends, distributions, and share repurchases. However, while this covenant effectively prevents shareholders from paying themselves dividends through asset sales, it does not prevent shareholders from limiting their losses through asset sales. This distinction has important impications for the incidence of corporate sanctions. I further consider the impact of covenants that explicitly forbid any asset sales in Section 5.

Firms funding choices are generally framed around the choice between debt or equity. However asset sales are another important source from which firms can raise funds (Edmans and Mann, 2018). While Shleifer and Vishny (1992) show that asset sales may not be an effective means of raising funding when there is industry-wide distress, Hite et al. (1987) give empirical evidence that firms sell assets as an alternative to issuing new securities. Eckbo and Kisser (2015) find that the proceeds from asset sales are roughly the same as

those from debt plus equity issuances, suggesting that asset sales are a considerable source of funding. Over half of asset-selling firms state financial motives for voluntarily selling assets (Borisova et al., 2013), and financially constrained firms are much more likely to sell assets to fund operations than unconstrained firms (Campello et al., 2010). However, while asset sales may benefit shareholders, piecemeal asset sales may generate less income than assets that are sold as a going-concern package (Hotchkiss et al., 2008).

Because this paper considers the collateral consequences of capital structure and sanctions on employees, it relates to the empirical literature on the relationship between firm leverage and employment outcomes. Giroud and Mueller (2015b) use firm-level data to show that counties with more highly-leveraged firms exhibit a significantly larger decline in employment following shocks than counties with less-leveraged firms. Giroud and Mueller (2018) find that regional increases in firm borrowing are associated with boom-bust cycles, resulting in declines in medium-run employment. Giroud and Mueller (2015a) show that financially constrained firms pay for new investment opportunities by withdrawing capital and laying off workers. Finally Bernstein et al. (2018) find that employment declines substantially in the immediate neighborhood of liquidated establishments.

While this paper is to my knowledge the first to show that how a firm pays sanctions affects the incidence of sanctions and collateral consequences, the policy proposal that I develop in Section 4 relates to legal scholarship that considers how sanctions should be paid. Coffee (1980) proposes that "equity fines" could be imposed on corporations,[5] while Hansmann and Kraakman (1990) propose that shareholders should face unlimited liability for corporate torts. This paper builds upon these works by carefully considering the interrelated questions of corporate sanctions and capital structure.

2 Paying Sanctions

In this section I explore how corporations pay sanctions and how that choice affects shareholders, creditors, and employees. For this discussion, I assume that a corporation is funded through both debt and equity. There is a huge variety of credit, varying in maturity, priority, security, and a variety of other features. For simplicity this section explores a single class of unsecured debt protected by two standard covenants: a covenant that prevents shareholders from paying themselves excessive dividends;[6] and a covenant that prevents

[5]While Coffee (1980) makes a similar proposal, he considered the proposal only briefly before dismissing it as a possibility "which has little chance of political adoption". Furthermore, he leaves open many questions that are addressed here. What are the effects of covenants? What is the effect on deterrence? And what is the fundamental incidence of monetary sanctions? Furthermore, not explicitly considering the effects of capital structure leads to some inconsistencies in his arguments. For example Coffee recognizes that the issuance of new equity results in shareholders bearing the costs. But he also contradicts this by arguing that, because equity issuances do not increase the chance of insolvency, "[t]hus, even as to the stockholders, there is a marginal degree of superiority associated with fines levied in securities over fines levied in cash." However, this is directly contradicted by my results, and if shareholders prefer equity issuances, mandating an equity issuance would be superfluous because shareholders would choose to do so themselves.

[6]A *restricted payments* covenant limits a corporation's ability to make payments in the form of dividends, distributions, and share repurchases. This provision ensures that shareholders are not paid before creditors.

the firm from issuing debt that is senior to outstanding debt.[7] In section 5 I consider covenants restricting asset sales that allow creditors to demand immediate repayment if the covenant is breached. I assume that decisions are made based on how they affect shareholders' wealth.[8]

2.1 Raising Funding

When firms need to raise funds, there are a variety of possible funding sources. The most basic source of funding is to use cash on hand. Before the financial crisis, the median US firm held cash and marketable securities equal to about 8% of total assets (Campello et al., 2010). So while some expenses can be paid with cash on hand, many firms do not hold sufficient cash to make substantial payments, and even firms that do must replenish their cash on hand quickly to avoid a variety of negative outcomes.[9] Following cash on hand, firms can raise funding though retaining earnings rather than paying dividends to shareholders. However, like cash on hand, retained earnings are not an effective means of making a large and unexpected payment, because raising a substantial sum of money through retained earnings may take years. A firm that needs to quickly raise substantial sums therefore has three options: equity financing, debt financing, and asset sales.

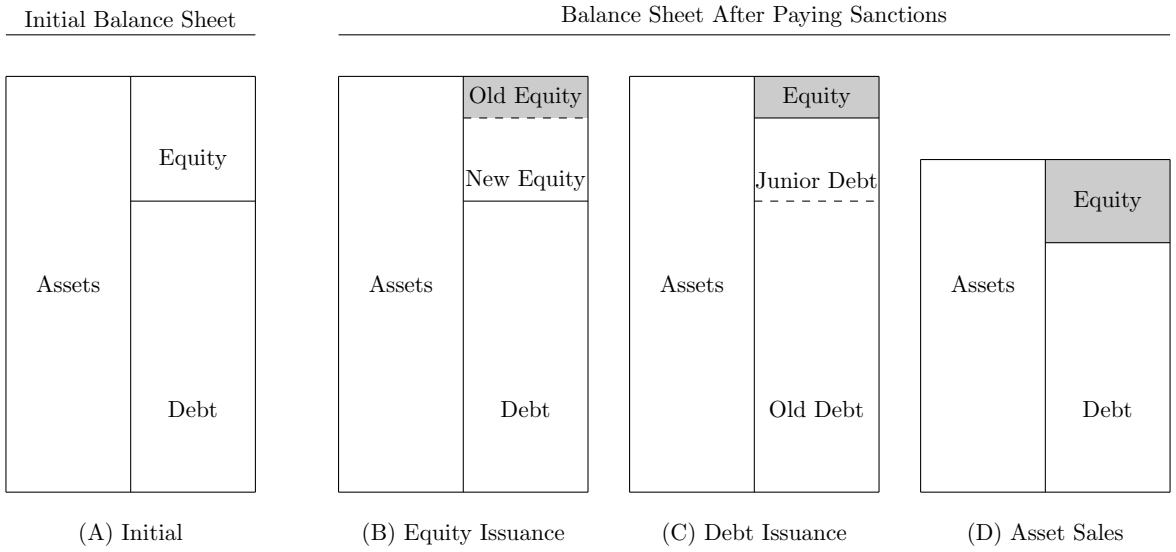

Figure 1: Ways to Pay Sanctions. The firm may raise money to pay sanctions through an equity issuance, a debt issuance, or asset sales.[11]

[7]There are many forms of debt limitation covenants, that can vary substantially on the type of debt and the yield of the debt.

[8]Shareholders elect directors who appoint managers who, in turn, manage the day-to-day operations of corporations. Managers and directors have their own interests that can diverge from those of shareholders. Over the past decades, aligning the interests of managers with those of shareholders has been the chief endeavor or scholarship in corporate governance. The primary solution to the managerial agency conflict has been to tie managerial compensation to financial measures of the corporation's performance.

[9]Campello et al. (2010) find that financially constrained firms that burn through cash on hand subsequently sell assets, cancel plans, and bypass attractive investments.

Figure 1 shows the three ways in which the firm can pay sanctions. Which will the firm choose? Importantly, shareholders make the decisions for solvent firms, meaning the decision will be the one that maximizes the value of equity. In the next section I consider the choice between issuing debt and issuing equity and show that in the absence of frictions, both shareholders and creditors are indifferent between the type of security issuance. In the following section I compare security issuances to asset sales and show that shareholders prefer asset sales to security issuances while creditors prefer security issuances to asset sales. I then consider the harmful effects of shareholders' choices on employees in Section 2.2.

2.1.1 The Choice Between Equity and Debt

The choice between debt and equity financing is a core question in corporate finance. Most of the literature deals with the question of how to fund a (potentially) profitable investment. Fundamentally, the choice between debt and equity does not *in and of itself* affect the value of a firm, but instead only affects how income is divided (Modigliani and Miller, 1958). In this section I restrict my attention to the frictionless case, where the firm has a single asset with an uncertain return that is funded by both existing debt and equity, and must raise funds to pay a sanction. By issuing equity, shareholders dilute their claims on the firm's residual income and must share any income proportionally with new shareholders. By issuing debt, the current shareholders remain the sole residual claimants. However, because creditors have priority to the firm's income, issuing debt puts their claim on cash flows behind the old and new creditors.

In the absence of frictions, risk-neutral shareholders are indifferent between issuing equity or debt to pay sanctions. In either case, the security must be priced to make it an attractive investment for new investors. If the firm issues equity, the number of shares offered and the price of those shares will reflect that the new shareholders are subordinate to creditors and are paid proportionately with old shareholders. If the firm issues debt, the face value of that debt will reflect that junior creditors have a fixed claim that is paid only after senior creditors are paid.[12] While the risk profile differs for new equity and debt, the expected return for the two securities will be equal. The firm can therefore price the security equal to its expected return,[13] meaning that shareholders are indifferent between equity and debt issuances.

Creditors are also indifferent between the choice of equity or debt financing. Standard covenants mean that any debt issuances must be junior to existing creditors, ensuring that senior creditors are the first group to be paid regardless of subsequent changes to the firm's financial obligations. Fixing a level of assets, changes to the distribution of claimants who are behind senior creditors has no effect on senior creditors. The preferences of shareholders and creditors are illustrated in the following example:

[11] A balance sheet diagram represents a firm's assets on the left hand side and liabilities on the right hand side.

[12] Because of uncertainty, the market value of debt is less than the face value of debt. The face value of debt is the promised payment. The market value of debt is how much the debt is actually worth, given the possibility that the firm will default on the debt.

[13] This is assuming that the risk-free rate of interest is normalized to zero.

Numerical Example 1 (Debt and equity issuances): Suppose that a firm has an asset that has a value of 0, 50, or 100 with probability 25%, 50%, and 25%, respectively. Let the firm have outstanding debt with a face value of 30. Which means that the market value of the debt is 22.5,[14] and the value of equity is 27.5.[15] Now suppose that the firm must immediately pay sanctions of 25, and consider the effects of paying with either an equity issuance or a debt issuance.

Equity Issuance: In order to raise 25 to pay sanctions, the firm has to issue equity equal to 91% of the company, meaning that the original shareholders are only entitled to 9% of the returns to equity.[16] Therefore the value of the old equity drops to 2.5. Because issuing equity has no effect on the solvency of the firm, creditors will receive the same expected payoffs and the value of debt is unchanged at 22.5.

Debt Issuance: Next, suppose that the firm issues junior debt to pay the sanctions. Because this debt will only be paid after senior creditors are paid, there is a high chance of default, meaning that it will command a high face value. In order to raise 25, the firm must issue junior debt with a face value of 60.[17] This leaves the value of senior debt unchanged, and the value of equity drops to 2.5.[18] Importantly, this also means that the firm will now be insolvent 75% of the time. But because assets are unchanged and senior creditors are paid first, creditors will receive the same expected payoffs and the value of debt is unchanged at 22.5.[19]

[14] Value of Debt $= (0.25)(0) + (0.5)(30) + (0.25)(30) = 22.5$.

[15] Value of Equity $= (0.25)(0) + (0.5)(50-30) + (0.25)(100-30) = 27.5$.

[16] If there is initially one share outstanding, the firm issues equity e such that the percentage of the company owned by the new company is $\frac{e}{1+e}$. The equity issued is therefore the e that solves: $(0.25)(0) + (0.5)(50-30)(\frac{e}{1+e}) + (0.25)(100-30)(\frac{e}{1+e})$. Which means that $e = 10$ and $\frac{e}{1+e} = \frac{10}{11} \approx 0.91$.

[17] The firm issues debt d to solve: $(0.25)(0) + (0.5)(\min\{50-30, d\}) + (0.25)(d) = 25$, which yields $d = 60$

[18] $V_E = (0.25)(0) + (0.5)(0) + (0.25)(100-30-60) = 2.5$.

[19] The following table shows the values of debt and equity depending on the asset returns and the means of paying sanctions:

	Asset Return			
	Low (25%)	Medium (50%)	High (25%)	Expected Value
Initial (pre-sanctions)				
Shareholders	0	20	70	27.5
Creditors	0	30	30	22.5
Issue Equity				
Shareholders	0	1.8	6.3	2.5
New Shareholders	0	18.2	63.7	25
Creditors	0	30	30	22.5
Issue Debt				
Shareholders	0	0	10	2.5
Creditors	0	30	30	22.5
New Creditors	0	20	60	25
Asset Sale				
Shareholders	0	0	20	5
Asset Sale	0	25	30	20

The example illustrates that the incidence of sanctions and the firm's ability to raise funds is not affected by its choice to issue equity or debt. However, the ability of the firm to raise funds is affected by the firm's *existing* capital structure. After paying sanctions through a security issuance, the firm's assets are unchanged and the claims held by senior creditors remain unchanged. Because new investors demand to break even in expectation, they can only acquire value by a corresponding decrease in the value of equity held by the old shareholders. In the above example, the initial value of equity was 27.5. This initial value of equity acts as an upper bound on the amount that can be raised by the corporation through a new security issuance. If instead of 25, the firm instead must pay sanctions of 30, it would not have been possible to do so through a security issuance. The most that can be transfered to new security holders is the initial value of equity, 27.5. And because new security holders will not pay 30 to receive a claim worth only 27.5, they will not invest in the firm. The initial value of equity effectively acts as a cap on the amount that can be raised through a security issuance.

This illustrates that a firm's leverage affects its ability to raise funding. A firm that is funded entirely through equity has ample room to raise new capital by issuing new securities, while an otherwise identical firm that is highly leveraged has much less scope to raise capital when the need arises. So while shareholders bear the full incidence of sanctions for both debt and equity issuances, they only bear the full incidence if the sanctions are less than the initial value of equity. If the sanctions are greater than the value of equity, the firm will be unable to remain solvent. This has important implications for deterring bad behavior, which I discuss in Section 3.

However, insolvency does not only occur when sanctions are greater than the value of equity. Even when sanctions can be paid, insolvency can subsequently occur when asset returns are less than value of debt obligations. In the case of insolvency, creditors receive the liquidation value of the firm (the value of the assets), and shareholders receive nothing. While the choice between equity and debt has no effect on the payouts to existing shareholders and creditors, it does have an effect on the prospective solvency of the firm. An equity issuance to pay sanctions recapitalizes the firm, and therefore has no effect on the probability of insolvency. A debt issuance however, leaves the firm with higher leverage and thereby increases the chance of insolvency. In the above example, the firm had a 25% chance of insolvency before sanctions were levied. If sanctions are paid through an equity issuance, the probability of insolvency remains at 25%. But if sanctions are instead paid though a debt issuance, the increase in debt means that the probability of insolvency increases to 75%. While the increased probability of insolvency does not affect shareholders and creditors,[20] it has important implications for employees and other stakeholders, which I explore in Section 3 after considering the effect of asset sales in the next section.

[20] While shareholders and creditors do not care about insolvency in and of itself in the absence of frictions, there may be frictions that change these preferences. In particular, in the presence of bankruptcy costs, creditors will prefer equity issuances to debt issuances.

2.1.2 The Choice Between Security Issuances and Asset Sales

Issuing junior debt or equity imposes the full incidence of the sanctions on existing shareholders, meaning that both shareholders and creditors are indifferent between the type of security issuance. However, this indifference does not carry over when the possibility of asset sales is considered. By selling assets, the firm is able to shift some of the incidence away from shareholders and onto creditors.

Shareholders' preference for (and creditors' preference against) asset sales stems from the uncertain nature of firm earnings. Because creditors hold a fixed claim on the firm's assets, they prefer that a firm take actions that maximize the probability that they are paid back. Creditors do not gain from any profit beyond their fixed claim. But as the residual claimants to the firm's income, shareholders are interested in maximizing the expected value of their claim, even if that comes at the expense of creditors. These competing claims leads to divergent preferences about risk and leverage: creditors prefer low leverage and low risk, while shareholders prefer high leverage and high risk.

This can be seen by looking back to Figure 1, which represents the fundamental accounting identity that assets equal debt plus equity. The issuance of equity or debt changes the firm's liabilities (the right hand side of the balance sheet), but has no effect on the firm's assets (the left hand side of the balance sheet), because the funds raised go to paying the sanctions. Because assets remain unchanged, the firm's expected income remains unchanged. And because creditors are the senior claimants, they receive the same expected payout after an equity or debt issuance. Therefore, the amount captured by shareholders must decrease by the amount of the sanctions.

But unlike equity and debt, selling assets has effects on both sides of a firm's balance sheet. The decrease in assets leads to a corresponding decrease in the value of the firm's liabilities. Creditors hold a fixed claim, but a decrease in assets means that there is an increased probability that the claim will not be paid back in full. By selling assets, there are some states of the world in which creditors would have previously been paid in full and where they are now not paid in full. This lowers the value of debt. But because the decrease in asset value must equal the sum of the decrease of debt and equity, this means that the decrease in the value of equity is less than the total decrease in the value of assets. An asset sale effectively transfers some of the incidence of sanctions away from shareholders and onto creditors. To see this, consider the following example:

> **Numerical Example 2** (Asset sales): Consider again a firm that owes creditors 30 and holds an asset that has a value of 0, 50, or 100 with probability 25%, 50%, and 25%, respectively. Assume that this asset can be divided into two perfectly correlated assets, so that each pays 0, 25, or 50 with probability 25%, 50%, and 25%, respectively. The expected value of each asset is therefore 25. Now suppose that the firm must immediately pay sanctions of 25, and consider the effects of an asset sale.
>
> *Asset Sale:* The firm can pay sanctions by selling off half of its assets. Asset returns are now 0, 25, or 50 with probability 25%, 50%, and 25%, respectively. Because the debt claim of 30, shareholders will now only receive a payout when

the asset returns are high. So the value of equity drops to 5.[21] But this is greater than the value of equity following equity or debt issuances. This asset sale has a negative impact on creditors. Before, creditors were paid in full so long as the asset did not return 0. But now creditors are not paid in full if the assets return 25. So the value of debt drops to 20.[22] In normal operating times, firms take actions for the benefit of shareholders, which means that the firm will sell assets rather than issuing equity or debt to pay sanctions, benefiting shareholders and harming creditors relative to an equity or debt issuance.

Whereas shareholders bore the entire incidence of sanctions when those sanctions were paid through a security issuance, shareholders are able to shift some of the incidence onto creditors through an asset sale. Selling assets to pay sanctions effectively increases leverage and increases risk, benefiting shareholders at the expense of creditors. To summarize: *shareholders prefer asset sales to security issuances, and are indifferent between equity and debt issuances*;[23] while *creditors prefer security issuances to asset sales, and are indifferent between equity and debt issuances.*[24]

Outside of covenant violations and managerial agency conflicts, firms are run in the interest of shareholders.[25] This implies that firms will be systematically biased towards selling assets to pay sanctions. When a leveraged firm pays sanctions through asset sales, shareholders will only pay a proportion of those sanctions. Very small sanctions have a very small effect on the expected solvency of the firm, so shareholders will effectively pay the entire sanction. However, *as the level of sanctions increases, the probability of insolvency increases, and creditors bear an increasing share of sanctions.*[26] In the preceding numerical example, sanctions of 25 were levied on the firm, but following an asset sale, shareholders only paid 22.5, meaning that shareholders bore 90% of the sanctions, while creditors bore the remaining 10%. The fact that shareholders control the firm and benefit from the firm's upside while only bearing a portion of sanctions has troubling implications for deterring corporate malfeasance.

Debt covenants frequently contain restricted payments covenants that are meant to prevent shareholders from looting the firm by selling assets and using the proceeds to pay themselves dividends. In the absence of sanctions, such a restricted payments covenant only allows dividend payments if the firm is in a sufficiently sound financial position. However, once sanctions are imposed, asset sales can transfer value from creditors to shareholders *without* the need to pay dividends. The wealth transfer occurs through increasing the lever-

[21] $V_E = (0.25)(0) + (0.5)(0) + (0.25)(50 - 30) = 5$.

[22] $V_D = (0.25)(0) + (0.5)(25) + (0.25)(30) = 20$.

[23] Proposition 1 (page 36)

[24] Proposition 2 (page 37).

[25] While Triantis and Daniels (1995) and Baird and Rasmussen (2006) provide anecdotal evidence of creditor influence before defaults occur, they focus on the role of creditors in overcoming managerial agency problems rather than debt-equity conflicts. Nini et al. (2012) provide empirical evidence that creditors intervene to address the debt-equity conflict after firms violate covenants but before default. But in the absence of covenant violations, shareholder-elected directors control the company. I discuss the impact of covenants on the firm's choice of paying sanctions in section 5.

[26] Proposition 3 (page 38). The proposition further shows that the proportion paid by shareholders is decreasing in the level of sanctions and decreasing in the level of debt.

age and the riskiness of the firm, which benefits shareholders at the expense of creditors. I further show in Section 5 that covenants that explicitly prevent asset sales may also lead to undesirable outcomes.

Not only do shareholders prefer asset sales to security issuances, but the magnitude of this preference is increasing in a firm's leverage. So while shareholders in a low-leverage firm will have a mild preference for asset sales, shareholders in a high-leverage firm will have a strong preference for asset sales. Shareholders benefit from increased leverage, and asset sales increase the leverage of a highly leveraged firm by more than a lowly leveraged firm. This is consistent with the empirical evidence that financially distressed firms frequently restructure and make considerable operational changes (Jensen, 1989). Ofek (1993) shows a robust relationship between a firm's financial leverage and asset restructuring and employee layoffs following financial distress. Ofek (1993) further shows that distressed firms restructure assets in order to generate immediate cash to pay liabilities. Asquith et al. (1994) find that 83% of firms reduce capital expenditures, with company downsizing accounting for much of the reduction, and find that financially distressed firms that sell a large portion of their assets are less likely to file for bankruptcy than firms that sell little or no assets.

This analysis has assumed that firm's could sell assets for their net present value. While this paper does not explicitly model the inefficiencies that arise from the sale of assets, Bulow and Shoven (1978), White (1980), Gertner and Scharfstein (1991), and Aghion et al. (1992) show how inefficient liquidation versus reorganization decisions can occur. For example, potential buyers may not value the assets as much as the firm, there may be liquidation costs to sell assets, or industry-wide distress may depress prices (Shleifer and Vishny, 1992).[27] If assets are sold at a discount, the relative benefit to shareholders of selling assets instead of issuing securities will be less. However, even if asset sales are inefficient there is scope for shareholders to profit from asset sales rather than security issuances.[28]

2.2 Collateral Consequences

Shareholders and creditors are not the only corporate stakeholders. The issuing of securities and the sale of assets can have profound implications for other constituencies. This section considers the effect of sanctions on a firm's employees. In particular, I consider how sanctions lead to firms laying off employees.

Firms may manage a wide variety of revenue-generating assets including real property, intellectual property, equipment, inventory, marketable securities, and human capital. Most assets require employees in order to generate revenue for the firm. When a firm goes

[27] Ideally, assets should be put to their most efficient uses. So a firm that is distressed but efficient should continue to operate, while a firm that is distressed and inefficient should transfer its assets to areas where they have higher uses. The inefficiency of liquidating some efficient firms while not liquidating inefficient firms is explored in White (1989).

[28] This can be seen graphically in Figure 8 (page 43), which shows shareholder utility from asset sales and security issuances. If assets were sold at a discount, the value of equity from asset sales would decrease. The level of discount would determine whether asset sales would remain shareholders' preferred method of paying sanctions.

insolvent or restructures, assets are sold or shut down, and employees lose their jobs. Some workers may be transferred to a new division at the firm, others may be able to get a position at a firm that buys the assets, and others may be able to find employment elsewhere. However, significant labor market frictions mean that asset sales will result in unemployment, and employees will prefer that firms pay sanctions in a manner that does not affect their employment.

Consider the three means of paying sanctions on employment. Issuing equity recapitalizes the firm, and has no effect on the firm's assets or leverage. This means that paying sanctions through an equity issuance has no effect on employees. If the firm issues debt to pay sanctions, there is no immediate effect on assets, so employees retain their positions. However the increase in leverage means that the firm now faces a higher probability of defaulting on its debt obligations, leading to subsequent restructuring and job losses. Unlike debt and equity issuances, asset sales affect both sides of the firm's balance sheet and have dual effects on employment. First there is an immediate cut to the firm's employment as employees who worked the assets lose their jobs. Second, because asset sales increase leverage, they also have the effect of increasing the probability of default and subsequent job losses. The effects on workers of paying sanctions are exemplified in the following example:

> **Numerical Example 3** (Employees): Consider again the firm that owes creditors 30 and holds an asset that has a value of 0, 50, or 100 with probability 25%, 50%, and 25%, respectively. The asset can be divided into two perfectly correlated assets, so that each pays 0, 25, or 50 with probability 25%, 50%, and 25%, respectively. But now assume further that each of the two assets requires the work of a single employee. If an asset is sold, an employee loses her job. If the firm goes insolvent, both employees lose their jobs.[29] Suppose that the firm must immediately pay sanctions of 25, and consider the effects of an equity issuance, a debt issuance, and an asset sale.
>
> *Equity Issuance:* As was shown in the previous examples, issuing equity has no effect on the firm's assets or the solvency of the firm. Therefore both employees keep their jobs. Once the uncertainty is resolved, there is a 75% chance that the firm will remain solvent and both employees will retain their jobs, and there is a 25% chance that the firm will be insolvent meaning that both employees will lose their jobs.
>
> *Debt Issuance:* Next, suppose that the firm issues junior debt to pay the sanctions. Because the firm retains both assets, both employees initially retain their jobs. However, the increase in debt increases the probability of default from 25% to 75%.[30] Therefore once the uncertainty is resolved, there is a 25% chance that the firm will remain solvent and both employees will retain their jobs, and there is a 75% chance that the firm will be insolvent meaning that

[29] In this example, there is only one period of work, but we can assume that there is some continuation value for employees if the firm remains solvent. In the formal model developed in Section 2.2, there are multiple periods of employment, which allows for a more nuanced examination of employment.

[30] As shown in the previous example, the firm must issue debt of 60 to pay the sanctions. Therefore the firm has outstanding debt of 90, meaning that the firm remains solvent only when the asset returns a value of 100.

both employees will lose their jobs. Issuing debt increases the probability of insolvency and thereby harms workers.

Asset Sale: The firm can pay sanctions by selling off half of its assets. Asset returns are now 0, 25, or 50 with probability 25%, 50%, and 25%, respectively. The asset sale means that one of the employees has lost her job, while the other employee retains her position. However, because the firm still owes creditors 30, there is a 75% probability of insolvency. Therefore once the uncertainty is resolved, there is a 25% chance that the firm will remain solvent and the remaining employee will retain her job, and there is a 75% chance that the firm will be insolvent meaning that the remaining employee will lose her job. Selling assets results in both immediate layoffs and an increased chance of insolvency that threatens the employment of retained workers.

The example illustrates that employees can be affected from changes on both sides of the balance sheet. Decreases in assets lead to immediate job losses, while increases in leverage increase the likelihood of future job losses. Employees have a clear preference for equity issuances. Equity issuances have no effect on either assets or leverage, and therefore have no effect on employees. Debt issuances only affect the firm's leverage, so while there is an increased chance of future job losses, there are no immediate job losses. And asset sales affect both sides of the balance sheet, leading to both immediate job losses and an increased probability of future job losses. To summarize: *employees prefer that sanctions are paid first through equity issuances, second through debt issuances, and finally through asset sales.*[31]

While employees who are motivated by employment clearly prefer that sanctions be paid through equity issuances, some employees may have other relevant motivations. In particular, employees may have stock options or employee stock ownership plans that may partially align their interests with shareholders. Substantial decreases in the value of equity may lower employees' incentives.[32] However, concerns other than employment are likely to be concentrated among managers and high-earners. While there are roughly 15 million participants with am average of approximately $90 thousand invested in employee stock ownership plans,[33] the vast majority of workers do not hold equity positions in the firms that they work for, and the majority of Americans do not hold equity in any company at all.

There is a growing body of empirical evidence showing the effects of leverage on employment. Aneja and Avenancio-León (2019) show that financial leverage acts as a transmission mechanism for unemployment in labor markets, with workers in highly-leveraged firms facing increased risk of unemployment. Furthermore, the authors find that leverage-related distress costs are disproportionately borne by disadvantaged groups. Giroud and Mueller (2015b) use firm-level data to show that counties with more highly-leveraged firms exhibit a

[31]Proposition 4 (page 42). Proposition 4 shows that while employees generally prefer debt issuances to asset sales, there are some cases when in which employees prefer asset sales to debt issuances. In particular, when the firm is very highly leveraged, asset sales may be preferable for very small sanctions. However the result that workers prefer equity issuances always holds.

[32]Acharya et al. (2000) analyze when options should be repriced.

[33]https://www.nceo.org/articles/statistical-profile-employee-ownership (last accessed April 27, 2019).

significantly larger decline in employment following shocks than counties with less-leveraged firms. Their finding is robust to productivity differences across firms.

There is also empirical evidence consistent with the theoretical results on the effects of asset sales on employment. In particular, Giroud and Mueller (2015a) study the effect of a positive economic shock at a plant on the capital and labor outcomes at other plants within the same firm. They find that financially constrained firms pay for the new investment opportunity by withdrawing capital and laying off workers at other plants within the firm. Importantly, because the distance between plants, it is unlikely that the firm is simply transferring employees between locations, and the decline in employment is greater than the increase in employment. Espahbodi et al. (2000) find positive effects of downsizing on firm performance. Davis et al. (2012) document that a majority of layoffs are concentrated at firms that shrink by more than 10% in a quarter. Moreover, when workers are laid off, they face significant frictions. Elsby et al. (2010) find that roughly 90% of laid-off workers flow into unemployment (versus only about 20% of workers who voluntarily quit). Other research finds that laid-off workers have inferior earnings paths (Davis et al., 2012).

3 The Inadequacy of Standard Sanctions

The previous section shows that firms that are run in the interest of shareholders will sell assets to pay sanctions. Doing so means that creditors, in addition to shareholders, bear some of the incidence of the sanctions, and collateral consequences will be imposed upon employees. Given the bias towards asset sales, imposing sanctions leads to a tradeoff between deterrence and collateral consequences.

3.1 Deterrence

Shareholders' preference for asset sales means that they will only bear a fraction of the total sanctions imposed on the corporation. To see this, consider numerical examples 1 through 3 in the previous section. The firm was sanctioned 25, but this only decreased shareholder utility by 22.5. The gap between the sanctions imposed and the sanctions borne by shareholders leaves room for firms to take harmful actions that benefit shareholders at the expense of other corporate stakeholders and society more broadly.

In order for shareholders to internalize the harm that the firm caused, the sanctioning authority must take into account that asset sales mean that shareholders will only bear some of the cost of sanctions. *In order to impose a particular cost on shareholders, the sanctions imposed on the company must be greater than that cost.*[34]

Figure 2 gives a graphical representation of this. The plot assumes that a firm sells assets to pay sanctions.[35] The horizontal axis is the desired cost to be imposed upon shareholders. The vertical axis shows the level of sanctions required to impose the given cost on shareholders. The solid line indicates the level of sanctions that will impose a

[34]Proposition 5 (page 43).

[35]This figure was generate from the formal model developed in Appendix A, assuming $D = 0.3$. The formal description of this figure is on page 43.

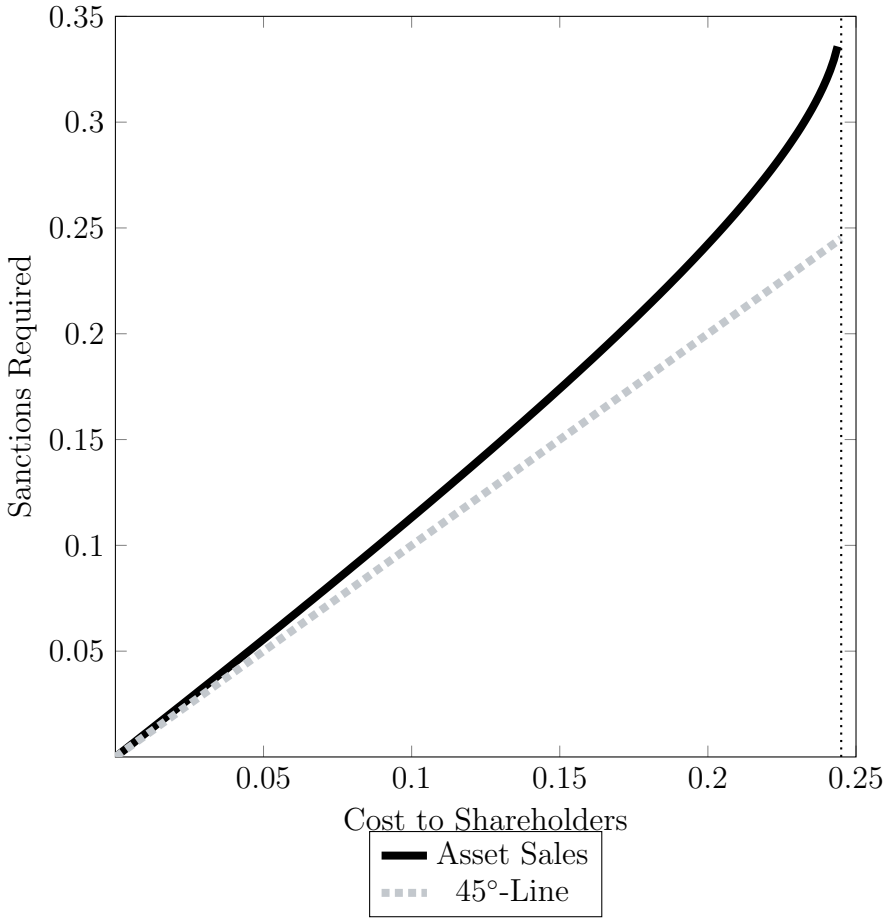

Figure 2: Sanctions Required to Impose a Given Cost on Shareholders (Debt=0.3)

given cost on shareholders, and because shareholders can shift some of the incidence onto creditors, the sanctions must be greater than the desired cost (and therefore the line is always above the 45-degree line). Furthermore, as the desired cost increases, the level of sanctions required for shareholders to internalize that cost increases at an increasing rate. Shareholders will therefore not internalize their harm if sanctions are set equal to harm, even under certain detection.

Up to this point, I have discussed the ex post decision of how to set sanctions so that shareholders internalize the harm caused. But shareholders also care about the benefits accrued from engaging in malfeasance. And while shareholders may benefit from malfeasance, other stakeholders may as well. If undetected, the benefits of malfeasance can decrease the chance of insolvency, thereby benefiting not only shareholders, but also creditors and employees. However, shareholders alone stand to gain when malfeasance is detected with certainty.

When malfeasance occurs, the corporation makes money while simultaneously imposing costs on other parties. The simplest case to consider is when the corporation's benefit is equal to the harm imposed, and the sanctions are set equal to the harm. If the malfeasance is detected with certainty, the firm will have to pay sanctions and disgorge the benefit. But even in this case, shareholders can benefit from the malfeasance because, in general, shareholders will be able to use the profits from the malfeasance to pay a dividend or repurchase shares *before* the sanctions are imposed. And even if shareholders can only extract a tiny portion of the benefit, they will find it profitable to engage in malfeasance. The following example illustrates this.

> **Numerical Example 4** (Deterrence): Consider again the firm that owes creditors 60 and holds an asset that has a value of 50, 100, or 150 with probability 25%, 50%, and 25%, respectively. Assume that the asset is homogeneous in the sense that the firm can sell x% of the asset and the realized return will be reduced by x%. Doing so further results in x% of employees losing their jobs.
>
> The initial value of debt is 57.5, and the initial value of equity is 42.5. Now suppose that the firm can defraud customers, causing a harm of 30 to customers. The fraud creates a benefit of 20 for the firm and a private benefit of 10 for shareholders. The total benefit is therefore equal to the harm caused. The government imposes sanctions of 30 on the firm.
>
> To pay the sanctions, the firm first uses the 20 that it made from malfeasance. The firm then needs to raise an additional 10. Doing so through asset sales means that the firm sells 10% of its assets and the firm's asset returns are now 45, 90, or 135 with probability 25%, 50%, and 25%, respectively. The value of equity drops to 33.75. However, adding shareholders' private benefit, shareholder value is 43.75. The value of debt drips to 56.25. And 10% of employees lost their jobs.

In the absence of detection and sanctions, the money retained by the firm could be used to repay creditors or give bonuses to employees. But once malfeasance is detected, that money will be used to pay sanctions, and the remaining sanctions will be paid through asset sales. This example illustrates a more general point. *If the harm caused is equal to the*

benefit, and the sanctions are equal to the harm, shareholders will engage in malfeasance so long as they can privately capture any fraction of the benefit, even if that malfeasance is detected with certainty.[36] And *even if the benefit from malfeasance is less than the harm and sanctions, there is still scope for shareholders to engage in malfeasance.*[37]

While shareholders can benefit from malfeasance, creditors will bear the costs. In principle, this could mean that creditors would monitor the firm in order to prevent malfeasance. However, imposing costs on creditors is unlikely to further the goal of deterrence. While creditors can intervene at firms after covenants are breached, they otherwise have little scope for exerting control. Furthermore, because creditors hold fixed claims on a firm's income, they will generally find strict covenants to be more effective at protecting their interests than trying to exert control. Imposing costs on shareholders rather than creditors is a much more effective means of deterring corporate malfeasance.

3.2 The Deterrence-Collateral Consequences Tradeoff

I showed in the previous section that in order to properly deter shareholders, the standard monetary sanctions imposed must be greater than the harm caused. But because imposing sanctions will create collateral consequences for creditors and employees, the imposition of standard sanctions leads to a tradeoff between deterrence and collateral consequences. Depending on the situation, the decision to impose sanctions and the magnitude of those sanctions will be made by a judge, jury, prosecutor, regulator, or politician. The fear of collateral consequences may undermine deterrence.

Consider the following example. In 2009, Beazer Homes, one of the country's largest home builders, was fined $50 million for fraudulent mortgage practices.[38] Immediately, the Department of Justice was criticized, even from within the government, for being too soft on Beazer, and for having recouped too little money.[39] However, the U.S. Attorney's Office justified the amount by recognizing that "the imposition of additional criminal penalties or the requirement of additional payment at this time would jeopardize the solvency of Beazer and put at risk the employment of approximately 15,000 employees and full-time contractors not involved in the criminal wrongdoing."[40] Given Beazer's financial position in the wake of the crash of the housing market, the fears of the U.S. Attorney's Office were likely justified.

This fear of imposing collateral consequences is pervasive when imposing large sanctions on corporations. At the prosecutorial level, a longstanding policy of the Justice Department is that prosecutors should take into account the collateral consequences of bringing a prosecution against business organizations (Holder, 1999; Thompson, 2003). In particular, prosecutors have been told to take into account "harm to shareholders, pension holders

[36] Proposition 6 (page 45).

[37] Corollary 2 (page 46).

[38] Henriques, Diana B. "Beazer Homes Reaches Deal on Fraud Charges." The New York Times. 07/01/2009.

[39] Javers, Eamon "DOJ Responds to Criticism of Beazer Homes Investigation." MSNBC. 09/24/2010.

[40] https://archives.fbi.gov/archives/charlotte/press-releases/2009/ce070109.htm (last accessed May 7, 2019).

and employees not proven personally culpable and impact on the public arising from the prosecution" (Thompson, 2003).

The consideration of collateral consequences carries over to sentencing by courts. In principle the United States Sentencing Guidelines (USSG) Organizational Guidelines are "designed so that the sanctions imposed upon organizations and their agents, taken together, will provide just punishment, adequate deterrence, and incentives for organizations to maintain internal mechanisms for preventing, detecting, and reporting criminal conduct."[41] But the USSG explicitly codify considerations of collateral consequences, providing mechanisms to adjust sanctions downwards to "avoid substantially jeopardizing the continued viability of the organization."[42] A number of appellate court cases have upheld downward departures to sanctions in order to protect employees (Racz, 1997). Garrett (2014) discusses how prosecutors frequently cite the fear of collateral consequences when imposing minimal sanctions.

There is every reason to believe that corporations can exploit the fear of collateral consequences. Airlines that are financially distressed receive greater concessions in labor negotiations than non-distressed firms (Benmelech et al., 2012). Towner (2016) finds that indebted firms are able to extract more surplus from bargaining with non-financial stakeholders, who are reticent to extract too much value from the firm for fear of jeopardizing solvency and threatening future returns. But not only can firms benefit from fears of existing debt, Matsa (2010) shows that firms strategically increase leverage in order to improve their bargaining position against workers. While there is no empirical evidence of the effect of fear of collateral consequences on the magnitude of sanctions, the same forces should be at play.

Should decision-makers take collateral consequences into account when sanctioning firms? Decreasing sanctions based on collateral consequences may help mitigate losses to third parties, but also may undermine the very goals of imposing sanctions in the first place. Determining the optimal tradeoff between these two forces is beyond the scope of this paper. However, the next section shows that sanctions can be imposed in a way that imposes the full incidence of sanctions on shareholders and eliminates collateral consequences, thereby avoiding any need to balance interests.

4 Mandating Equity Issuances

The previous sections paint a bleak picture of corporate malfeasance. When sanctions are imposed, shareholders will only pay a portion of those sanctions, undermining deterrence. Creditors and employees will suffer from sanctions, even though there is little that they could have done to prevent malfeasance. In order for shareholders to internalize their harms, sanctions have to be increased, imposing further collateral consequences on others. And because decision-makers will be reticent to impose sanctions on corporations for fear of corporate insolvency and collateral consequences, shareholders will face even less deterrence. A potential solution to these problems is to require that corporations pay sanctions by

[41] USSG §8.

[42] USSG §8C3.3(b).

issuing new equity.[43] Doing so confers a wide variety of advantages.

Under standard sanctions, shareholders will be biased towards paying fines through asset sales, bearing only some of the incidence of the sanctions. Mandating that sanctions be paid through equity issuances means that shareholders alone bear the entire incidence of the sanctions, and no collateral consequences are imposed on others. While these are important first order effects, this section explores the further benefits and mechanics of mandating equity issuances.

4.1 Eliminating the Deterrence-Collateral Consequences Trade-off

The previous section showed that standard sanctions equal to the harm caused do not provide adequate deterrence. Instead, sanctions must be increased further in order to provide proper deterrence. However, *if sanctions are payable through an equity issuance the optimal sanctions are equal to the harm caused.*[44]

Mandating that sanctions are to be paid through equity issuances allows decision makers to impose fines that are far larger than feasible under the standard approach. Consider again the case of Beazer Homes, which was sanctioned $50 million for mortgage fraud in 2009. At the time of the fine, Beazer's market capitalization was approximately $200 million.[45] Even this modest fine could have threatened Beazer's solvency and employees' jobs. But an equity issuance would have allowed the government to impose a fine of up to Beazer's $200 million market capitalization without threatening the firm's solvency or employees.

Imposing a monetary fine on a company that is a significant portion of its market capitalization will threaten its solvency. For this reason, the United States Sentencing Guidelines explicitly allow for downwards adjustments to fines in order to "avoid substantially jeopardizing the continued viability of the organization."[46] The equity issuance removes the need for decision makers to weigh deterrence against collateral consequences and thereby reduces the reticence to impose sanctions.[47] Without the fear of insolvent creditors and laid-off workers, decision makers are more likely to impose the correct level of sanctions,

[43]Coffee (1980) first recognized some of the benefits of forcing corporations to issue stock, but only briefly analyzed the case before dismissing it as a possibility "which has little chance of political adoption." Furthermore, the lack of a model limits the precision of his arguments. For example Coffee recognizes that the issuance of new equity results in shareholders bearing the costs. But he also contradicts this by arguing that, because equity issuances do not increase the chance of insolvency, "[t]hus, even as to the stockholders, there is a marginal degree of superiority associated with fines levied in securities over fines levied in cash." However, this is directly contradicted by my results, and if shareholders prefer equity issuances, mandating an equity issuance would be superfluous because shareholders would choose to do so themselves.

[44]Proposition 7 (page 47).

[45]https://www.macrotrends.net/stocks/charts/BZH/beazer-homes-usa/market-cap

[46]USSG §8C3.3(b).

[47]However, many decision makers are wary about even imposing costs on shareholders. For example, in the case of a fine against Barclays for violating international sanctions, the presiding judge asked of the fine: "Who pays that? Does that come out of the shareholders?[...]There's no alternative source of income to pay for this?[...]Why should the shareholders have to pay for the Bank's irresponsibility? I don't understand that" (Garrett, 2014).

aligning shareholders' interests with society's.

This paper has assumed that decisions are made by shareholders (or in the interest of shareholders). However, while shareholders elect directors and are the ultimate authorities, managers make the day-to-day decisions at a firm, and may seek to further their own compensation rather than shareholders' interests. Studying this managerial agency conflict has been a driving question in corporate finance over the past half century, and the primary solution to the managerial agency problem has been to tie managerial compensation to financial measures. Managerial compensation is typically a combination of a salary, bonus, and stock-based incentives. The bonus and stock-based incentives are meant to get managers to internalize shareholders' preferences. In recent decades, there have been dramatic increases in stock-based pay, and the sensitivity of executive pay to shareholder returns has increased substantially (Tirole, 2010).

Because a manager is compensated based on her firm's share price, she benefits from malfeasance that benefits shareholders.[48] When sanctions are imposed on the firm, managers, like shareholders, will generally favor selling assets to pay sanctions.[49] This in turn means that managers internalize less of the cost of sanctions than they would if the sanctions were paid through an equity issuance. So mandating equity issuances can be expected to better deter malfeasance by managers.

The effectiveness of the mandatory equity issuance would further increase in closely held firms where insiders obtain private benefits from control (Grossman and Hart, 1980). Using the exchange of controlling blocks in 39 countries, Dyck and Zingales (2004) estimate that the average value of control is 14% of the equity value of the firm. This preference for control means that closely held firms would be even more biased away from equity issuances and towards asset sales. A mandatory equity issuance would dilute insider ownership, giving controlling shareholders stronger incentives to refrain from malfeasance.

4.2 Repurchasing Shares

Shareholders have a clear preference for selling assets instead of issuing equity. This raises the following question: will shareholders, following a mandatory equity issuance, immediately sell assets and use the proceeds to repurchase the newly-issued shares?

First, note that if shareholders could profit from selling assets and repurchasing shares after the equity issuance, they could have done so before. Shareholders' incentives to loot a leveraged firm by selling assets to buy shares is *always* present, which is why creditors take steps to protect themselves. Covenants aim to restrict the actions that may benefit shareholders at the expense of creditors. For example covenants may limit dividend payments, restrict share repurchases, ban affiliated transactions, require that loans be earmarked for specific purposes, or require minimum standards of insurance coverage. In the absence of these covenants, shareholders would often find it in their interests to expropriate value from creditors, even in the absence of a mandatory equity issuance. If these covenants

[48]However, managers will generally be tenure-motivated as well, meaning that they may trade off the potential financial benefits of malfeasance against the possibility that they will lose their position.

[49]In fact, because much managerial pay is in the form of options, managers may have even stronger preferences for selling assets and increasing leverage than typical shareholders.

were effective at preventing expropriation before the equity issuance, they should remain effective afterwards.

Furthermore, market forces may discourage further equity issuances. Under the static tradeoff theory, firms' capital structures are determined by a trading off the costs and benefits of more debt. If a firm's capital structure was optimal before sanctions were imposed, that capital structure should remain optimal after the equity issuance. While sanctions diluted shareholders, it did nothing to change the firm's capital structure. So if it was not optimal for the firm to change its capital structure before sanctions, it is still not optimal for the firm to do so after sanctions are imposed.[50]

While covenants and market incentives will limit the repurchase of newly-issued shares, the government can take further steps to limit share repurchases. Most fundamentally, the firm could be restricted from repurchasing shares or paying dividends for some period of time or until some financial milestones are met. Alternatively, the regulator could require that the equity be issued through a general issue in the secondary market instead of a rights offering. In a rights offering, current shareholders are given the first opportunity to buy the new shares, whereas in a general issuance the shares are sold on the open market to any buyers. Mandating a general issuance dilutes the original shareholders. So if the firm does repurchase shares, the original shareholders will only capture a fraction of the gains, thereby eliminating a share repurchase as a means of completely undoing the mandatory equity issuance.

4.3 The Mechanics of Mandatory Equity Issuances

Mandatory equity issuances can be implemented in both civil and criminal cases. They can be implemented at the conclusion of a trial by a judge, through a civil settlement, or through a criminal deferred-prosecution agreement. While a full legal analysis of the ability to implement mandatory equity issuances will be left to future work, this section briefly sketches out how decision makers might implement mandatory equity issuances.

In civil cases, courts cam implement remedies through legal or equitable relief. While legal relief, consisting of damages, is the presumptive form of relief in most cases, equitable relief allows courts to impose injunctions and coercive remedies on the defendant (Dobbs, 1993). This injunctive relief could be used to mandate equity issuances. In criminal cases, the United States Sentencing Guidelines instruct judges how to deal with sentencing organizations. And while monetary fines are the principal means of sanctioning corporations, the USSG also provides that the court can direct the organization to make an in-kind payment to the victim or organization other than the victim.[51] Furthermore, judges can also impose probation and mandate that corporations satisfy conditions prescribed by the court.[52]

[50] Admati et al. (2018) show that firms' capital structures are unlikely to be explained by a series of firm-value maximizing choices, but instead that capital structures will evolve over time based on shareholders' preferences. However in this case, the mandatory issuance of equity has no real effect on the decisions available to the firm.

[51] USSG §8B1.1(d).

[52] USSG §8D1.1, §8D1.3(c). If these conditions are violated, the court may impose a master or trustee to ensure compliance (§8F).

While judges should have the tools to implement mandatory equity issuances, most cases settle before trial. In these cases, the corporation engages into a settlement agreement with a regulator or prosecutor. While settlement agreements could require equity issuances, shareholders would resist issuing equity. In order to induce compliance, regulators may be able to threaten the revocation of a corporation's charter, and prosecutors may threaten prosecution. However, settlement would hinge on the credibility of the threat, and the amount of the equity issuance may be less than would be optimal.

However, even if shareholders resist paying sanctions through equity issuances, there is scope for a Pareto improvement in which shareholders agree to reduced sanctions that are paid through an equity issuance. To see this, suppose that standard monetary sanctions are imposed on a firm. This will result in shareholders bearing some cost less than those sanctions. Instead, lower sanctions could be imposed with a mandatory equity issuance, which would leave shareholders indifferent, but would leave creditors and employees better off.

By mandating an equity issuance, shareholders bear the full incidence of sanctions and collateral consequences are avoided. And the amount of equity issued can be set to make shareholders indifferent between an equity issuance or a larger monetary fine. This illustrates a more general point: *for any monetary sanctions, there is a mandatory equity issuance that results in a Pareto improvement.*[53] The ideal remedy is for sanctions to equal to harm and for those sanctions to be payable through an equity issuance. But if this is not achievable, any monetary fine can be improved upon from the perspective of all stakeholders by a smaller fine that is payable through equity.

Faced with corporate malfeasance, the government has a number of options. The status quo under certain enforcement, supported by the literature, is to impose a monetary fine equal to the harm caused. But this has the effect of under-deterring shareholders and imposing collateral consequences. If a monetary fine is imposed, shareholders will only internalize the harms imposed if the sanctions are set greater than the harm caused, but this results in even greater collateral consequences. Imposing sanctions and mandating equity issuances alleviates the problems of under-deterrence and collateral consequences, and is the best solution for corporate malfeasance.

5 Extension: Debt Covenants

Because shareholders will sell assets to shift some of the incidence of sanctions to creditors, the previous section argued that the government should mandate that sanctions are paid through equity issuances. However, rational creditors will recognize shareholders, raising the question of whether debt covenants can be used in place of mandatory equity issuances to protect creditors.

Covenants act as a means of limiting the agency conflict between creditors and shareholders.[54] While providing some protection to creditors, covenants are necessarily incomplete—writing an optimal complete contingent debt contract is impossible. In some cases, covenants

[53] Corollary 1 (page 44).

[54] In addition to, or in place of, covenants, creditors who anticipate shareholders' incentives to sell assets will demand increased compensation ex ante. While this increases creditors' ex ante welfare, it does nothing

may effectively protect creditors, but in other cases they may be ineffective. Furthermore there is considerable variation between covenants in public and private debt, with private loan agreement generally having much stronger covenants (Nikolaev, 2010). In this section, I first discuss how covenants, particularly those in public debt issuances, do not generally protect creditors from paying sanctions through asset sales. I then consider the more restrictive covenants that are present in private debt, and show that these covenants may provide only modest protection, and that when they do protect creditors, these covenants may actually exacerbate collateral consequences.

5.1 Selling Assets With Unrestrictive Debt Covenants

While bank loans may have restrictive covenants, many public debt issuances place vanishingly few restrictions on the firm's behavior. As an example, consider the conditions placed on a $2 billion issuance of unsecured and unsubordinated debt to be traded on the New York Stock Exchange by British Petroleum.[55] The prospectus explicitly states that BP is "permitted to sell or lease substantially all of our assets to another corporation or other entity or to buy or lease substantially all of the assets of another corporation or other entity." Furthermore, the prospectus states that BP "may take these actions even if they result in a lower credit rating being assigned to the debt securities" and further that BP has "no obligation under the indenture to seek to avoid these results, or any other legal or financial effects that are disadvantageous to you, in connection with a merger, consolidation or sale or lease of assets that is permitted under the indenture." The prospectus for the debt issuance has a small number of restrictions. Short of reducing the amount due, changing the maturity, or changing the voting rules, creditors can only intervene in the event of a missed payment. It is notable that after this issuance, BP sold tens of billions of dollars of assets and the 10-year cumulative default probability of BP increased three-fold (van Deventer, 2015).

Loan agreements like this provide no protection against asset sales by the firm. What explains these permissive terms? Investment grade bonds frequently rely more on the market's trust of the firm's solvency rather than restrictive covenants.[56] But while that trust may be founded ex ante, after significant sanctions are imposed, the absence of covenants restricting asset sales harms creditors. Furthermore, insurance is unlikely to provide significant protections for major sanctions.[57] And even in the presence of covenants that are

to deter corporate malfeasance or the firm's incentives to raise funds by selling assets.

[55]https://sec.report/Document/0001193125-14-391678/d811140d424b5.htm (last accessed May 3,2019).

[56]While higher-risk bonds typically have stronger covenants, Mellow (2017) reports that recent years have seen an erosion in the protective clauses in high-yield investors. This process of erosion even extends to bank senior bonds. Caiger-Smith (2017) reports that senior bank bonds increasingly omit acceleration covenants, removing the ability of investors to demand immediate payment except in the case of default. Economist (2019) reports that among leveraged loans, "covenant-light" loans make up around 85% of new issuances.

[57]BP did not collect any significant amount from insurance coverage to pay for its liability related to Deepwater Horizon (Gyo Lee et al., 2018). Large businesses will frequently self-insure, meaning that instead of buying general liability insurance, they pay losses themselves. They do this because they have the financial capacity to pay for small to medium sized liabilities, and because it is difficult and expensive to find insurers to bear large losses (Doherty and Smith Jr, 1993). While Directors and Officers insurance

meant to protect creditors from expropriation, firms may be able to take additional actions to avoid tripping additional covenants. While private debt frequently requires quarterly compliance with covenants, public debt contracts often only require annual compliance certification (Kahan and Tuckman, 1993), potentially giving firms a substantial amount of time to behave opportunistically before the next certification is due. Finally, when firms do violate covenants, the conditions imposed on the firm are frequently waived or relaxed and are almost never strengthened (Garleanu and Zwiebel, 2008).

An analysis of over 4,000 public bonds issued by U.S. industrial companies shows that 90% include restrictions on asset sales. However these covenants do not generally prevent asset sales, but instead typically require that assets are sold at a fair market value, limit non-cash proceeds, or put limits on leverage following the asset sale (Reisel, 2014). While these requirements may limit asset substitution, they may be ineffective at preventing the firm from selling assets to the benefit of shareholders. Even if assets are sold at fair market value (or even above fair market value), paying sanctions through asset sales can harm creditors. And to circumvent restrictions on leverage, the firm may be able to sell even more assets and use the proceeds to repurchase junior debt to bring the firm's leverage back in line with covenants.[58] In these cases, firms may be able to sell assets without tripping any covenants.

5.2 Selling Assets With Restrictive Debt Covenants

Private loan agreements typically have more covenants in their loan agreements than public offerings. Firms that issue private debt tend to be smaller, have less long-term debt, fewer tangible assets, and more volatile cash flows than those firms that issue public debt (Bradley and Roberts, 2015). Furthermore lenders may also issue secured debt, which gives them a stronger claim on the firm's assets than unsecured debt. The presence of strong covenants may mean that it is difficult for a firm to sell an appreciable amount of assets without violating a covenant. In response to covenant violations, loan agreements have acceleration clauses that allow the lender to demand the immediate repayment of the principal and any accrued interest. Nonetheless, this section shows that it may be in shareholders' interests for the firm to sell assets even when doing so violates a covenant protected by an acceleration clause.

The example of an actual loan helps to illustrate the steps that lenders take to protect themselves. In 2006 a group of banks with HSBC as the administrative agent made a loan to Lifetime Brands, Inc.[59] The loan agreement commits the lenders to provide funds as long as the borrower complies with the terms of the loan. Table 1 lists the affirmative and negative covenants in the agreement. There is wide range of covenants, but particularly relevant are

may provide entity coverage ("Side C"), this coverage typically only covers securities claims.

[58] Admati et al. (2018) show for example that balance sheet covenants may in fact exacerbate the sale of assets when a firm is forced to recapitalize. Because junior debt can be repurchased at a relatively low price, the firm can sell additional assets in order to buy back a substantial amount of junior debt. So while a leverage covenant may limit the risk to creditors, it may exacerbate asset sales, thereby increasing the collateral consequences imposed on employees.

[59] The example and Table 1 are drawn from Chodorow-Reich and Falato (2017), who show the importance of covenant violations in transmitting information about bank health.

Affirmative Covenants	Negative Covenants
Financial statements and other information (6.01)	Indebtedness (7.01)
Notices of material events (6.02)	Liens (7.02)
Existence; conduct of business (6.03)	Fundamental changes (7.03)
Payment of obligations (6.04)	Investments, loans, advances, guarantees and acquisitions (7.04)
Maintenance of properties (6.05)	Asset sales (7.05)
Books and records; inspection rights (6.06)	Sale and lease-back transactions (7.06)
Compliance with laws (6.07)	Hedging agreements (7.07)
Use of proceeds (6.08)	Restricted payments (7.08)
Notice of certain changes (6.09)	Transactions with affiliates (7.09)
Insurance (6.10)	Restrictive agreements (7.10)
Additional subsidiaries (6.11)	Amendment of material documents (7.11)
Information regarding collateral (6.12)	Leverage ratio (7.12)
Casualty and condemnation (6.13)	Interest coverage ratio (7.13)
Intellectual property (6.14)	further assurances
	Prepayments of indebtedness (7.14)
	Capital expenditures (7.15)
	Fiscal year (7.16)
	ERISA obligations (7.17)

Table 1: Covenants for Loan Agreement between HSBC and Lifetime Brands, Inc.

negative covenants that restrict indebtedness (7.01), asset sales (7.05), the leverage ratio (7.13), the interest coverage ratio (7.14), and an affirmative covenant mandating compliance with the law (6.07). The presence of these covenants make it unlikely that the borrower would be able to pay sanctions through asset sales without violating some covenant. Upon violating these covenants, the lender may immediately demand repayment of the loan and all accrued and unpaid interest(Sections 8.01(d) and 8.02(b)). Under a loan agreement like this, a firm that sells assets without the lender's permission may need to repay its loan.[60]

In a typical corporate bond investment the borrower makes predetermined semi-annual interest payments until the bond reaches its maturity, at which time the borrower repays the principal that the lender invested. The bond's face value, or par value, is the amount that will be paid to the lender at the maturity date. If a lender demands payment from a borrower who has violated covenants, the lender receives the principal and accrued interest, not the face value of the bond.[61]

[60]However, while violated covenants generally allow the lender to call in the loan, some agreements only allow the loan to be called in the event of insolvency (Caiger-Smith, 2017). Furthermore, when covenants are violated creditors may not call the loan, and may instead use the threat of doing so to renegotiate the credit agreement and impose stronger contractual restrictions on the borrower (Nini et al., 2012). However Nini et al. (2012) find that violating firms sell assets and that balance sheet debt declines, decreasing leverage.

[61]To make this more clear, consider a 30-year home mortgage at a 5% interest rate for $1 million. Over the lifetime of this mortgage, the home buyer will pay the bank back approximately $2 million ($1 million

But the principal of the bond is not the same as its market value. Because a bond is a risky investment with a promise of future interest rates, the market value of the bond will vary with the firm's prospects and the state of the broader financial market. If the bond's interest rate increases (decreases) relative to the broader market, the market value of a bond will increase (decrease). And if the firm's probability of insolvency decreases (increases) the market value of the bond will increase (decrease). If the market value of the bond is less than the principal, the lender will profit from demanding immediate repayment from a borrower who has violated covenants. In other words, the option to accelerate the loan is "in the money." But if the market value of the bond is greater than the principal, the lender will not exercise its option for immediate repayment (the option is "out of the money"). This divergence between market value and the principal value gives shareholders scope to profitably sell assets even when doing so violates covenants. To see this, consider the following example:

> **Numerical Example 5** (Violating Covenants): Consider again a firm that owns an asset that has a value of 0, 50, or 100 with probability 25%, 50%, and 25%, respectively. Assume that this asset can be divided into two perfectly correlated assets, so that each pays 0, 25, or 50 with probability 25%, 50%, and 25%, respectively. Again, the firm must pay sanctions of 25.
>
> Assume that the firm owes a creditor 30. The loan has a no asset sale covenant that allows the creditor to demand the principal of the loan if the firm sells any assets. In the absence of any sanctions, the market value of debt is the same as in the previous examples, 22.5. Consider two cases to see how the value of the loan principal affects the creditor's welfare and her choice of whether to demand payment:
>
> 1. (*Market Value* > *Principal*) Suppose that the principal on the loan is 15 and the promised interest is 15. If sanctions are paid through asset sales, the market value of debt drops to 20, but the principal remains at 15. This means that the creditor will not exercise her option for immediate payment. The creditor therefore lost 2.5 from the firm's actions.
> 2. (*Market Value* < *Principal*) Suppose that the principal on the loan is 25 and the promised interest is 5. If sanctions are paid through asset sales, the market value of debt drops to 20, but the principal remains at 25. The creditor will therefore exercise her option and will demand immediate repayment. Immediate repayment will decrease the value of equity to 0 because the firm will have to sell its second asset. Anticipating that the creditor will demand immediate payment, the shareholder will instead pay sanctions through a security issuance. The value of debt is therefore unaffected and remains at 22.5.

This example illustrates that covenants that allow the creditor to accelerate debt payments may or may not protect the creditor. In the first case, the market value of debt was

in principal and $1 million in interest). Suppose the home buyer breaks the agreement after the first month, and the bank demands repayment. The bank is entitled to the $1 million principal plus the missed interest payment. The bank is not entitled to the $1 million in expected interest payments.

sufficiently high that the covenant did not protect creditors, whereas in the second case the market value was low enough so that the covenant prevented the firm from selling assets. The relationship between the market value and the principal value of debt will determine whether the covenant can effectively protect creditors. *If the debt principal is less than the market value of debt, there exist sanctions for which shareholders are able to pass some of the incidence onto creditors.*[62]

But even when a covenant can protect a creditor, it may lead to worse outcomes for other stakeholders. When a creditor accelerates a debt payment, the firm will pay through asset sales, lowering the prospects of repayment for any remaining creditors. Furthermore, the asset sales will result in further job losses for employees.

6 Discussion

This paper has shown that firms' capital structures have important consequences for the incidence of sanctions related to corporate malfeasance. With debt in place, firms that act in the interest of shareholders will pay sanctions by selling assets, thereby increasing leverage and imposing costs on creditors and employees. Importantly, shareholders will only bear a portion of sanctions, meaning that standard fines will underdeter corporate malfeasance. Importantly, this paper has shown that under standard sanctions, shareholders can profit from malfeasance even when it is detected and sanctioned with certainty.

In principle, creditors and employees could anticipate corporate malfeasance in advance and could take steps to protect themselves. If creditors charge higher interest rates because of the expected effects of asset sales, then the cost of capital will increase above its efficient level. Introducing stronger debt-to-equity ratio or no-asset-sale covenants in loan agreements will protect creditors to an extent, but they are not a panacea. While these covenants protect some of the creditors' interests ex post, it still keeps shareholders from internalizing the full cost of the harms that they cause. Furthermore, even strong covenants protected by debt acceleration clauses only provide modest protection, and these covenants may increase the costs for unprotected creditors and the collateral harms to employees.

Employees have even less opportunity to protect themselves than do creditors. While employment contracts provide a measure of protection, most employees can be fired without much difficulty. While employees should, in principle, take actions to monitor the firm and prevent corporate malfeasance, the majority of employees who will be adversely effected by asset sales are not in the position to monitor corporate malfeasance. Executives and managers benefit the most from corporate malfeasance, yet their jobs tend to be more secure than rank-and-file employees, and even when these managers lose their jobs, they tend to have better employment prospects.

And after malfeasance has occurred, those responsible for sanctioning the corporation often fail to effectively do so. The justice department explicitly tasks prosecutors to take collateral harms into account. Sentencing guidelines encourage downwards adjustments to fines if a firm's viability is threatened. It is admirable that these decision makers take the welfare of employees, creditors, shareholders, and communities into account. However, this

[62] Proposition 8 (page 48).

concern with collateral consequences undermines justice and the effectiveness of deterrence.

This paper has offered a solution for the problems of insufficient internalization of harms by shareholders and the fear of collateral consequences: decision-makers should require that firms pay sanctions through equity issuances. Doing so has two effects. First, it induces shareholders to fully internalize the results of their actions. And second, it eliminates collateral harms, thereby reducing the reticence of prosecutors, regulators, and judges to impose large fines on corporations.

In order to capture stakeholders' fundamental motivations, this paper has considered firms' choices in the frictionless setting of Modigliani and Miller (1958). This led shareholders and creditors to be indifferent between debt and equity financing. However, this may change in the presence of frictions such as tax-subsidized debt and bankruptcy costs. Admati et al. (2018) show that shareholders are predisposed to increasing leverage in a manner that expropriates value from creditors. This force implies that firms may rely on both asset sales and debt issuances to pay sanctions. This is particularly relevant in cases where assets would be sold at a discount, because it still leaves room for shareholders to pass costs to creditors.

This paper presents a number of avenues and challenges for empirical work. This paper predicts that a firm's market capitalization will decline by less than imposed sanctions, and the value of debt will fall as well. However, because decision-makers may be concerned about collateral consequences, sanctions may be adjusted downwards (Garrett, 2014; Racz, 1997). Understanding the degree to which decision-makers adjust sanctions downwards for fear of collateral consequences is a promising avenue for future research. And while some work has been done on firms rationally engaging in malfeasance (Shapira and Zingales, 2017), the extent to which firms can and do engage in malfeasance that is likely to be detected is unknown.

Firms' financing decisions have important implications outside of areas that are traditionally related to finance. While increasing shareholder value is often associated with increases in firm value, that is not always the case. Shareholders can take actions that decrease firm value while increasing shareholder value. This paper illustrates that shareholders, not the corporation, are the ultimate principals. When deciding how to combat corporate malfeasance, society must take into account the realities of the corporate form. It is shareholders who are ultimately in control of corporations, and by overlooking this fact, the present system of dealing with corporate malfeasance fails to achieve its desired ends.

A Model

This appendix lays out a model and formally derives the main results established in the paper.

A.1 Setup

In this section, I develop a reduced-form model to analyze the interaction of a firm's capital structure and sanctions against the corporation.

Consider a corporation that has made an investment in a risky asset and has funded itself partly through debt. The analysis makes the following assumptions about the firm:

Assumption 1 (Firm Investment)**.** *The firm has investment in assets A, with a uniformly distributed return $x \sim U[0, A]$. The value of x is revealed at period 1, and at period 2 the returns are realized. The initial level of assets is normalized to one.*

Assumption 2 (Firm Liabilities)**.** *The firm is partially funded by a short-term debt claim with a face value of $D \in (0, 1)$ that is due at period 1.*

Assumption 3 (Refinancing and Insolvency)**.** *If at period 1, $x < D$, the firm will not be able to pay its debts and the firm will be liquidated. Creditors will receive the the liquidation value of the firm, x. If $x > D$, then the firm will refinance the loan.*

Assumption 4 (Debt Covenants)**.** *The following debt covenants are in place:*[63]

1. *The firm can only issue junior debt.*

2. *The firm cannot pay a dividend (or repurchase shares) before creditors are paid.*

Assumption 5 (Malfeasance)**.** *The firm has taken an illegal action that has harmed society. The level of harm is perfectly observable and is given by h. A regulator imposes sanctions s on the firm.*[64]

Assumption 6 (Paying Sanctions)**.** *The firm must immediately pay the sanctions imposed. It can do so through adjusting its capital structure with any combination of (i) issuing equity, (ii) issuing junior debt, d, and (iii) selling assets. Let $C \in \{E, D, A\}$ denote the firm's capital structure after having made a payment. Where $C = E$ means the firm has paid through an equity issuance, $C = D$ means the firm has paid through debt issuance, and $C = A$ means that the firm has paid through asset sales. The decision of how to pay the sanctions is made only on the basis of how it affects shareholders' wealth.*

Assumption 7 (Pricing)**.** *All securities are traded in perfect Walrasian markets. The risk-free rate of interest is normalized to zero. All securities (including the risky asset) trade at a price equal to their expected value.*

[63] These covenants protect shareholders from looting the firm at the expense of creditors. Section A.6 considers more restrictive covenants

[64] I frame this paper in terms of crime and criminal sanctions. However all of the results hold for civil liability.

Overall, the sequence of actions is as follows:

Period 0 - The firm has an existing level of debt, D.
- The regulator observes harm h and imposes sanctions s on the firm.
- The firm pays the sanctions, raising the money to do so through issuing equity, issuing debt, or selling assets.

Period 1 - The value of the assets, x is revealed.
- If $x > D$, the firm refinances and remains solvent.
- If $x < D$, the firm defaults and creditors receive the liquidation value of the firm, x.

Period 2 - The assets pay out. Creditors receive D and shareholders receive $x - D$.

A.2 Firm Value

Given the assumptions about the firm and pricing, the value of the firm's debt and equity in the absence of any sanctions is given by:

$$\begin{aligned}\text{Value of Debt} \equiv V_D(D) &= Pr[x \geq D]D + Pr[x < D]\mathbb{E}[x|x < D] \\ &= (1 - D)D + D(\frac{1}{2}D) \\ &= D - \frac{D^2}{2} \end{aligned} \tag{1}$$

$$\begin{aligned}\text{Value of Equity} \equiv V_E(D) &= Pr[x \geq D]\mathbb{E}[x - D|x \geq D] + Pr[x < D](0) \\ &= (1 - D)(\frac{1}{2}(1 + D) - D) \\ &= \frac{1}{2}(1 - D)^2 \end{aligned} \tag{2}$$

The total value of the firm is therefore $V_F \equiv V_D(D) + V_E(D) = \frac{1}{2}$, which is equal to the expected returns of the asset. In the absence of any additional frictions, the total value of the firm is independent of the firm's capital structure (Modigliani and Miller, 1958).

In the absence of sanctions, there is nothing that shareholders can do to improve their payoffs. Covenants restrict shareholders from looting the firm by selling assets to pay themselves dividends. Furthermore, shareholders will never benefit from issuing additional equity to reduce leverage. To see this, suppose that the firm buys back a portion d of its existing debt. The firm cannot buy back debt at the price given in (1). Instead it must buy back the debt at a price such that, on the margin, creditors are indifferent between retaining or selling their debt.[65] The value of any outstanding debt following a repurchase is therefore given by:

$$V_{D-d}(D - d) = (D - d) - \frac{(D - d)^2}{2}.$$

[65]The holdout effect is discussed in Frenkel et al. (1989) and Bulow and Rogoff (1990).

So the price to buy back debt d is given by $\frac{V_{D-d}(D-d)}{D-d}d$. And given that the value of equity is given by $V_E(D-d) = \frac{1}{2}(1-(D-d))^2$, the net effect on shareholders of issuing equity to buy back debt d is:

$$\big(V_E(D-d) - V_E(D)\big) - \frac{V_{D-d}(D-d)}{D-d}d = -\frac{dD}{2}. \tag{3}$$

Therefore shareholders will not voluntarily reduce leverage.[66]

Next consider the refinancing decision that faces the firm at period 1. At this point, the firm must raise sufficient funds to pay back all existing debts. Because the value of x is known at this point, the ability of the firm to refinance is contingent on the amount of outstanding debt. If $x \geq D + d$, it is costless for the firm to refinance by issuing new riskless debt that is equal to the outstanding debt. If, however, $x < D + d$, the assets are insufficient to raise sufficient capital to pay back outstanding debts, and the firm will default. Finally, note that at period 1, the firm is indifferent between refinancing through debt issuances, equity issuances, and asset sales because the value of x has been realized.

A.3 Paying Sanctions

Now suppose that the regulator has imposed sanctions s on the firm. The firm must pay the sanctions immediately. Because the firm has no cash on hand, it must raise sufficient funds to pay the sanctions. It can do so through adjusting its capital structure with any combination of (i) issuing equity, (ii) issuing junior debt, d, and (iii) selling assets.

First, suppose that the firm raises capital through issuing additional equity. The price of the new equity will be equal to the expected return of the new equity. Therefore the returns to equity remain unchanged, but shareholders now share the returns with new investors. Issuing equity to pay sanctions is equivalent to levying sanctions directly on shareholders. The value of equity given debt D, sanctions s, and capital structure E is given by:

$$V_E(D, s, C = E) = \frac{1}{2}(1-D)^2 - s. \tag{4}$$

But because issuing equity is a voluntary choice made by shareholders, any equity issuance requires that shareholder utility remains weakly positive. This implies that the maximum amount of sanctions that can be paid through an equity issuance is the initial value of equity: $V_E(D)$. Because issuing equity leaves the level of assets and debt unchanged, it has no effect on the value of debt:

$$V_D(D, s, C = E) = D - \frac{D^2}{2}. \tag{5}$$

Next, suppose that the firm raises capital through issuing junior debt. Let the face value of the junior debt be given by d. The firm must issue debt such that the new creditors

[66] The result that shareholders will never voluntarily reduce leverage is shown in a more general framework in Admati et al. (2018).

break even in expectation. The firm will sell the debt at a price equal to its expected value, $V_d < d$. The value of junior debt is given by:

$$\begin{aligned} V_d(D, s, C = D) &= Pr[x \geq D + d]d + Pr[D \leq x < D + d]\mathbb{E}[x|D \leq x < D + d] \\ &= (1 - D - d)(d) + d(\frac{1}{2}d) \end{aligned}$$

To pay the sanctions through a debt issuance, the firm must issue debt such that $V_d(D, d) = s$. Solving yields that the firm must issue debt:

$$d = 1 - D - \sqrt{(1 - D)^2 - 2s}. \tag{6}$$

The payment to senior debt is protected and the expected returns for the firm are unchanged following the debt issuance, so the most that the firm can raise through a junior debt issuance is the initial value of equity $V_E(D)$. The value of equity following the issuance of junior debt is given by:

$$\begin{aligned} V_E(D, s, C = D) &= \frac{1}{2}(1 - D - d)^2 \\ &= \frac{1}{2}(\sqrt{(1 - D)^2 - 2s})^2 \\ &= \frac{1}{2}(1 - D)^2 - s. \end{aligned} \tag{7}$$

Which is the same as the value of equity following the issuance of new equity to pay the sanctions. And because initial creditors are senior to junior creditors, the issuing of junior debt has no effect on the value of senior debt:

$$V_D(D, s, C = D) = D - \frac{D^2}{2}. \tag{8}$$

The final option for paying sanctions is through asset sales. The asset has an expected value of $\frac{1}{2}$, so the firm can sell assets a at the price $\frac{a}{2}$. Given sanctions s, a firm that relies on asset sales will therefore have to sell assets $2s$, and will therefore have a new asset stock $1 - a = 1 - 2s$. The distribution of asset returns becomes $x \sim U[0, 1 - 2s]$.

First consider the value of equity following an asset sale. Equity loses all of its value if the level of assets drops below the face value of debt claims, $1 - a \leq D$. In this case, insolvency is guaranteed. If $1 - a > D$, equity retains some of its value, because while there is an increased chance that the firm becomes insolvent, there remains a positive probability that the firm will remain solvent and shareholders will receive a payout. Given that the firm has to sell assets of $2s$ to pay the sanction, the value of equity is:

$$V_E(D, s, C = A) = \begin{cases} \frac{(1-2s-D)^2}{2(1-2s)} & \text{if } s < \frac{1-D}{2} \\ 0 & \text{if } s \geq \frac{1-D}{2} \end{cases} \tag{9}$$

Next, consider the value of debt following a sale of assets. The asset sale increases the probability that the firm will default, and that creditors will receive only partial payment—

or no payment at all. The value of debt is given by:

$$V_D(D, s, C = A) = \begin{cases} D - \frac{D^2}{2(1-2s)} & \text{if } s < \frac{1-D}{2} \\ \frac{1}{2}(1-2s) & \text{if } \frac{1-D}{2} \leq s \leq \frac{1}{2} \\ 0 & \text{if } s > \frac{1}{2} \end{cases} \tag{10}$$

If sanctions are small, creditors may still be paid in full. If sanctions are sufficiently large, creditors receive at most a partial payment. And very large sanctions mean that creditors are not paid.

Investors' utilities and the magnitude of sanctions determine the choices that the firm has in paying sanctions:

Lemma 1. *The firm can pay* ***low sanctions*** *($s < \frac{1}{2}(1-D)^2$) through any means. The firm can pay* ***medium sanctions*** *($s \in \left[\frac{1}{2}(1-D)^2, \frac{1}{2}(1-D)\right]$) through asset sales or combined asset sales and security issuances. The firm can pay only* ***high sanctions*** *($s > \frac{1}{2}(1-D)$) with asset sales. Sanctions above $\frac{1}{2}(1-D)$ necessarily lead to insolvency.*

This result shows that the magnitude of sanctions determines what flexibility a firm has in determining how to pay sanctions. For small sanctions, the firm can pay through either asset sales, security issuances, or a mix of the two. However, once sanctions are sufficiently large, the financial outlook of the firm is sufficiently bad that it cannot raise enough capital through security issuances alone, because new investors do not believe that they will be paid back in full. Finally, very large sanctions will bankrupt the firm and will require liquidating assets.

A.3.1 Shareholder Preferences

The following result shows that shareholders *always* prefer selling assets rather than issuing debt or equity.

Proposition 1. *Shareholders always prefer selling assets over issuing debt or equity. Shareholders are indifferent between issuing debt or equity.*

Figure 3 gives a graphical intuition of Proposition 1. It shows shareholder value as a function of the level of sanctions and the method of payment. The dashed line represents shareholder utility from security issuances—either debt or equity. When the firm pays its sanctions through security issuances, shareholders internalize the full cost of sanctions. Therefore, the highest sanctions that can be sustained through security issuances is the ex ante market capitalization of the firm.

The solid line shows shareholder utility when paid through asset sales. Asset sales lower the firm's expected earnings, and decrease shareholder utility. However, unlike security issuances, some of the cost of the sanctions are borne by creditors, who now face lower expected payments. By selling assets, shareholders are able to defray some of the cost of sanctions.

The vertical dashed lines separate the plot into three regions, based on the firm's options for paying sanctions. When sanctions are relatively low ($s < 0.245$ in the example), the firm

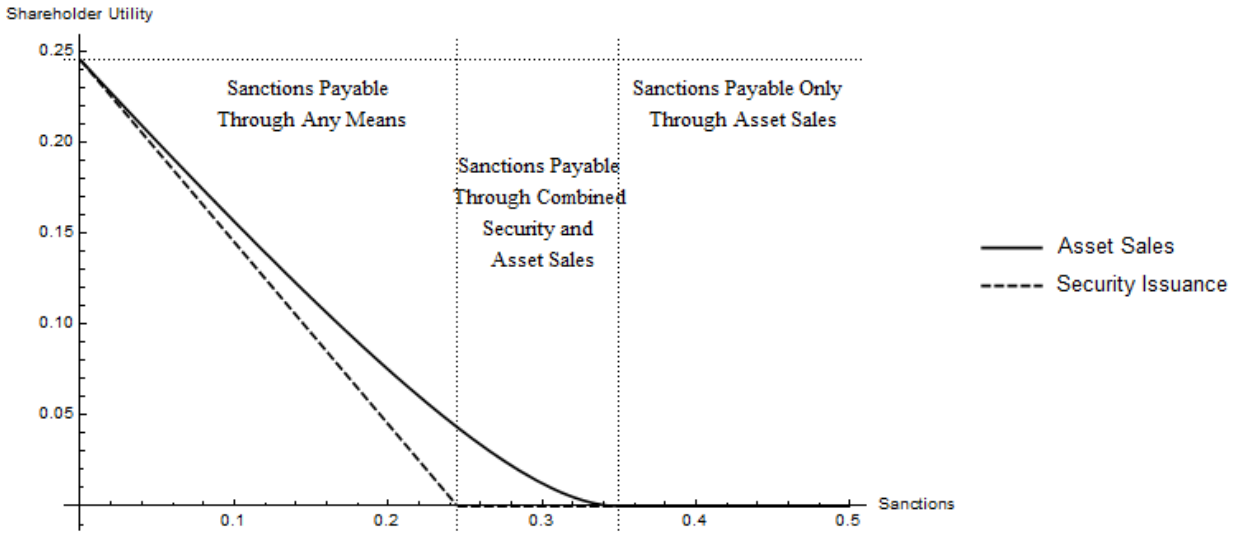

Figure 3: Shareholder Utility as a Function of Sanctions and Shareholders' Chosen Capital Structure ($D = 0.3$)

can pay through any combination of security issuances and asset sales. When sanctions increase to a moderate level ($0.245 \leq s \leq 0.35$), it is no longer possible to pay the sanctions through security issuances alone, because new creditors (or shareholders) are behind the original claimants. The financial state of the firm means that it cannot offer prospective investors sufficient returns to induce them to invest. Therefore the firm must sell assets to pay off some of the sanctions. However, in this middle region, it is possible for the firm to combine asset sales with security issuances. When sanctions are large ($s > 0.35$), the combination of sanctions and commitments to existing creditors means that it is impossible to raise any money through security issuances. In this case, the firm will resort to selling assets to pay the sanctions.

A.3.2 Creditor Preferences

Shareholders' preferences for asset sales harm creditors. The following proposition shows that creditors prefer securities to be issued to pay sanctions wherever possible, and asset sales should be used only as a last resort.

Proposition 2. *For low sanctions, creditors prefer sanctions to be paid through pure security issuances. For moderate sanctions, creditors prefer combined security issuances and asset sales. For high sanctions, sanctions are only payable through asset sales. Creditors are indifferent between debt and equity securities.*

Figure 4 gives a graphical interpretation of proposition 2. The solid line indicates creditor utility from asset sales, while the dashed line shows creditor utility from security issuances. In direct contrast to shareholders, creditors prefer that sanctions be paid through security issuances wherever possible. Creditors are senior claimants, so any additional debt or equity issuances have no effect on senior creditors' payoffs. Therefore, if sanctions are

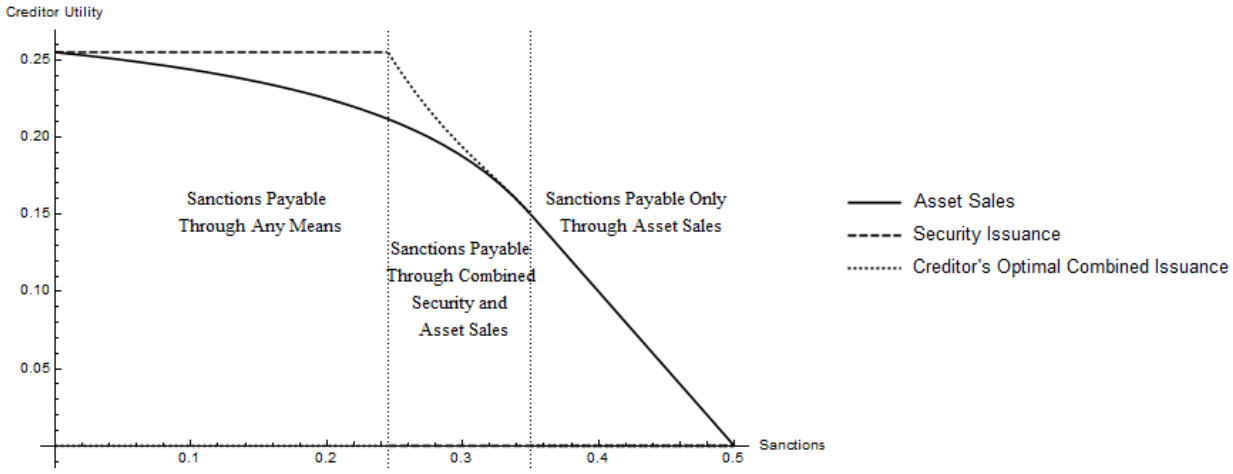

Figure 4: Creditor Utility as a Function of Sanctions and Shareholders' Chosen Capital Structure ($D = 0.3$)

paid through equity issuances alone, sanctions have no effect on creditor utility, because the entire incidence of the loss is paid for by shareholders. Asset sales, however, decrease creditor utility, because they increase the probability of insolvency and thereby decrease creditors' expected payoffs. So for small sanctions, $s < 0.245$, creditors prefer sanctions to be paid through security issuances.

When sanctions increase past a certain level, it is no longer possible to pay through security issuances alone. For moderate sanctions, $0.245 \leq s \leq 0.35$, creditors preferred method of payment is through combined asset sales and security issuances. The relative weighting of security issuances and asset sales is determined by shareholders' utility. Creditors prefer that enough securities are issued so that current shareholders lose their entire investment, and new security holders break even in expectation. This means that creditors' only losses are the increased chances of insolvency, where the probability of insolvency has been minimized.

As sanctions increase, the amount that can be paid through security issuances decreases, and the firm must sell more assets. When sanctions are sufficiently high ($s > 0.35$), no securities can be issued, and sanctions will be paid only through asset sales. At this point, insolvency is guaranteed and each unit of additional sanctions decreases creditor utility by another unit.

A.3.3 Incidence of Sanctions

However, while creditors have preferences for full or partial security issuances to pay the fine, decisions for firms outside of bankruptcy are typically made by shareholders. And because shareholders will prefer to sell assets, creditor utility will not be maximized. By selling assets, part of the incidence of the sanctions is borne by shareholders and part is borne by creditors. The following proposition characterizes the incidence of sanctions:

Proposition 3. *The proportion of sanctions paid by equity holders is :*

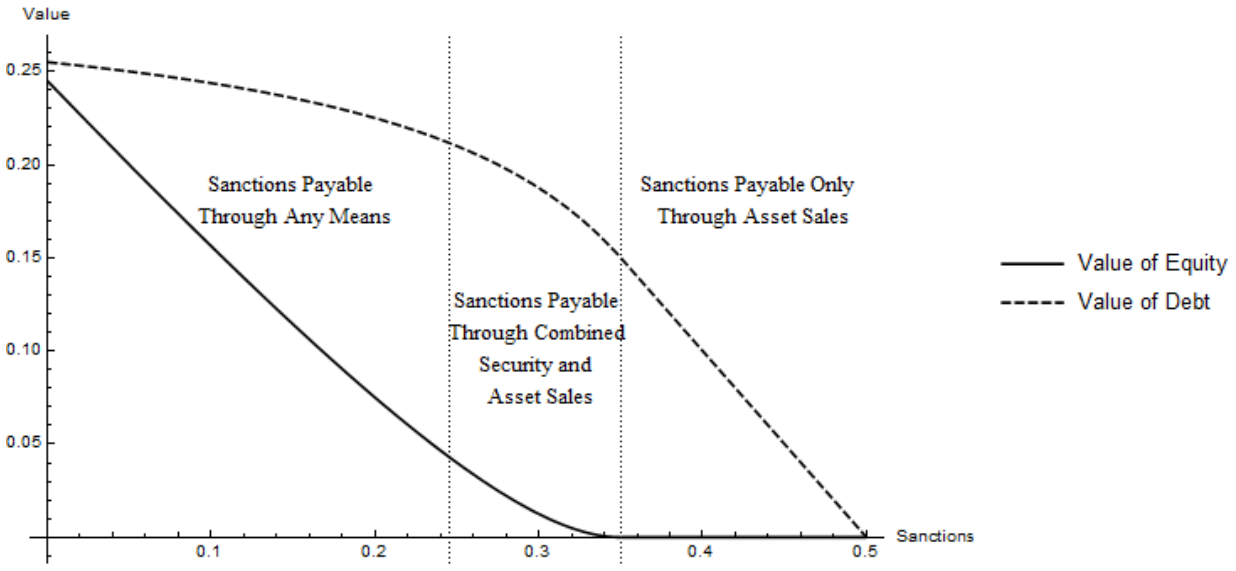

Figure 5: Value of Debt and Equity as a Function of Sanctions Given Asset Sales ($D = 0.3$)

(a) Decreasing in the level of sanctions, and

(b) Decreasing in the level of debt.

Proposition 3 shows that creditors pay an increasing proportion of sanctions as sanctions increase. This follows from the fact that the marginal cost of sanctions for equity holders is decreasing in the level of sanctions, while the marginal cost of sanctions for creditors holders is increasing in the level of sanctions. Therefore each subsequent increase in the level of sanctions is less painful for equity holders but more painful for creditors.

Figure 5 plots the incidence of sanctions on creditors and shareholders for a firm with debt $D = 0.3$, assuming that shareholders sell assets. In the absence of sanctions, the value of equity is $V_E(0.3) = 0.245$ and the value of debt is $V_D(0.3) = 0.255$, for a total firm value of $V_F(0.3) = 0.5$. For small sanctions, the value of equity decreases much faster than that of credit. This is because equity holders remain residual claimants, and are only paid after creditors are paid in full. However as sanctions increase, creditors pay more and more as the probability of default increases.

While figure 5 shows the absolute incidence of the sanctions on equity and debt, figure 6 shows the percentage of sanctions borne by equity and debt. In this example, creditors pay less than equity holders when sanctions are less than 0.49. However, as the initial level of debt increases, creditors will bear a higher proportion of the incidence of sanctions for any level of sanctions—the higher a firm's leverage, the higher proportion of sanctions will be borne by creditors.

If a firm is sufficiently leveraged, and sanctions are sufficiently high, the majority of the incidence of the sanctions may be borne by creditors rather than equity holders. Figure 7 shows sanctions for which equity holders and creditors will bear equal incidences for a given level of debt. For low levels of debt ($D < 0.29$), equity holders will always bear more of the incidence of sanctions than creditors. Once debt is sufficiently high ($D = 0.29$), the

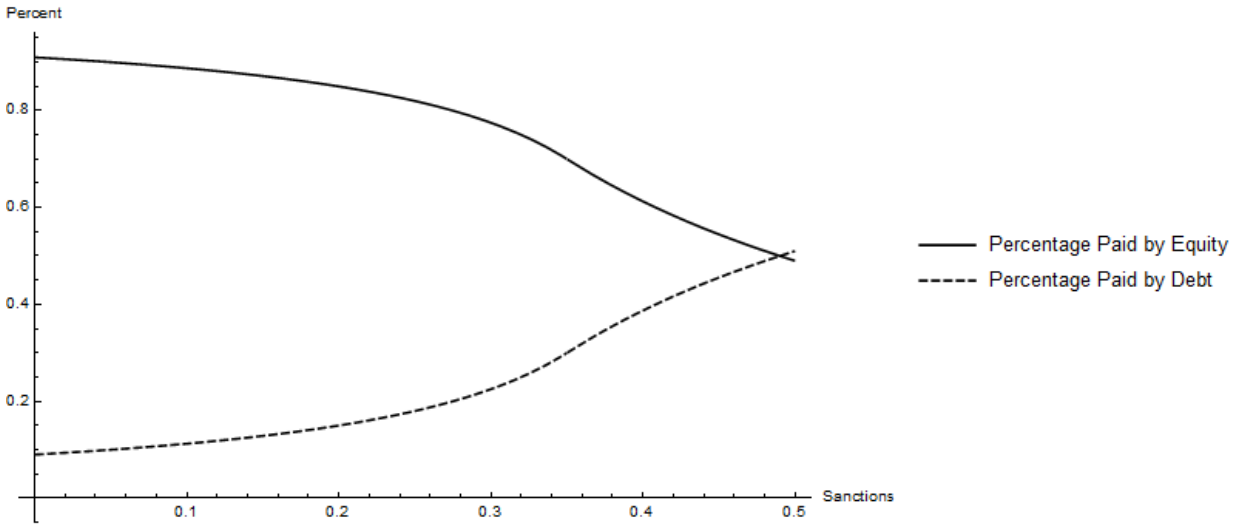

Figure 6: Percent of Sanctions Paid by Debt and Equity as a Function of Sanctions Given Asset Sales ($D = 0.3$)

value of equity and the value of credit are equal, and sanctions that require full liquidation ($s = 0.5$) will result in equal incidences. However, as the level of debt increases, the level of sanctions that results in an equal incidence borne by equity and debt decreases. And for very highly leveraged firms, even minor sanctions will result in creditors bearing a majority of the incidence.

A.4 Collateral Consequences

While the direct incidence of sanctions will be borne by shareholders and creditors, sanctions have broader effects. Collateral consequences related to firm insolvency can include suppliers, customers, pensioners, and entire communities. In this section, I consider the effects of sanctions on employees. I make the following assumption for the remainder of this section about firm employment:

Assumption 8 (Firm Employment)**.** *The firm employs a mass of employees. The firm employs one unit of employees for each unit of assets. The asset returns, x, are net of wages. If the firm is solvent at period 1, employees retain their jobs. If the firm is insolvent at period 1, all employees are laid off. Let w_0 denote the number of employees in period 0 and w_1 denote the number of employees in period 1. Let the average level of employment be denoted $W \equiv \frac{w_0+w_1}{2}$.*

When a firm sells assets or is liquidated, employees lose their jobs. This is a simplification. In reality, selling assets does not necessitate that employees will lose their jobs. Some employees may be able to retain their jobs with the current company or the acquiring firm after asset sales. And even employees who are fired may be able to quickly find new employment. However, there are significant labor market frictions that mean employees that lose their jobs will generally spend a period of time unemployed. In general, it is likely

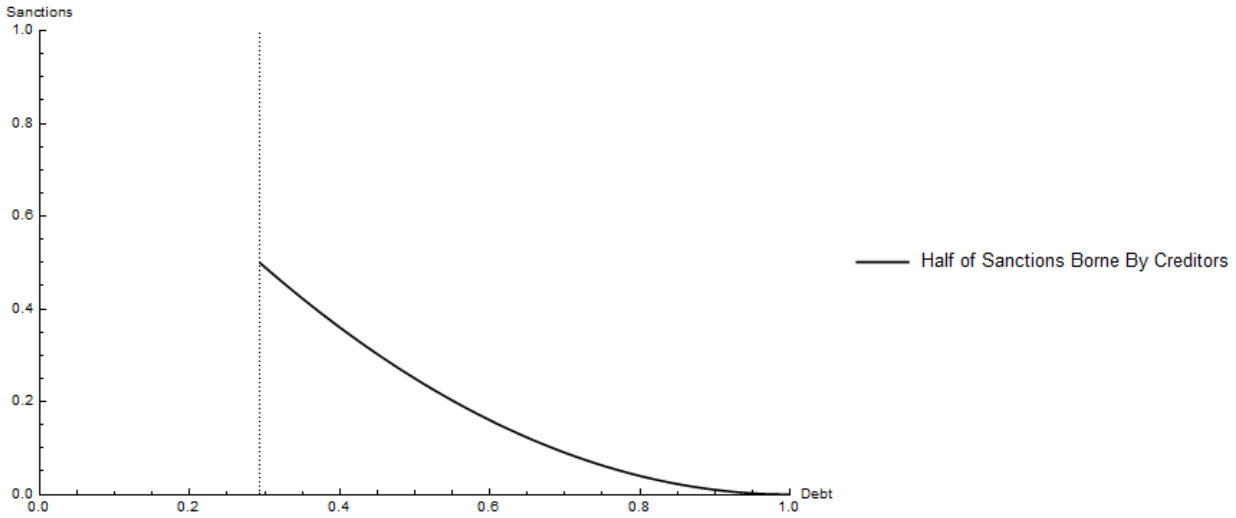

Figure 7: Level of Sanctions such that Half of Incidence is Borne by Debt and Half by Equity as a Function of Initial Debt

that when assets are sold or a division is closed, a fraction of employees will retain their jobs or quickly find new jobs, while the remainder will face a prolonged spell of unemployment. The above assumption could be modified such that a fraction α of employees lose their jobs. This would change the quantitative results, but would not alter the qualitative conclusions.

Initially the firm employs one unit of workers. There are two types of actions that can affect workers. The first is asset sales. If the firm sells assets a at period 0, then a workers lose their jobs. Otherwise workers retain their positions. Therefore period 0 employment is given by the amount of asset sales: $w_0 = 1 - a$.

Second, workers lose their jobs if the firm is liquidated at period 1. Let the probability that the firm remains solvent at period 1 be denoted $\pi(D, s, C)$. In the absence of sanctions, the firm remains solvent so long as asset returns are not less than the outstanding debt:

$$\pi(D, s = 0) = 1 - D$$

If sanctions are imposed, the probability of remaining solvent depends on how those sanctions are paid. If the sanctions are paid through an equity issuance, the probability of insolvency remains unchanged:

$$\pi(D, s, C = E) = 1 - D.$$

This is because equity issuances have no effect on the solvency of the firm. If, however, the firm pays sanctions through a debt issuance, the increase in leverage increases the probability of insolvency. The issuance of junior debt, d, decreases the probability that the firm remains solvent:

$$\begin{aligned} \pi(D, s, C = D) &= 1 - D - d \\ &= \sqrt{(1 - D)^2 - 2s} \end{aligned}$$

Finally, if the firm pays sanctions through asset sales, the probability that the firm remains solvent is:

$$\pi(D, s, C = A) = \begin{cases} 0 & \text{if } s > \frac{1-D}{2} \\ 1 - \frac{D}{1-2s} & \text{if } s < \frac{1-D}{2} \end{cases}$$

Because all employees who were employed at period 0 retain their jobs in period 1 unless the firm goes insolvent, employment at period 1 is given by $w_1 = \pi w_0$. Therefore average employment is $W = \frac{1}{2}(1+\pi)w_0$. Therefore in the absence of any sanctions, employment is given by:

$$W(D, s = 0) = 1 - \frac{1}{2}D. \tag{11}$$

Plugging in the first period employment and probability of insolvency gives employments as a function of the firm's post-sanction capital structure:

$$W(D, s, C = E) = 1 - \frac{1}{2}D \tag{12}$$

$$W(D, s, C = D) = \frac{1}{2}(1 + \sqrt{(1-D)^2 - 2s}) \tag{13}$$

$$W(D, s, C = A) = \begin{cases} \frac{1}{2}(1-2s) & \text{if } s > \frac{1-D}{2} \\ 1 - 2s - \frac{1}{2}D & \text{if } s < \frac{1-D}{2} \end{cases} \tag{14}$$

The following proposition characterizes employee preferences:

Proposition 4. *Workers prefer that sanctions are paid through equity issuances. Workers preferences over debt issuances and asset sales depends on the level of debt:*

(i) If $D \leq \frac{1}{2}$ workers always prefer debt issuances to asset sales.

(ii) If $D > \frac{1}{2}$, workers prefer debt issuances for low levels of sanctions and prefer asset sales for high levels of sanctions.

Figure 8 gives a graphical representation of proposition 4(i). The x-axis represents the level of sanctions and the y-axis represents long-term employment. The initial level of debt is $D = 0.3$. Workers prefer equity issuances, because equity issuances alone have no effect on their employment prospects. However, if the firm does not issue equity, workers' prefer debt issuances over asset sales, because debt issuances mean that all employees retain their jobs for the short term. As the level of debt issued increases, the probability of insolvency increases. Asset sales, on the other hand both increase the probability of insolvency and also necessitate the laying off of some workers.

When sanctions increase past a certain level, it is no longer possible to pay through equity issuances alone. For moderate sanctions ($0.245 \leq s \leq 0.35$), employees' preferred method of payment is through combined asset sales and equity issuances. The relative weighting of security issuances and asset sales is determined by shareholders' utility. Employees prefer that enough securities are issued so that current shareholders lose their entire

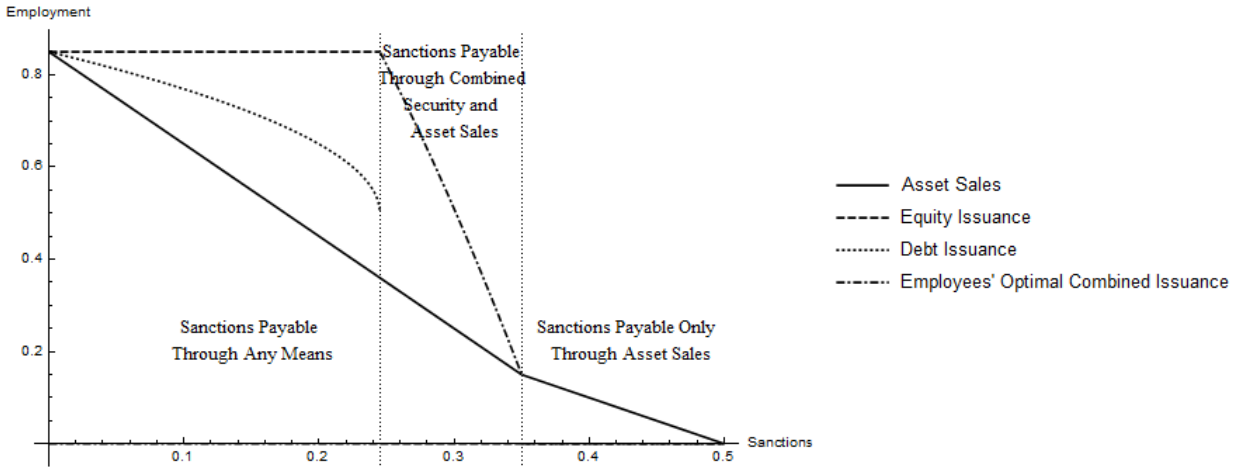

Figure 8: Expected Employment as a Function of Sanctions and Shareholders' Chosen Capital Structure ($D = 0.3$)

investment, and new security holders break even in expectation. This minimizes the assets that must be sold and therefore maximizes employment. As sanctions increase, the amount that can be paid through equity issuances decreases, and the firm must sell more assets. When sanctions are sufficiently high ($s > 0.35$), no securities can be issued, and sanctions will be paid only through asset sales. At this point, insolvency is guaranteed. Some workers may retain their jobs in the short-term, but all employees will be out of work at period 1. The second part of proposition 4 explains employee preferences when the firm is heavily indebted. When the firm is heavily indebted, even minor debt issuances can result in guaranteed insolvency. Whereas asset sales can mitigate some of the risk of insolvency.

While employees prefer sanctions to be paid through equity issuances, shareholders will instead pay sanctions through asset sales. Given this, employees will prefer to work in less-leveraged firms. To see this, differentiating the second part of (14) yields $\frac{\partial W(D,s,C=A)}{\partial D} = -\frac{1}{2}$.

A.5 The High Cost of Deterring Corporate Wrongdoing

This section explores how sanctions should be structured to get shareholders to internalize the costs of committing crimes.

The key result is that, because shareholders do not bear the full incidence of sanctions, regulators must impose sanctions that are *greater* than the harm caused, even under perfect enforcement:

Proposition 5. *In order for shareholders to internalize harm, the sanctions must be greater than the harm caused. The marginal effect of sanctions on shareholders is decreasing in the level of the sanctions, so sanctions must be increased an an increasing rate for higher levels of harm.*

Figure 2 (page 18) gives a graphical representation of proposition 5. The plot assumes existing debt of $D = 0.3$ and that the firm will sell assets to pay the sanctions. The x-axis is the desired cost to be imposed upon shareholders, σ. To properly deter shareholders, the

cost should be set equal to the harm shareholder cause, $\sigma = h$. The y-axis shows the level of sanctions required to impose a cost σ on shareholders. The dashed line is the 45-degree line, and indicates setting sanctions equal to the harm caused. The solid line indicates the optimal level of sanctions. And following proposition 5, the optimal level of sanctions is always greater than the harm caused. Note that the maximum level of harm that can be imposed upon shareholders is the value of equity, 0.245 in this case. To impose that cost on shareholders, the sanctions must be set considerable higher. Because the maximum harm that can be imposed on shareholders is the initial value of equity, there is a limit to the ability of sanctions to deter bad behavior. There is simply nothing that regulators can do to impose costs on shareholders that are greater than the initial value of equity.[67]

Setting sanctions greater than harm is necessary to properly deter shareholders from harming those *outside* of the corporation. However, these sanctions will increase the costs borne by creditors and employees as well. If the government took into account the harms imposed on creditors and employees, sanctions would need to be significantly larger than those in proposition 5 in order for shareholders to internalize the harm. However, doing so would exacerbate collateral consequences on creditors and employees in cases of malfeasance.

The fear of collateral consequences may make decision-makers reticent to impose monetary fines on corporations. The following result shows that for any level of monetary fine, a mandatory equity issuance can impose the same cost on shareholders while eliminating collateral consequences:

Corollary 1. *For any level of monetary sanctions, there exists a level of sanctions payable through a mandatory equity issuance that is a Pareto Improvement.*

The intuition of Corollary 1 can be seen graphically by looking at Figure 3. Given that shareholders will pay monetary sanctions through asset sales, the value of equity for a given level of sanctions is given by the solid line. But this value of equity could also be achieved by imposing a smaller sanction and mandating that it be paid through an equity issuance. For example, given $D = 0.3$, shareholders would be indifferent between a monetary fine of 0.24 paid through asset sales or sanctions of 0.2 paid through an equity issuance. But in the case of the equity issuance, both creditors and employees are better off.

A.5.1 Endogenous Choice of Malfeasance

Section A.5 discussed the fines necessary for shareholders to internalize harms. The key result of that section, proposition 5, showed that in order to impose a given cost on shareholders, the fine imposed on the firm must be greater than the cost. This section builds upon that result by making endogenous the choice of whether to engage in malfeasance. The model is identical except the following assumption

[67] Hansmann and Kraakman (1990) discuss the possibility of imposing unlimited liability on shareholders for corporate torts. While doing so could in principle increase deterrence, there are many practical difficulties with doing so, and the possibility of unlimited liability removes the many benefits associated with limited liability.

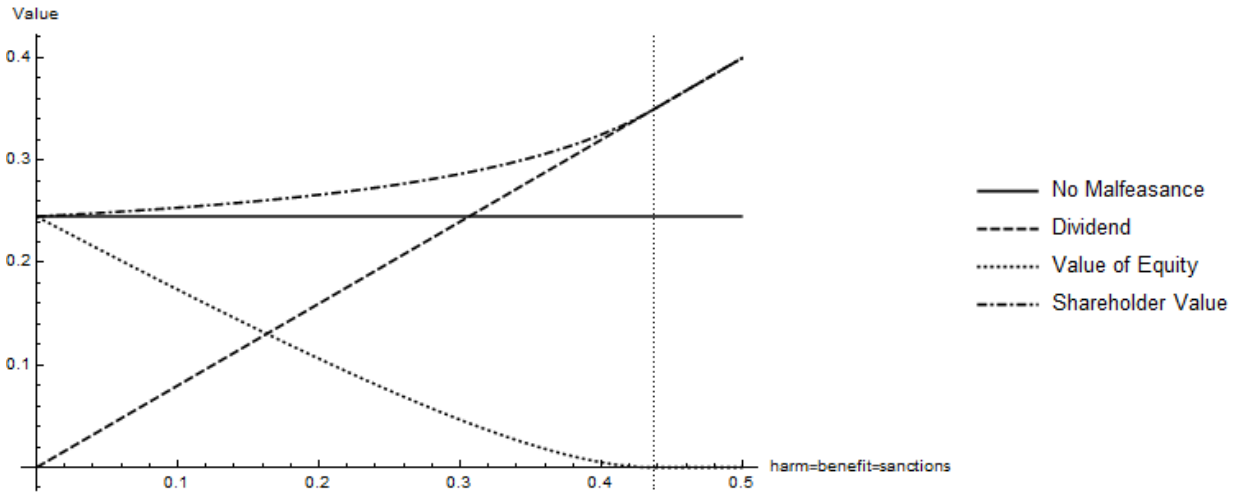

Figure 9: Value of Equity as a Function of Harm Given that Harm=Benefit=Sanctions ($D = 0.3$, $\sigma = 0.8$)

Assumption 9. *Before Period 0, shareholders decide whether to engage in an action that causes harm h to third-party victims and creates a benefit B. Shareholders directly capture a fraction $\sigma \in [0, 1]$ of the benefit, while a fraction $(1 - \sigma)$ is retained by the firm.*

As before, the harmful action is perfectly observable. The σ term captures the idea that shareholders may be able to capture some of the gain from the action before the harm is observed. For example, the firm may use the proceeds from the action to pay dividends to shareholders rather than retaining the earnings. A value of $\sigma = 1$ implies that shareholders directly capture the full gain, whereas a value of $\sigma = 0$ implies that the firm, rather than shareholders, retain the earnings. Given that sanctioning a firm for malfeasance generally takes time during which the firm can pay dividends based on excess earnings from the malfeasance, it will generally be the case that $\sigma > 0$.

The first result of this section explores the case where the harm imposed is equal to the firm's benefit from the harm. Examples include cases of defrauding customers or outright theft. The following proposition shows that so long as shareholders can capture a fraction of the benefit, the firm will always engage in malfeasance if sanctions are equal to the harm caused.

Proposition 6. *Suppose that the firm engages in malfeasance where the firm's gain is equal to the harm caused, and sanctions are equal to harm ($h = b = s$). Then the firm will engage in malfeasance for any $\sigma > 0$.*

Proposition 6 has stark implications for deterring corporate malfeasance. In many cases, firms can take actions that effectively expropriate money from others, and when those firms are caught the fine imposed is equal to the harm caused.[68] Figure 9 gives a

[68]For example, §8C2.4(a) of the United States Sentencing Guidelines for Organizations specifies that the base fine imposed on an organization is the greatest of (1) an amount determined under a schedule in §8C2.3 (Offense Level), (2) the pecuniary gain to the organization, or (3) the pecuniary loss.

graphical interpretation of the result. The solid horizontal line indicates the value of equity if the firm does not engage in malfeasance. If the firm engages in malfeasance, shareholders directly capture a fixed proportion of the benefit, as illustrated by the straight dashed line. The decreasing dotted line illustrates that value of equity in the firm will decrease because sanctions must be paid. The vertical line illustrates the point at which equity has lost all of its value. However, following Proposition 1, the firm will sell assets to pay sanctions, so shareholders do not bear the full incidence of sanctions. Shareholder welfare is the sum of the dividend payment and the value of equity, which is increasing in the harm caused, and is always greater than the value of the firm in the absence of malfeasance. The following numerical example illustrates the firm's calculus for a particular level of harm.

> **Numerical Example 6**. Suppose that the firm has debt $D = 0.3$ and can take an action that creates a benefit $B = 0.2$, harm $h = 0.2$, and sanctions are equal to harm, $s = 0.2$. Assume that shareholders directly capture 25% of the benefit through dividend payments, $\sigma = 0.25$.
>
> If the firm does not engage in malfeasance, the value of equity is given by: $\frac{1}{2}(1-.3)^2 = 0.245$. By engaging in malfeasance, shareholders collect dividends of $\sigma B = (0.25)(0.2) = 0.05$. The firm retains a benefit of $(1-\sigma)B = (0.75)(0.2) = 0.15$. When sanctions are imposed, the firm exhausts cash on hand, so the remaining sanctions to be paid are $0.2 - 0.15 = 0.05$. So engaging in the harmful action effectively created a private benefit of 0.05 for shareholders, and a cost to the firm of 0.05. The firm will sell assets to pay the sanctions. Using equation (9), the value of equity (including the dividend payment) is: $0.05 + \frac{(1-2(0.05)-0.3)^2}{2(1-2(0.05))} = 0.25$. Therefore shareholders profit from malfeasance even when the action is perfectly observable and the fine is set equal to the harm caused.

Proposition 6 shows that shareholders have a strong preference to engage in malfeasance when the benefit equals the harm caused. The following result shows that shareholders prefer that the firm engages in malfeasance even when the harm caused and the sanction imposed are greater than the benefit.

Corollary 2. *Suppose sanctions are equal to the harm caused. For any positive level of debt and any $\sigma > 0$, there exists level of benefit $B < h$, such that shareholders will engage in malfeasance.*

Corollary 2 shows that shareholders will benefit from firms taking harmful actions, even when they know that sanctions will be greater than the benefit conferred. This result follows from the fact that shareholders can privately capture a proportion σ of the benefit, and share the costs with creditors.

As discussed in Section A.5, if monetary sanctions are imposed on the corporation, those sanctions must be greater than the harm caused in order for shareholders to internalize the harm that they have caused (Proposition 5). However, doing so has the unfortunate effect of increasing costs to creditors and imposing further collateral consequences on workers. Section 4 proposed that the sanctioning authority should mandate that sanctions be paid

through equity issuances in order to limit collateral consequences. The following result formalizes the discussion in Section 4 and shows that making sanctions payable through equity provides the correct incentives for the firm when the harm is not too high.

Proposition 7. *Suppose sanctions must be paid through an equity issuance. If $h < V_E(D)$, the optimal sanctions are equal to the harm caused.*

The intuition for this result is that which was developed in Section 4: mandating equity issuances imposes the full incidence of sanctions on shareholders and results in no collateral consequences. However, because shareholders enjoy limited liability, the amount that can be raised through equity issuances is limited to the market capitalization of the firm. Sanctions greater than the firm's market capitalization will force the firm into insolvency.

This section has made endogenous the choice of whether or not to engage in malfeasance. However, this section has not explored the endogeneity of sanctions, harm, and collateral consequences. I have treated the harm as independent of the sanctions imposed. In other words, "harm" does not include the losses borne by creditors or the collateral consequences imposed on employees. If one or both of these were factored into harm caused, then increasing sanctions would have the effect of increasing the harm caused. This increase in the harm caused would in turn require imposing additional sanctions on the firm.

In general, the losses to creditors and/or employees will not be taken into account for the question of deterrence. This means that sanctions imposed will generally be less than the true costs created by the firm's actions, leaving broad scope for malfeasance that benefits shareholders at the cost of other corporate constituencies and society more broadly.

A.6 Debt Covenants

The baseline model developed in Section 2 contained two typical covenants contained in most debt contracts: restrictions on paying dividends, and restrictions on issuing senior debt. As shown in Proposition 2, these covenants were insufficient to protect creditors in the event of corporate sanctions. This section considers a much stronger covenant that could, in principle be used to protect creditors. In particular, I assume that the firm is restricted by covenant from selling assets and that an acceleration clause allows senior creditors to demand the immediate repayment of her principal if the firm has sold assets (Hahn, 2009). Formally, the following assumption is made for the remainder of this section:

Assumption 10 (Debt Acceleration Covenant)**.** *Debt is comprised of a principal payment, D_P and an interest component, D_I, where $D_P + D_I = D$. The creditor can accelerate her debt and demand immediate repayment of the principal, D_P, if the firm sells assets. If the creditor is indifferent between accelerating the debt or not, she accelerates the debt.*

The debt acceleration covenant gives the creditor the option of removing her principal as soon as the firm sells assets. Because the principal is set by contract and the market value of debt fluctuates based on the probability of repayment and prevailing market conditions, it is possible that the principal is either above or below the market value of debt. That is it may be that $V_D(D) > D_P$, $V_D(D) = D_P$, or $V_D(D) < D_P$. The relationship between

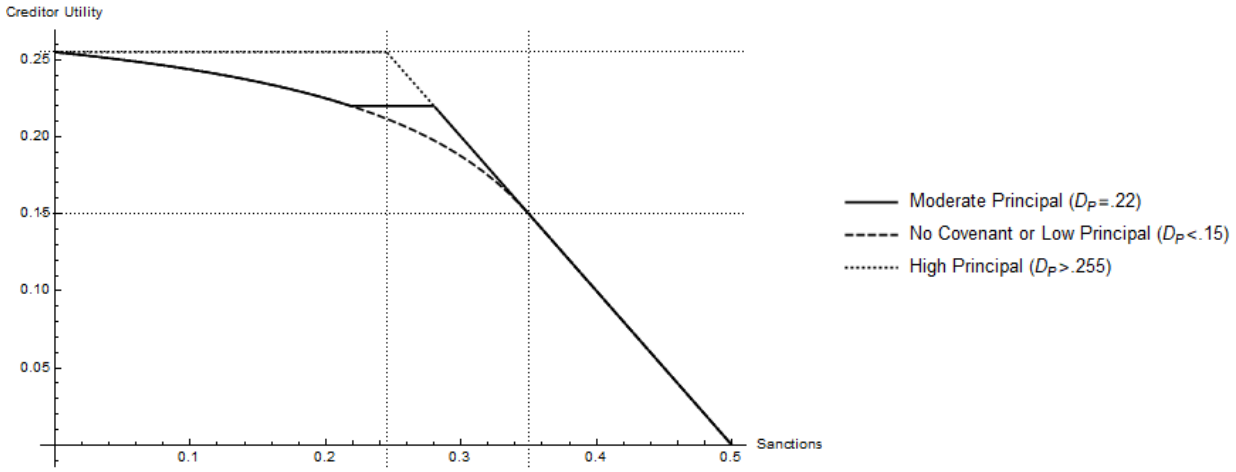

Figure 10: Value of Credit with Acceleration Covenant as a Function of the Value of Principal ($D = 0.3$

the principal and the market value of debt will determine whether the degree to which acceleration covenants will protect the creditor.

The following proposition shows that the acceleration covenant fully protects the creditor only if the market value of the debt is less than the principal:

Proposition 8. *If the debt principal is less than the market value of debt, there exist sanctions for which shareholders are able to pass some of the incidence onto creditors.*

Figure 10 gives a graphical representation of the result for a firm with $D = 0.3$. The face value of the firm's debt means that before sanctions are imposed, the market value of the debt is $V_D(0.3) = 0.255$. Whether the creditor will be able to protect herself will depend on the debt principal. To begin, the dashed line illustrates creditor utility in the absence of any covenants (i.e. creditor utility from asset sales). This line also illustrates creditor utility if the principal is sufficiently low ($D_P < 0.15$). In this case, the creditor will not trigger the acceleration clause for small sanctions, because the market value of debt remains higher than the debt principal. But if sanctions are large enough so that the market value approaches the principal, equity has already lost all of its value, so the creditor will be indifferent between accelerating the debt or keeping the residual value of her asset. If instead the principal is greater than the market value of debt ($D_P > 0.255$) the covenant fully protects the creditor from being expropriated by the shareholder. As soon as the firm sells assets, the creditor would make a profit by triggering the acceleration clause. But because this would effectively be a transfer from shareholders to creditors, shareholders will instead issue debt or equity to pay sanctions, meaning that the clause is never triggered. In this case, creditors receive their first-best outcome (conditional on sanctions being imposed), illustrated by the dotted line. Finally consider the case of a moderate principal ($D_P = 0.22$). In this case, the protection provided by the acceleration covenant depends on the level of sanctions, as illustrated by the solid line. When sanctions are low, the market value is greater than the principal, so the firm can sell assets without the creditor triggering the covenant. When sanctions are moderate, the market value of

debt will drop below the principal, so the creditor will accelerate the debt, providing a degree of protection. And when sanctions are large, the covenant achieves the creditor's first-best outcome by completely wiping out the value of equity before credit is touched.

So while covenants can provide some protection to creditors, they are only as effective as mandating equity issuances if the value of the principal is greater than the market value of the debt *before* sanctions are imposed. But because the market value of debt is a random process, this will not be generically true.

A.7 Proofs

Proof of Lemma 1. Consider the statements in turn:

1. The firm can pay low sanctions, $s < \frac{1}{2}(1-D)^2$ with security issuances alone:

   From equation 4, the value of equity following an equity issuance is $V_E(D, s, C = E) = \frac{1}{2}(1-D)^2 - s$, and incentive compatibility means that s must be small enough such that $V_E(D, s, C = E) \geq 0$. Therefore the maximum that can be paid is $\frac{1}{2}(1-D)^2$.

   From equation 6, the face value of junior debt is $d = 1 - D - \sqrt{(1-D)^2 - 2s}$. Differentiating with respect to s gives: $\frac{\partial d}{\partial s} = \frac{1}{\sqrt{(1-D)^2-2s}}$. Therefore the amount of junior debt issued is increasing for $s \in \left[0, \frac{1}{2}(1-D)^2\right)$, and the maximum sanctions that can be paid are therefore $\frac{1}{2}(1-D)^2$.

2. The firm can pay medium sanctions, $s \in \left[\frac{1}{2}(1-D)^2, \frac{1}{2}(1-D)\right]$, through asset sales or combined asset sales and security issuances:

   The maximum that can be raised through asset sales is the expected value of the asset, $\frac{1}{2}$. From equation 9, $V_E(D, s, C = A) > 0$ for $s < \frac{1}{2}(1-D)$, which means that the firm can issue equity in addition to asset sales. But at $s = \frac{1}{2}(1-D)$, $V_E(D, s, C = A) = 0$, so it is no longer possible to raise equity.

3. Sanctions above $\frac{1}{2}(1-D)$ necessarily lead to insolvency:

   Because $\frac{1}{2}(1-D) \geq \frac{1}{2}(1-D)^2$, the firm must sell assets. And from equation (10), the maximum asset return drops below the face value of outstanding debt when $s > \frac{1}{2}(1-D)$, guaranteeing insolvency.

□

Proof of Proposition 1. Shareholders indifference between debt and equity is given by equations (4) and (7).

To see shareholders' preferences for asset sales, consider two cases:

1. Suppose that $s \leq \frac{1}{2}(1-D)^2$. Therefore shareholder value from an equity issuance is $V_E(D, s, C = E) = \frac{1}{2}(1-D)^2 - s$ and shareholder value from asset sales is $V_E(D, s, C = A) = \frac{(1-2s-D)^2}{2(1-2s)}$. The gain in shareholder utility from opting for asset sales is therefore:

$$\begin{aligned} V_E(D, s, C = A) - V_E(D, s, C = E) &= \left(\frac{(1-2s-D)^2}{2(1-2s)}\right) - \left(\frac{1}{2}(1-D)^2 - s\right) \\ &= \frac{sD^2}{1-2s} \end{aligned} \tag{15}$$

   And by assumption, $s \leq \frac{1}{2}(1-D)^2$ for $D \in [0, 1)$ implies that $s < \frac{1}{2}$, so (15) is positive.

2. Suppose that $s > \frac{1}{2}(1-D)^2$. An equity issuance can at most raise $\frac{1}{2}(1-D)^2$, which means that $V_E(D,s,C=E)=0$ for any $s > \frac{1}{2}(1-D)^2$. However from (9), $V_E(D,s,C=A) = \frac{(1-2s-D)^2}{2(1-2s)}$ for $s \in \left[\frac{(1-D)^2}{2}, \frac{1-D}{2}\right]$. Therefore in the range, $s \in \left[\frac{(1-D)^2}{2}, \frac{1-D}{2}\right]$ shareholders can maintain positive utility through asset sales but not through security issuances.

To see that shareholders never prefer combining asset sales and security issuances, suppose that the firm raises ϵ through an equity issuance, and raises $s-\epsilon$ through asset sales. The new level of assets is therefore $1-2(s-\epsilon)$. Shareholder utility is therefore given by:

$$V_E(D,s,C=(A,E)) = \frac{(1-2(s-\epsilon)-D)^2}{2(1-2(s-\epsilon))} - \epsilon \tag{16}$$

Differentiating with respect to ϵ yields

$$\frac{\partial V_E(D,s,C=(A,E))}{\partial \epsilon} = -\frac{D^2}{(1+2\epsilon-2s)^2} < 0$$

Therefore paying any of the sanctions through an equity issuance decreases shareholder value relative to paying solely through asset sales. □

Proof of Proposition 2. The indifference between equity and debt is given by equations (5) and (8). To see creditors' preferences, consider three cases:

1. Suppose that $s \leq \frac{1}{2}(1-D)^2$. It is therefore possible to pay the sanctions through a pure equity issuance, resulting in creditor utility $V_D(D,s,C=E) = D - \frac{D^2}{2}$. Creditor utility from asset sales is $V_D(D,s,C=A) = D - \frac{D^2}{2(1-2s)}$. And creditor utility from a combined asset sale and equity issuance of ϵ is: $V_D(D,s,C=A,E) = D - \frac{D^2}{2(1-2(s-\epsilon))}$. Clearly creditor utility is maximized at $\epsilon = s$, a pure equity issuance.

2. Suppose that $\frac{1}{2}(1-D)^2 < s \leq \frac{1}{2}(1-D)$. It is no longer possible to pay the sanction through a pure equity issuance. Suppose that the firm raises ϵ through an equity issuance, and raises $s-\epsilon$ through asset sales. Creditor utility is therefore given by:

$$V_D(D,s,C=(A,E)) = \begin{cases} 0 & \text{if } s-\epsilon > \frac{1}{2} \\ \frac{1}{2}(1-2s+2\epsilon) & \text{if } \frac{1-D}{2} \leq s-\epsilon < \frac{1}{2} \\ D - \frac{D^2}{2(1-2s+2\epsilon)} & \text{if } s-\epsilon < \frac{1-D}{2} \end{cases}$$

Differentiating with respect to ϵ:

$$\frac{\partial V_D(D,s,C=(A,E))}{\partial \epsilon} = \begin{cases} 0 & \text{if } s-\epsilon > \frac{1}{2} \\ \epsilon & \text{if } \frac{1-D}{2} \leq s-\epsilon < \frac{1}{2} \\ \frac{D^2}{(1-2s-2\epsilon)^2} & \text{if } s-\epsilon < \frac{1-D}{2} \end{cases} \tag{17}$$

Therefore creditor utility is increasing in the amount of the security issuance, ϵ. And from (16), the maximum equity issuance that can be raised through a combined equity issuance and asset sale is given by shareholders' indifference condition: $\frac{(1-2(s-\epsilon)-D)^2}{2(1-2(s-\epsilon))} - \epsilon = 0$. Therefore creditors prefer the firm to exhaust security issuances and only then to sell assets.

3. Suppose that $s > \frac{1}{2}(1-D)$. From Lemma 1, no new securities can be issued, because the outstanding claims on the firm are too large to allow new investors to break even. Therefore the only way to raise funds to pay the sanctions is through asset sales.

□

Proof of Proposition 3. Consider two cases:

1. Suppose $s < \frac{1-D}{2}$. From (2) and (9), the proportion of sanctions borne by equity is:

$$\frac{V_E(D) - V_E(D, s, C = A)}{s} = \frac{(1 - D^2 - 2s)}{1 - 2s} \tag{18}$$

Differentiating with respect to s yields: $-\frac{2D^2}{(1-2s)^2} < 0$. Therefore the proportion of sanctions borne by equity are decreasing in the level of the sanctions, s.

And differentiating (18) with respect to D yields: $-\frac{2D}{1-2s} < 0$. Therefore the proportion of sanctions borne by equity are decreasing in the level of debt, D.

2. Suppose that $s \geq \frac{1-D}{2}$. This implies that equity holders lose their entire value. From (2) and (9), the proportion of sanctions borne by equity is:

$$\frac{V_E(D) - V_E(D, s, C = A)}{s} = \frac{(1 - D)^2}{2s} \tag{19}$$

Differentiating with respect to s yields: $-\frac{(1-D)^2}{2s} < 0$. Therefore the proportion of sanctions borne by equity are decreasing in the level of the sanctions, s.

And differentiating (18) with respect to D yields: $-\frac{1-D}{s} < 0$. Therefore the proportion of sanctions borne by equity are decreasing in the level of debt, D.

□

Proof of Proposition 4. First observe that employees prefer equity issuances to debt issuances:

$$\begin{aligned} W(D, s, C = E) - W(D, s, C = D) &= \left(1 - \frac{1}{2}D\right) - \left(\frac{1}{2}(1 + \sqrt{(1-D)^2 - 2s})\right) \\ &= (1 - D)^2 - (1 - D)^2 + 2s \\ &= 2s \end{aligned}$$

Next consider workers' preferences over debt issuances and asset sales. Consider two cases:

1. Suppose that $s \leq \frac{1}{2}(1-D)^2$. It is therefore possible to pay sanctions entirely though a debt issuance or an asset sale. First observe that if $s = 0$, the two methods are equivalent. Next consider the maximum sanctions in this range, $s = \frac{1}{2}(1-D)^2$, which gives employment of $W(D, s = \frac{1}{2}(1-D)^2, C = D) = \frac{1}{2}$ and $W(D, s = \frac{1}{2}(1-D)^2, C = A) = 1 - \frac{1}{2}D - (1-D)^2$. The gain in employment from choosing debt issuance rather than an asset sale is given by $W(D, s = \frac{1}{2}(1-D)^2, C = D) - W(D, s = \frac{1}{2}(1-D)^2, C = A) = (1-D)((1-D) - \frac{1}{2})$.

   (a) Suppose $D < \frac{1}{2}$. This implies that $(1-D)((1-D) - \frac{1}{2}) > 0$. Therefore workers weakly prefer debt issuances to asset sales at $s = 0$ and $s = \frac{1}{2}(1-D)^2$.
   Next observe that $W(D, s, C = D) - W(D, s, C = A)$ is a concave function on $[0, \frac{1}{2}(1-D)^2]$:

$$\frac{\partial^2\big(W(D, s, C = D) - W(D, s, C = A)\big)}{\partial s^2} = -\frac{1}{2((1-D)^2 - 2s)^{\frac{3}{2}}}. \tag{20}$$

   Therefore $W(D, s, C = D) \geq W(D, s, C = A)$, $\forall s \in [0, \frac{1}{2}(1-D)^2]$.

   (b) Suppose $D > \frac{1}{2}$. This implies that $(1-D)((1-D) - \frac{1}{2}) < 0$. Therefore for $s = \frac{1}{2}(1-D)^2$, asset sales are preferred to debt issuances.
   From (20), $W(D, s, C = D) - W(D, s, C = A)$ is a concave function on $[0, \frac{1}{2}(1-D)^2]$. The first order condition for the maximum of this function is:

$$\frac{\partial\big(W(D, s, C = D) - W(D, s, C = A)\big)}{\partial s} = 2 - \frac{1}{2((1-D)^2 - 2s)^{\frac{1}{2}}} = 0$$
$$s^* = \frac{1}{2}(1-D)^2 - \frac{1}{32}.$$

   And $s^* \in (0, \frac{1}{2}(1-D)^2)$ when $\frac{1}{2}(1-D)^2 - \frac{1}{32} > 0$. Therefore there is a level of sanctions in $(0, \frac{1}{2}(1-D)^2)$ where debt issuances are preferred to asset sales. And because at $s = \frac{1}{2}(1-D)^2$, asset sales are preferred to debt issuances, there exists a level of sanctions s' such that debt issuances are preferred for $s < s'$ and asset sales are preferred for $s > s'$.

2. Suppose that $s > \frac{1}{2}(1-D)^2$. It is no longer possible to pay sanctions through a pure security issuance. Employment from a combined asset sale and equity issuance is given by: $W(D, s, C = (A, E)) = 1 - 2(s - \epsilon) - \frac{1}{2}D$. Differentiating with respect to ϵ yields $\frac{\partial W(D,s,C=(A,E))}{\partial \epsilon} = 2$. Therefore employment is maximized when the equity issuance is set to the highest level that shareholders can bear, $\frac{(1-2(s-\epsilon)-D)^2}{2(1-2(s-\epsilon))} - \epsilon = 0$.

□

Proof of Proposition 5. In order to make shareholders internalize the harm that they cause, sanctions imposed on shareholders need to equal the harm caused. Given that the firm will sell assets to pay the fine, the value of equity is given by equation (9):

$$V(E^I_{T=1}, s, C = A) = \begin{cases} \frac{(1-2s-D)^2}{2(1-2s)} & \text{if } s < \frac{1-D}{2} \\ 0 & \text{if } s \geq \frac{1-D}{2} \end{cases}$$

The incidence of sanctions on shareholders is the difference in the value of equity without sanctions and the value of equity with sanctions. Let $\sigma(s, D)$ denote the cost to shareholders of sanctions s given debt D, and that shareholders sell assets to pay for the sanctions:

$$\sigma(s, D) = \begin{cases} \frac{1}{2}(1-D)^2 - \frac{(1-2s-D)^2}{2(1-2s)} & \text{if } s < \frac{1-D}{2} \\ \frac{1}{2}(1-D)^2 & \text{if } s \geq \frac{1-D}{2} \end{cases}$$

In order for shareholders to internalize the harm caused, the court sets sanctions such that $\sigma = h$. Assuming that $s < \frac{1-D}{2}$, the sanctions that get shareholders to internalize their harm is given by inverting the above and solving for s:

$$s = \frac{1}{4}\left(1 - D^2 - \sqrt{(1 - D^2 + 2\sigma)^2 - 8\sigma} + 2\sigma\right).$$

Because of limited liability, the maximum harm that shareholders can internalize is capped at the initial value of equity: $\frac{1}{2}(1-D)^2$. So shareholders will not bear any of the costs of sanctions after $s \geq \frac{1}{2}(1-D)$. Therefore sanctions that induce shareholders to fully internalize their harm are given by:

$$s^* = \begin{cases} \frac{1}{4}\left(1 - D^2 - \sqrt{(1 - D^2 + 2\sigma)^2 - 8\sigma} + 2\sigma\right) & \text{if } \sigma < \frac{1}{2}(1-D)^2 \\ \text{undefined} & \text{if } \sigma \geq \frac{1}{2}(1-D)^2 \end{cases}$$

To see that sanctions are always greater than the harm caused:

$$\begin{aligned} s^* > h &\iff \frac{1}{4}\left(1 - D^2 - \sqrt{(1 - D^2 + 2h)^2 - 8h} + 2h\right) > h \\ &\iff 1 - D^2 - 2h > \sqrt{(1 - D^2 + 2h)^2 - 8h} \\ &\iff (1 - D^2 - 2h)^2 > (1 - D^2 + 2h)^2 - 8h \\ &\iff 1 > 1 - D^2 \\ &\iff D > 0 \end{aligned}$$

Which is true by assumption. Therefore in order for shareholders to internalize the harms caused, it must be that $s^* > h$.

□

Proof of Proposition 6. If the firm does not engage in malfeasance, the value of equity is given by equation (2): $V_E(D) = \frac{1}{2}(1-D)^2$. Engaging in malfeasance will result in the firm retaining earnings of $(1-\sigma)B$. Given sanctions $s = B$, the firm will first exhaust retained earnings, so the effective sanction will be given by σs. Following Proposition 1, the firm will sell assets to pay the remaining sanctions. The value of equity (including the dividend paid out, σs, is given by:

$$V_E(D, s = B = H, \sigma > 0) = \begin{cases} \sigma s & \text{if } \frac{1-D}{2} \leq \sigma s \\ \sigma s + \frac{(1-2\sigma s-D)^2}{2(1-2\sigma s)} & \text{if } \frac{1-D}{2} > \sigma s \end{cases}$$

Consider two cases:

1. Suppose $\frac{1-D}{2} \leq \sigma s$. Because $(1-D)^2 < (1-D)$, therefore $\frac{(1-D)^2}{2} < \frac{1-D}{2} \leq \sigma s$, so $V_E(D, s = B = H, \sigma > 0) > V_E(D)$.

2. Suppose $\frac{1-D}{2} > \sigma s$. Therefore

$$V_E(D) < V_E(D, s = B = H, \sigma > 0) \iff \frac{1}{2}(1-D)^2 < \sigma s + \frac{(1-2\sigma s - D)^2}{2(1-2\sigma s)}$$
$$\iff 0 < \frac{D^2 s\sigma}{1-2\sigma s}.$$

   And by assumption $\frac{1-D}{2} > \sigma s$ which implies that the denominator, $1-2\sigma s$, is positive. Therefore $V_E(D, s = B = H, \sigma > 0) > V_E(D)$.

Therefore engaging in malfeasance is profitable. □

Proof of Corollary 2. Proposition 6 shows that the firm will engage in malfeasance when $h = b = s$. It follows immediately that there exists a minor reduction in b such that utility remains strictly positive. □

Proof of Proposition 7. Given that sanctions are paid through and equity issuance, shareholder utility from engaging in malfeasance with benefit B and harm h is given by:

$$V_E(D, B, s = h, C = E) = \sigma B + \frac{1}{2}(1-D)^2 - (h - (1-\sigma)B).$$

Therefore the firm engages in malfeasance only if

$$V_E(D, B, s = h, C = E) \geq V_E(D) \iff \sigma B + \frac{1}{2}(1-D)^2 - (h - (1-\sigma)B) \geq \frac{1}{2}(1-D)^2$$
$$\iff B \geq h.$$

So the firm only engages in the action when the social benefits outweigh the social costs. □

Proof of Proposition 8. The creditors will trigger the acceleration clause if $V_D < D_P$, that is, if the market value of debt drops below the principal. Consider three cases:

1. Suppose $D_P \geq D - \frac{D^2}{2}$. Because the principal is greater than the market value of debt, the creditor will trigger the acceleration clause for any asset sales. Acceleration harms shareholders, so shareholders will issue equity instead of selling assets. Creditor utility is therefore given by:

$$V_D = \begin{cases} D - \frac{D^2}{2} & \text{if } s < \frac{1}{2}(1-D)^2 \\ \frac{1}{2} - s & \text{if } s \geq \frac{1}{2}(1-D)^2 \end{cases},$$

   which is the creditor's optimal outcome conditional on sanctions being imposed.

2. Suppose that $D_P \leq \frac{1}{2}D$. At $s = \frac{1}{2}(1-D)$, asset sales result in $V_D(D, s, C = A) = \frac{1}{2}D$. So the creditor will not trigger the acceleration clause for $s < \frac{1}{2}(1-D)$. But at $s \geq \frac{1}{2}(1-D)$, creditors receive the liquidation value of the firm regardless of whether the acceleration clause is triggered. Creditor utility is given by:

$$V_D = \begin{cases} D - \frac{D^2}{2(1-2s)} & \text{if} s < \frac{1}{2}(1-D) \\ \frac{1}{2} - s & \text{if} s \geq \frac{1}{2}(1-D)^2 \end{cases},$$

which is the same as creditor utility from asset sales. Therefore the acceleration clause does not benefit creditors for $D_P \leq \frac{1}{2}D$.

3. Suppose that $D_P \in \left(\frac{1}{2}D, D - \frac{D^2}{2}\right)$. The creditor is indifferent about accelerating if $D - \frac{D^2}{2(1-2s)} = D_P$, which implies that $s = \frac{1}{2} - \frac{D^2}{4(D-D_P)}$. Therefore there are two cases:

   (a) If $s \leq \frac{1}{2} - \frac{D^2}{4(D-D_P)}$ the creditor will not trigger the acceleration clause, so creditor utility is given by:

$$V_D = D - \frac{D^2}{2(1-2s)}$$

   (b) If $s > \frac{1}{2} - \frac{D^2}{4(D-D_P)}$, the creditor will trigger the acceleration clause. This means that they will get the principal *if* the firm can pay it. The ability of the firm to pay is determined by the value of equity given asset sales. At $s = \frac{1}{2} - \frac{D^2}{4(D-D_P)}$, the value of equity is given by $V_E = \frac{(D-2D_P)^2}{4(D-D_P)}$. Equity bears the full cost until its value is exhausted at $s + V_E(s) = \frac{1}{2} - \frac{D^2}{4(D-D_P)} + \frac{(D-2D_P)^2}{4(D-D_P)} = \frac{1}{2} - D_P$. After this, equity is depleted, so creditors bear the full incidence of sanctions. Therefore creditor utility is given by:

$$V_D = \begin{cases} D_P & \text{if } s \in \left[\frac{1}{2} - \frac{D^2}{4(D-D_P)}, \frac{1}{2} - D_P\right] \\ \frac{1}{2} - s & \text{if } s > \frac{1}{2} - D_P \end{cases}.$$

   Therefore the acceleration clause benefits the creditor only if sanctions are sufficiently low.

□

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