CONFLICTING PRIORITIES: A THEORY OF COVENANTS AND COLLATERAL*

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Abstract

We develop a theory of secured debt, unsecured debt, and debt with anti-dilution covenants. We assume that covenant-protected debt can be accelerated following new secured debt issuance, but that, as in practice, secured debt retains its priority even if issued in violation of covenants. We find covenants can be useful nonetheless: they provide state-contingent flexibility, balancing over- and under-investment incentives. The optimal debt structure is multi-layered, combining anti-dilution covenants with secured and unsecured debt. Our results are consistent with observations about debt structure, covenant violations, and waivers. They also speak to a policy debate about the priority of secured debt.

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1 Introduction

Firms finance themselves mainly with debt, and they often combine several types of debt.[1] Some types of debt have stronger priority rights than others. In particular, secured debt has absolute priority over assets used as collateral—until it is paid in full, it has the first claim on the assets if they are sold, used as collateral for other debt, or used to pay other debt.[2] As a result, existing unsecured debt is vulnerable to dilution by new secured debt. To protect unsecured debt, some policy proposals advocate relaxing the priority of secured debt (e.g., Bebchuk and Fried (1996)). Absent such reforms, creditors must rely on contractual defenses against dilution.

Indeed, private debt agreements often contain provisions aimed at protecting creditors against dilution by new secured debt. Collateral itself is one protection as the priority rights that allow dilution with new secured debt likewise protect existing secured debt against such dilution. So-called negative pledge covenants are another protection: they give creditors the right to accelerate their debt if the borrower takes on new secured debt.[3]

Yet new secured debt retains its priority over unsecured debt *even if taken in violation of covenants*. Hence, covenants are no substitute for collateral: a violation leaves creditors with little more than the right to accelerate a junior claim against a borrower with assets pledged elsewhere. (Of course, unsecured creditors can attempt to recoup assets pledged to new secured creditors, but those that do are consistently denied in court (Bjerre (1999, p. 317).) Thus, acceleration is a remedy for dilution only in so far as such a junior claim can be paid, i.e. in so far as dilution due to the violation is limited. This weakness leads lawyers to warn against relying on negative pledge covenants as the sole projection against dilution.[4]

This suggests a ranking of dilution protection, with the strongest protection provided by collateral and weaker protection by covenants. Some firms seem to follow a corresponding pecking order of debt types. For example, firms in financial distress tend to favor secured debt financing and to resort to unsecured debt only once available collateral has been exhausted. More often, however, firms issue unsecured debt and use negative pledge covenants even

[1]See, e.g., Erel, Julio, Kim, and Weisbach (2012) on debt's predominance (95.6% in their sample) and, e.g., Barclay and Smith (1995), Rauh and Sufi (2010), and Colla, Ippolito, and Li (2013) on its heterogeneity.

[2]See, e.g., Hansmann and Kraakman (2002) and Merrill and Smith (2001) on the priority of secured debt over unsecured debt and equity. In practice, unsecured debt does sometimes get paid ahead of secured debt, but only in 11% of Ch. 11 bankruptcies and never in Ch. 7 bankruptcies (Bris, Welch, and Zhu (2006)).

[3]Negative pledge covenants are the fourth most common type of covenant in Billett, King, and Mauer's (2007) sample, in which they are included in 44% of the debt contracts.

[4]E.g., an article in the *National Law Review* says that "a Negative Pledge is merely an unsecured promise and gives the Lender very little" ("Negative Pledge Pros and Cons," April 10, 2016), expressing a view ubiquitous among lawyers (see, e.g., D'Angelo and Saccomandi (2016) and Goetz and Hoffmann (2010)).

when collateral is available.[5]

Why is there not a pecking order of debt instruments? I.e. why do many firms use negative pledge covenants despite having assets available to pledge as collateral? What determines the mix of secured and unsecured debt with and without negative pledge covenants? I.e. why do some firms rely more on collateral, whereas others rely more on covenants? Finally, taking a step back, is it desirable for the law to give secured debt the power to override covenants? Or should the priority of secured debt be relaxed?

To address these questions, we develop a model in which collateral serves to establish priority between different debt claims.[6] We assume that secured debt retains its priority even if taken in violation of negative pledge covenants, i.e. collateral has the power to override covenants. This power, which is central to our theory, is a good approximation of the law. It defines what collateral can achieve beyond what can be reproduced by contract. But, with the exception of Ayotte and Bolton (2011), it is absent from the finance literature.

In our theory, a borrower chooses his debt structure to manage a trade-off between commitment and flexibility. By borrowing secured, he commits not to dilute existing debt in the future. This can prevent over-investment. However, he also forgoes the financial flexibility afforded by unsecured borrowing—without the option to dilute, he could be unable to take on new debt. This can cause under-investment. A multi-layered debt structure, including secured and unsecured debt with and without covenants, trades off over- and under-investment by blocking "bad," but not "good" dilution. Our results are consistent with several observations about debt structure, including covenant violations and waivers. They explain why distressed firms rely heavily on secured debt, whereas others might not. Further, they suggest that the relative weakness of negative pledge covenants could be desirable, and thus they speak to the legal debate about the efficiency of current priority rules.

Model preview. A borrower, B, has two projects to finance sequentially via secured and/or unsecured debt with and/or without negative pledge covenants. Each project generates some pledgeable cash flow, which can be promised and distributed to creditors, and some non-pledgeable cash flow, which accrues to B alone and cannot be credibly promised to creditors. The first project's NPV is positive, but the second project's NPV, revealed once the first is underway, can be positive or negative. The projects use the same asset, which can be sold before they pay off, destroying any non-pledgeable cash flow. Thus, it is efficient for B to undertake the first project, to undertake the second if its NPV is positive, and never

[5]See, e.g., Badoer, Dudley, and James (2019), Benmelech, Kumar, and Rajan (2019), and Rampini and Viswanathan (2013).

[6]This perspective, taken in some recent papers (e.g., DeMarzo (2019) and Donaldson, Gromb, and Piacentino (2018)), departs from much of the finance literature, which emphasizes collateral's role in enhancing the pledgeability of assets (e.g., Hart and Moore (1994, 1998) and Rampini and Viswanathan (2010, 2013)).

to sell the asset.

Financing is subject to two frictions. First, pledgeability is limited: because not all cash flows can be promised to creditors, B cannot borrow against the full value of his projects. This friction, standard in corporate finance, captures numerous agency problems; e.g., to the extent projects rely on B's specific human capital, the threat to withhold it could allow B to extract value ex post. As a result, B may be inefficiently financially constrained. Second, contracts are non-exclusive: B's debt contract with initial creditors (financing the first project) cannot rule out new debt contracts with later creditors (financing the second project). In particular, while B can include a negative pledge covenant to promise not to take on new secured debt, he can break his promise. In this case, the debt contracts are in conflict: one can be upheld only if the other is violated.

We assume that collateral serves to resolve such conflicts by establishing priority among contracts: debt secured by collateral trumps other debt, including debt protected by covenants and future debt secured by the same collateral. Hence, even if taken on in violation of a covenant, secured debt has the first claim on the assets used as collateral.

The acceleration right embedded in the covenant could provide a partial remedy to violations, because B could be forced to sell his asset to pay the accelerated debt. However, even in this case, secured debt retains its priority: because the asset is used as collateral, B must use the sale's proceeds to pay the secured debt first.

Results preview. Efficiency requires investing in the first project, and investing in the second one if it has positive NPV. We show that if B's asset is sufficiently valuable, so B represents a well-capitalized firm, the efficient investment policy can be implemented with unsecured debt alone. But if it is less valuable, so B represents a constrained firm, non-exclusivity and limited-pledgeability could make it hard to implement the efficient policy, as we focus on next.

Our first main result is that financing the first project via unsecured debt without covenants can foster over-investment. Indeed, even if the second project has negative NPV, non-exclusivity allows B to finance it via secured debt, diluting existing unsecured debt. This effectively forces part of the project's cost onto existing creditors, so that B can find it optimal to invest even if the NPV is negative. Thus, dilution by new secured debt can be "bad."

Our second main result is that financing the first project via secured debt avoids over-investment, but can lead to under-investment. Since secured debt cannot be diluted, it prevents over-investment. However, even if B's second project has positive NPV, dilution may be necessary to loosen financial constraints stemming from limited pledgeability—dilution can be "good," because it can avoid under-investment. Thus, by blocking dilution, secured debt undermines the financial flexibility afforded by unsecured debt, potentially causing a "collateral-overhang" problem (Donaldson, Gromb, and Piacentino (2018)). This resonates with the notion that secured borrowing "encumbers assets" (see, e.g., Deloitte Blogs (2014)).

Financing the first project via a mix of secured and unsecured debt (without covenants) can mitigate the over- and under-investment problems, since it allows for some, but limited, dilution. We find that such a mix of debt can implement the efficient investment policy provided the under-investment problem is "mild," in that positive NPV projects have relatively high pledgeability—e.g., they could be based on relatively established lines of business—and negative NPV projects have relatively low pledgeability—e.g., they could require specific human capital to facilitate managerial entrenchment as in Shleifer and Vishny (1989). Otherwise, however, with only secured and unsecured debt financing, the collateral overhang problem could persist.

Hence, we explore a possible role for negative pledge covenants. If the first project is financed via unsecured debt with negative pledge covenants—i.e. if B makes a promise not to borrow secured in the future, backed by creditors' option to accelerate—then B can still issue new secured debt. Doing so, however, would activate the acceleration option which, if exercised, would destroy non pledgeable cash flows. Could the acceleration option act as a deterrent?

Our third main result is that if the first project is financed entirely via unsecured debt with negative pledge covenants, the acceleration threat is not credible and cannot deter over-investment. The reason is that B issues secured debt only to dilute existing creditors and, since secured debt is paid first whether unsecured debt is accelerated or not, unsecured creditors have nothing to gain from acceleration. This resonates with legal scholars' warnings about the weakness of negative pledge covenants (Bjerre (1999)).

Our fourth main result is that financing the first project with a mix of unsecured debt with and without negative pledge covenants can create a credible acceleration threat. Indeed, covenant-protected creditors have something to gain from acceleration—namely, priority over the unsecured debt without covenants.

If possible, B should choose the mix of debt with and without covenants to commit to follow the efficient investment policy. We find that such a mix exists when the under-investment problem is relatively "severe," in the sense that positive NPV projects have relatively low pledgeability—e.g., they could require specific human capital to facilitate value-creating innovation—and negative NPV projects have relatively high pledgeability—e.g., they could be relatively generic, hence easily transferable. In this case, creditors have little to gain from accelerating following an investment in a (low-pledgeability) positive NPV project; hence, they waive covenants, facilitating efficient investment. But they gain from accelerating following an investment in a (high-pledgeability) negative NPV project; hence, they uphold covenants, preventing inefficient investment. Thus, the covenant provides state-contingent flexibility, because the very act of violating it to finance a new project makes acceleration unattractive in some states (if pledgeability is low), but attractive in others (if it is high).

Our fifth main result is to characterize the optimal debt structure for financing the first project. It is multi-layered, and depends on the characteristics of B's projects. As we saw, if the under-investment problem is relatively mild, a mix of secured and unsecured debt without covenants is optimal. Secured debt puts a hard limit on new investments, mitigating over-investment without causing under-investment. In the opposite case, if the under-investment problem is relatively severe, the optimal mix features unsecured debt with covenants. Covenants can be violated and waived sometimes, mitigating the under-investment problem. This points to a trade-off theory of debt structure, based on the balance between the financial rigidity afforded by secured debt and the financial flexibility allowed by unsecured debt (with and without covenants).

In our model, the optimal debt structure implements the efficient investment policy. This suggests an efficiency rationale for the priority of secured debt over unsecured debt, including that protected by covenants: it provides state-contingent flexibility. It allows for a debt structure such that both the borrower's debt capacity and his creditors' acceleration threat depend on the characteristics of investment opportunities. Hence, it allows borrowers to commit not to engage in "bad dilution," but to maintain the flexibility to engage in "good dilution."

Further results. We explore a number of extensions. Among other things, they connect our theory to observed contracts our baseline set-up does not allow (or need), such as secured debt with negative pledge covenants, unsecured debt with general leverage covenants, subordinated debt, and intercreditor agreements.

Stylized facts. Our model is consistent with several stylized facts, including that borrowers frequently (i) rely heavily on unsecured debt when they are well-capitalized, i.e. when little dilution is possible, but otherwise they (ii) use a mix of simple debt instruments, (iii) use negative pledge covenants, (iv) violate covenants, (v) receive covenant waivers from creditors following violations, (vi) use covenants and collateral as parts of multi-tiered debt structures, (vii) borrow unsecured despite having assets available to use as collateral (no pecking order of debt types), and (vii) have less financial flexibility for investment if they borrow secured (collateral overhang); see Section 8.1.

Policy. Our results speak to the costs and benefits of the absolute priority rule (APR), which prescribes that secured debt be paid first in bankruptcy. The rule is a subject of debate in the law literature; e.g., Bebchuk and Fried (1996) challenge the desirability of the absolute priority of secured debt on account that it facilitates dilution. Our model reveals that relaxing the APR could also block desirable dilution, leading to under-investment, and that its downsides may be limited, as borrowers may be able to structure their debt around them.[7]

Literature. Our paper contributes to the large finance theory literature on collateral and the smaller one on covenants.[8] In this literature, covenants and collateral typically mitigate conflicts of interest between borrowers and creditors and increase pledgeable income as a result. We focus on how they mitigate conflicts among creditors by establishing priority among otherwise conflicting debt contracts. Although this role is arguably the main legal function of collateral and the express objective of anti-dilution covenants, it has received relatively little attention in the finance literature. DeMarzo (2019), Donaldson, Gromb, and Piacentino (2018), Longhofer and Santos (2003), and Stulz and Johnson (1985) explore how collateral establishes priority among creditors, but do not study negative-pledge covenants and how they interact with collateral, our main focus here.[9]

Ayotte and Bolton's (2011) paper, the closest to ours, studies negative pledge covenants explicitly. Like ours, it analyzes how the scope of property/priority rights can affect investment efficiency, and rationalizes aspects of current law. Unlike ours, however, it does not consider efficient dilution, and does not rationalize covenant violations/waivers. It also abstracts from acceleration and renegotiation, two important features of our analysis.

Attar, Casamatta, Chassagnon, and Décamps (2019b) also study covenants in credit markets with non-exclusivity and limited pledgeability.[10] They focus on how covenants can backfire, acting as anti-competitive devices among lenders, an issue that does not arise in our setting in which lenders are perfectly competitive.

The disciplining effect of the acceleration threat in our theory evokes that of demandable deposits (notably, Calomiris and Kahn (1991) and Diamond and Rajan (2001)) and of short-term debt more broadly (e.g., Bolton and Scharfstein (1990)). Unlike demandable or short-term debt, however, covenant-protected debt can be accelerated (i.e. redeemed/not rolled over) only in the event of a covenant violation. This matters in our model because accelera-

[7]See Ravid et al. (2015) for a model in which borrowers structure their debt anticipating deviations from APR in bankruptcy.

[8]For more on collateral, see, e.g., Bester (1985), Eisfeldt and Rampini (2009), Hart and Moore (1994, 1998), and Rampini and Viswanathan (2010, 2013). For more on covenants, see, e.g., Berlin and Mester (1992), Gârleanu and Zwiebel (2009), Park (2002), and Rajan and Winton (1995). There are also numerous other papers on debt structure without covenants, including, e.g., Bolton and Scharfstein (1996), Gennaioli and Rossi (2013), and Gertner and Scharfstein (1991).

[9]See also Bolton and Oehmke (2015) on the priority of debt vis-à-vis derivatives.

[10]Other papers on non-exclusive financial contracting include Acharya and Bisin (2014), Asryan and Vanasco (2020), Attar et al. (2019a), Bisin and Gottardi (1999, 2003), Bisin and Rampini (2005), Bizer and DeMarzo (1992), Kahn and Mookherjee (1998), Leitner (2012), and Parlour and Rajan (2001).

tion could be too frequent otherwise. Moreover, unlike in models of demandable/short-term debt, the acceleration threat is effective only if some debt is not covenant-protected. This matters in our model because acceleration would not be credible otherwise.[11]

Our paper is also related to the law literature on secured debt and priority (e.g., Bebchuk and Fried (1996), Hansmann and Kraakman (2002), Hansmann and Santilli (1997), Kronman and Jackson (1979), Schwarcz (1997), and Schwartz (1984, 1994, 1997)) and to papers on contracting subject to legal rules (e.g., Aghion and Hermalin (1990) and Gennaioli (2006)).

Finally, there is a buoyant empirical literature on secured and unsecured debt, which we relate to throughout the paper, especially in Section 8.1.

Layout. Section 2 presents the model. Section 3 presents the first- and second-best benchmarks. Section 4 studies unsecured and secured debt and Section 5 negative pledge covenants. Section 6 characterizes the equilibrium. Section 7 contains extensions. Section 8 discusses related evidence, new predictions, and other implications. Section 9 concludes. All proofs are in the Appendix.

2 Model

We consider a model in which a borrower B finances two projects sequentially subject to financial contracting frictions. The model has one good, three dates $t \in \{0, 1, 2\}$, universal risk neutrality, limited liability, and no discounting.

2.1 Projects

B is penniless, but has two investment projects, Project 0 at Date 0 and Project 1 at Date 1.

Project 0 costs I_0 at Date 0 and generates a risky payoff at Date 2 when B consumes: with probability p, the project succeeds and pays off $X_0 + Y_0$, where $X_0 > 0$ is pledgeable to investors and $Y_0 > 0$ is not; otherwise, it fails and pays nothing.

Project 1 can be high or low quality. Its quality $Q \in \{H, L\}$ is revealed at Date 1, with $\mathbb{P}[Q = H] =: q$. The project costs I_1 at Date 1 and pays off at Date 2, when it succeeds or fails. If it succeeds, it pays off $X_1^Q + Y_1^Q$, where $X_1^Q > 0$ is pledgeable and $Y_1^Q > 0$ is not. If it fails, it pays nothing.

We refer to project payoffs as "cash flows" and we assume, for simplicity, that the two projects' cash flows are perfectly correlated.[12] Thus, we interpret Project 1 as an extension

[11] Note that we rule out "acceleration runs," as they are suboptimal in our model, leading to excessive liquidation (cf. Section 2.2).

[12] This assumption simplifies the analysis, by reducing the number of states (see, however, Section 7.8).

of Project 0.

We interpret the pledgeable cash flows as the redeployment value of a single asset, used in both projects. We interpret the non-pledgeable cash flow as the value specific to B, which could reflect a number of agency problems standard in corporate finance, such as private benefits of control, output that he can divert, or perhaps other future valuable opportunities created by the project that are distant in time or otherwise out of the legal reach of outside investors.[13]

We use $X_{\text{tot.}}$ to denote the total pledgeable cash flow if all projects undertaken succeed:

$$X_{\text{tot.}} := \mathbb{1}_0 X_0 + \mathbb{1}_1 X_1^Q, \tag{1}$$

where $\mathbb{1}_t := 1$ if Project t is undertaken and $\mathbb{1}_t := 0$ otherwise.

Projects mature at Date 2, but can be terminated before that. If so, the asset is sold for the projects' expected pledgeable cash flows $pX_{\text{tot.}}$, but the non-pledgeable cash flow, which is specific to B, is destroyed. Thus, selling assets is inefficient in that it destroys all (but only) non-pledgeable cash flows.[14]

2.2 Financing

Frictions. At Date $t \in \{0, 1\}$, B can borrow I_t from competitive creditors under two frictions.

1. *Cash flow pledgeability is limited:* X_t can be pledged to creditors, but Y_t cannot. Thus, B cannot borrow against his projects' full value and might be unable to finance positive-NPV projects.

2. *Contracts are non-exclusive:* B's debt contract with initial creditors at Date 0 cannot rule out new debt contracts with later creditors at Date 1.

Instruments. We focus on three debt instruments: secured debt and unsecured debt with or without negative pledge covenants. We will show this to be without loss of generality in our baseline model in that agents would be indifferent to other claims being introduced; other instruments, such as secured debt with negative pledge covenants, arise in extensions (see Section 7).

[13] See Aghion and Bolton (1992) and Grossman and Hart (1988).

[14] The sale value is the price competitive buyers would bid for the pledgeable cash flows, reflecting our assumption that outsiders cannot capture non-pledgeable cash flows. We consider an additional asset sale cost in Section 7.6.

1. *Secured debt* is a promise to repay a fixed face value at Date 2 with pledgeable cash flows as collateral.[15] (The role of collateral is set by priority rules described below.)

2. *Unsecured debt* is a promise to repay a fixed face value at Date 2 without collateral.

3. *Unsecured debt with negative pledge covenants* is unsecured debt with the option to accelerate, i.e. to demand repayment of *any fraction* of the face value at Date 1, if B takes on new secured debt.[16] Covenants can be waived at any time, both ex post—if B violates covenants, and creditors choose not to accelerate—and ex ante—if B asks for covenants to be relaxed, and creditors accept.

We assume that unsecured debt with negative pledge covenants is held by a single creditor. This turns out to be optimal ex ante, hence without loss, and allows us to abstract from inter-creditor coordination issues (viz. creditor runs and hold-outs). This assumption could be taken literally, with the single creditor representing an institutional lender with a controlling stake in the issue. Or it could just be a presentation short-cut capturing multiple creditors that can coordinate to waive covenants, e.g., via collective action clauses, secondary market trading, or active cooperation. Indeed, even in public firms' bonds, covenants[17] can be modified by simple majority vote (Bratton (2006)). Indeed, bond covenants are frequently altered this way in practice (Kahan and Tuckman (1993)). More generally, coordination among dispersed bond holders does not seem to delay restructuring (Helwege (1999)).

Restructuring and bankruptcy. At any time, all parties (i.e. B and all creditors) can renegotiate their contracts if it makes *all of them* strictly better off.[18] If (despite renegotiation) B cannot satisfy all claims at a given date, bankruptcy is declared and all claims are accelerated.

Priority rules. Given non-exclusivity, B can enter into contracts with different creditors. For instance, B can take on more debt than he can repay or he can violate covenants. As such, rules must exist that specify how to resolve these conflicts (both in bankruptcy and out). We consider the following priority rules:

1. *Secured debt* has priority over assets used as collateral:

[15] Although we interpret pledgeable cash flows as the value of B's asset for concreteness, other interpretations are possible. Indeed, in practice, not all secured debt is "asset based." E.g., secured debt backed by a corporate division as collateral is based on the future cash flows of the division as a going concern, not the assets it currently holds. Likewise, not all unsecured debt is "cash flow based." E.g., unsecured debt taken by a firm with unmortgaged real estate could be backed by these assets in place. See Lian and Ma (2019).

[16] We analyze "all-or-nothing" acceleration, in which this fraction can be only zero or one, in Section 7.7.

[17] For public firms, modifying other terms—repayment and maturity—requires unanimous bondholder consent per the Trust Indenture Act.

[18] Section 7.5 discusses renegotiation by sub-coalitions of the parties.

(i) Secured debt is paid ahead of unsecured debt.

(ii) Secured debt taken on earlier is paid ahead of secured debt taken on later.

(iii) If the asset (collateral) is sold at Date 1, any secured debt has priority over the proceeds. (Cf. Section 8.2 on how security differs from seniority.)

2. *Unsecured debt (with or without covenants)* is paid in the order it comes due. Specifically, if unsecured debt is accelerated and therefore becomes due at Date 1, it is paid ahead of any unsecured debt that remains due at Date 2. In bankruptcy, all debt is accelerated and is thus due at the same time.

Realism. These priority rules reflect practice. For example, Schwartz (1989) summarizes the basic priority rules between secured and unsecured debt:

> Current law regulating these priorities rests on three "priority principles": First, if the first creditor to deal with the debt makes an unsecured loan, it shares pro rata with later unsecured creditors in the debtor's assets on default. Second, if this initial creditor makes an unsecured loan and a later creditor takes security, the later creditor has priority over the initial creditor in the assets subject to the security interest. Third, if the initial creditor makes a secured loan, it generally has priority over later creditors in the assets in which it has security (p. 209).

Merrill and Smith (2001) emphasize that secured debt gives creditors a claim on collateral that is prioritized not only ahead of other creditors, but also ahead of potential purchasers—to illustrate, you cannot sell your house without paying off your mortgage—

> a secured lender has a "priority right," which means that under state law, the lender can enjoy this property right in the face of competing claims of purchasers, transferees, and other creditors (p. 834).

Hahn (2010) details how acceleration can dilute unsecured debt but not secured debt:

> [Acceleration] facilitates collection by the speedy...creditors [i.e. those who accelerate their debt] with the potential of harming the less fortunate ones [i.e. those who do not].... Moreover, in the case of a debtor who is also indebted to secured creditors acceleration by unsecured creditors upon the deterioration of the debtor's financial state seems somewhat futile (p. 240).

We focus on acceleration, which seems to be creditors' main protection against dilution. We abstract from other protections, which could, however, still matter in some circumstances;

e.g., reputable creditors could be deterred from lending in violation of covenants. But creditors have no legal responsibility to check whether covenants are present; see Ayotte and Bolton (2011), p. 3404. Therefore, such alternative protections seem to have limited power.

Beyond being realistic, the priority rules (in conjunction with the available instruments) are (weakly) optimal in our model (Proposition 5).

2.3 Timeline

Date 0: B funds Project 0 from competitive creditors or does not.

Date 1: The quality Q of Project 1 is revealed.

B funds Project 1 from competitive creditors or does not.

If a covenant is violated, covenant-protected creditors accelerate or do not (waive).

The asset is sold or not.

The accelerating creditors are repaid or not.

Date 2: If the asset is not sold at Date 1, projects succeed or fail (together) with probability p, and B makes repayments or defaults.

2.4 Assumptions

We impose three restrictions on parameters.

Assumption 1. Project 0 is efficient, and Project 1 is efficient if and only if it is high quality:

$$p\big(X_0 + Y_0\big) > I_0, \tag{2}$$

$$p\big(X_1^H + Y_1^H\big) > I_1 > p\big(X_1^L + Y_1^L\big). \tag{3}$$

This implies that the efficient investment policy is state-contingent, with investment if $Q = H$, but not if $Q = L$.

Assumption 2. If B undertakes Project 0 and undertakes Project 1 only if it is high quality, the expected pledgeable cash flows exceed the expected investment costs:

$$pX_0 - I_0 + q\big(pX_1^H - I_1\big) \geq 0. \tag{4}$$

This assumption ensures that limited pledgeability alone does not prevent B from implementing the efficient investment policy (Corollary 1). Hence, non-exclusivity is necessary for our results.

Assumption 3. Irrespective of Project 1's quality, the expected pledgeable cash flows of both projects exceed the face value needed to finance Project 1, i.e. for $Q \in \{H, L\}$,

$$p\big(X_0 + X_1^Q\big) > \frac{I_1}{p}. \tag{5}$$

The LHS above is the sum of the expected pledgeable cash flows of Project 0 and Project 1, which is the sale value of the asset deployed in the projects (given both are underway). The RHS is the face value of secured debt F_1^s that B must take on to finance Project 1 (given secured creditors' break-even condition is $pF_1^s = I_1$ and projects succeed with probability p or pay zero). Thus, the assumption implies the assets are valuable enough to secure new debt fully.

We maintain two assumptions on B's behavior. They simplify the presentation significantly, but are without loss of generality. In Section 7.1 and Section 7.2, we relax them. We show that they merely impose restrictions on B's behavior that he would otherwise want to impose on himself (and can impose with realistic instruments we abstract from in the baseline model).

Assumption 4. *If B finances Project 1 at Date 1, he (i) borrows exactly I_1 and (ii) borrows secured.*[19]

3 First Best and Second Best

The first-best investment policy follows immediately from Assumption 1.

Lemma 1. (First best) *The first-best investment policy is to undertake Project 0 and to undertake Project 1 if and only if it is high quality.*

Given the assumed contracting frictions, there are two possible hurdles to implementing the first-best policy.

1. Non-exclusivity might lead B to *over-invest* when $Q = L$, since he could dilute his initial debt.

2. Limited pledgeability might lead B to *under-invest* when $Q = H$, since he could be inefficiently financially constrained.

[19] We also focus on the case in which B borrows exactly I_0 at Date 0. However, we do not need to assume he does for our equilibrium analysis because it turns out that it is (weakly) optimal for him to choose to do so.

Our results are driven by the trade-off induced by the over- and under-investment problems. However, Assumption 2 implies that limited pledgeability alone does not make the under-investment problem so severe that B cannot invest efficiently.

Corollary 1. (Sufficient pledgeability) *If B follows the efficient investment policy, the pledgeable cash flow exceeds the investment cost.*

We now examine whether B can achieve the first best with the available instruments.

4 Unsecured and Secured Debt

In this section, we study how the non-exclusivity friction affects financing and, ultimately, investment. We find conditions under which the first best is and is not implementable with only a mix of secured and unsecured debt (i.e. without covenants).

4.1 Unsecured Debt and Over-investment

Suppose B has issued unsecured debt with face value F_0^u to finance Project 0 at Date 0. Existing debt being unsecured, B can issue debt at Date 1 secured by the asset. Financing Project 1 of quality Q is feasible whenever the implied debt capacity exceeds its investment cost, or

$$p\big(X_0 + X_1^Q\big) \geq I_1. \tag{6}$$

Given Assumption 3, this condition always holds. For B to be not only able but also willing to invest, his payoff—the total non-pledgeable cash flows plus any pledgeable cash flows not paid to creditors—must be higher if he invests than if he does not:

$$p\left(Y_0 + Y_1^Q + \max\left\{0\ ,\ X_0 + X_1^Q - F_0^u - \frac{I_1}{p}\right\}\right) \geq p\Big(Y_0 + \max\big\{0\ ,\ X_0 - F_0^u\big\}\Big), \tag{7}$$

where $I_1/p \equiv F_1^s$ is the face value of secured debt needed to fund Project 1. This can be simplified as

$$Y_1^Q + \max\left\{0\ ,\ X_0 + X_1^Q - F_0^u - \frac{I_1}{p}\right\} \geq \max\big\{0\ ,\ X_0 - F_0^u\big\}. \tag{8}$$

Given that investment is always feasible, two sufficient conditions for efficiency are that condition (8) holds for $Q = H$, but not for $Q = L$, i.e. that B has incentive to undertake Project 1 if its value is positive but not if it is negative:

1. *B undertakes Project 1 if $Q = H$.* From equation (8) with $Q = H$, B will do so if

$$Y_1^H + \max\left\{0\ ,\ X_0 + X_1^H - F_0^u - \frac{I_1}{p}\right\} < \max\left\{0\ ,\ X_0 - F_0^u\right\}, \tag{9}$$

which is satisfied (Assumption 1 with $Q = H$). This simply reflects that Project 1 has positive NPV if $Q = H$—B captures the NPV, and may also benefit from dilution.

2. *B does not undertake Project 1 if $Q = L$.* From equation (8) with $Q = L$, B will *not* do so if

$$Y_1^L + \max\left\{0\ ,\ X_0 + X_1^L - F_0^u - \frac{I_1}{p}\right\} \leq \max\left\{0\ ,\ X_0 - F_0^u\right\}. \tag{10}$$

Thus, B will not invest in Project 1 provided its non-pledgeable cash flow Y_1^L is low enough. Otherwise, he has incentive to over-invest, since Date-0 creditors would bear part of the investment cost and B would capture (at least) the non-pledgeable cash flow—dilution is effectively a tax on existing debt that subsidizes new investment.

Absent renegotiation, these conditions are not only sufficient, but also necessary. With renegotiation, the latter is not: if it is violated the creditor will bribe B not to invest. However, renegotiation may not make the first best attainable. Indeed, if Y_1^L is large, the cost of bribing B may be so high as to deter the creditor from funding Project 0 in the first place. Combined with the conditions above, this gives our first main result.

Proposition 1. (Unsecured debt) *A threshold Y_1^* exists such that the first-best investment policy can be implemented by borrowing unsecured (without covenants) at Date 0 if and only if either $Y_1^L \leq Y_1^*$ or*

$$p\Big(X_0 + qX_1^H + (1-q)X_1^L\Big) \geq I_0 + I_1. \tag{11}$$

The condition that $Y_1^L \leq Y_1^*$ says that B does not have incentive to over-invest, which immediately implies the first best can be implemented. If this does not hold, creditors can renegotiate, bribing B not to invest. Because B has full bargaining power, the bribe pushes creditors to their outside option, i.e. their payoff if B invested. Condition (11) says that the pledgeable cash flow suffices for creditors to break even on average, despite the bribe, as would be the case if B represents a well-capitalized/highly-rated firm. Otherwise, if neither condition is satisfied, unsecured debt can lead to inefficiencies because B has incentive to over-invest. We focus on this case from now on:

Assumption 5. *Unsecured debt cannot implement the first best, i.e. $Y_1^L > Y_1^*$ and condition (11) is violated.*

Under this assumption, B should be interpreted as a constrained firm, so both H and L can be viewed as times of relative financial distress. With this interpretation, the positive-NPV project could represent, e.g., a valuable investment that helps B to endure a liquidity shock.[20]

4.2 Secured Debt and Under-investment

Now, suppose B has issued a mix of secured and unsecured debt with face values F_0^s and F_0^u to finance Project 0 at Date 0. Since earlier secured debt is repaid ahead of any later debt, B cannot dilute F_0^s. But he can still dilute the unsecured debt. Thus, at Date 1, B's borrowing capacity is maximized if he issues debt secured by all assets not already used as collateral. If Project 1 has quality Q, his debt capacity is thus $p\big(X_0 + X_1^Q - F_0^s\big)$.

If that capacity suffices to finance Project 1 when $Q = H$, but not when $Q = L$, then B can satisfy the two conditions for efficiency:

1. *B undertakes Project 1 if $Q = H$.* This is true whenever

$$p\big(X_0 + X_1^H - F_0^s\big) \geq I_1. \tag{12}$$

2. *B does not undertake Project 1 if $Q = L$.* This is true whenever

$$p\big(X_0 + X_1^L - F_0^s\big) < I_1. \tag{13}$$

Both conditions hold for X_1^L small enough. Given Assumption 5, renegotiation is immaterial—if condition (13) is violated, the renegotiation-implied cost prohibits Project 0's funding—and the conditions are necessary and sufficient.

Proposition 2. (Secured and unsecured debt) *The first-best investment policy can be implemented via a mix of secured and unsecured debt (without negative pledge covenants) at Date 0 if and only if*

$$X_1^L < X_1^H. \tag{14}$$

Because financing Project 1 could require dilution, there could be no investment if all debt is secured, i.e. cannot be diluted. Thus, to allow for investment, the fraction of secured debt must be low enough to allow for dilution.[21]

[20] Indeed, liquidity shocks provide a further micro-foundation for limited pledgeability (Holmström and Tirole (1998)).

[21] The idea that issuing new secured debt, and thereby diluting existing unsecured debt, can improve investment efficiency goes back to Stulz and Johnson (1985). However, here dilution helps loosen financial constraints, whereas there it helps incentivize investment (it mitigates a debt-overhang problem à la Myers (1977)). Moreover, here dilution helps despite renegotiation, whereas there it helps only absent renegotiation (because renegotiation solves the debt-overhang problem).

Condition (14) implies that the under-investment problem is relatively "mild," i.e. that the debt capacity is larger if $Q = H$ than if $Q = L$. In this case, B can find a fraction of secured debt that allows for enough (good) dilution to finance the high-quality project, but not enough (bad) dilution to finance the low-quality one. Otherwise, however, if the under-investment problem is relatively "severe" (condition (14) is violated), B cannot implement the first best with only secured and unsecured debt, but may end up under-investing.

Corollary 2. (Collateral overhang) *Suppose*

$$X_1^L \geq X_1^H. \tag{15}$$

Any level of secured debt that prevents B from financing the low-quality project at Date 1, also prevents him from financing the high-quality one.

This is the "collateral overhang problem" in Donaldson, Gromb, and Piacentino (2018): secured debt prevents B from diluting Date-0 creditors to fund an efficient investment—collateralization encumbers B's assets. This problem is reminiscent of Myers's (1977) "debt-overhang problem": debt in place breeds under-investment. The difference is that there, a borrower will not fund an investment for its benefits go to existing creditors, whereas here, creditors will not fund an investment for its benefits go to the borrower. Moreover, ex interim renegotiation can resolve the debt-overhang problem, but not the collateral-overhang problem. The reason is that, due to limited pledgeability, the borrower cannot commit to compensate existing creditors. Hence, the problem arises whenever the pledgeable cash flows are lower if the project is high quality than if it is low quality (equation (15)).

5 Negative Pledge Covenants

So far, we have shown that a mix of secured and unsecured debt can implement the first best when the under-investment problem is relatively mild. In this section, we show that negative pledge covenants can help when it is relatively severe. We consider, first, Date-0 financing entirely with unsecured debt with covenants and, next, with a mix of unsecured debt with and without covenants.

5.1 Only Unsecured Debt with Covenants

Suppose Project 0 is financed entirely with covenant-protected unsecured debt with face value F_0^c. B can issue new secured debt, in violation of covenants, in which case the creditor has the option to accelerate the debt. Since acceleration forces B to sell the asset, which destroys non-pledgeable cash flows, the acceleration threat could deter dilution, and perhaps lead B to invest efficiently. The acceleration threat must be credible, however. But what is there to gain from acceleration? The violation itself entails prioritizing the new secured debt. Thus, there is nothing to gain and the threat is not credible.

Proposition 3. (Covenant irrelevance) *If B finances Project 0 entirely via unsecured debt with negative pledge covenants, the covenant is irrelevant.*

To understand the result, suppose B violates the covenant, taking on new secured debt F_1^s. And suppose B cannot fully repay both this and the initial debt, i.e. $X_{\text{tot.}} < F_0^c + F_1^s$ (this is necessary for dilution and hence without loss).[22] This implies that even if there is no acceleration, B will be in bankruptcy at Date 2, in which case secured debt has priority. Thus, the covenant-protected creditor is paid after F_1^s; it gets expected payoff $p(X_{\text{tot.}} - F_1^s)$. However, if there is acceleration, B is forced to sell his asset at Date 1 to generate proceeds of $pX_{\text{tot.}}$.[23] And secured debt still has priority over assets, even outside bankruptcy. Thus, the covenant-protected creditor is still paid after F_1^s; it gets payoff $pX_{\text{tot.}} - F_1^s$. Comparing these payoffs from continuation and acceleration, we see that

$$p\big(X_{\text{tot.}} - F_1^s\big) > pX_{\text{tot.}} - F_1^s. \tag{16}$$

I.e. the creditor never accelerates. Acceleration is not desirable because assets sales subsidize the secured debt by making it less risky: it is repaid F_1^s for sure, not just with probability p. This subsidy is a tax on unsecured debt. To avoid it, the unsecured creditor will not accelerate. Thus, B is not deterred from taking new secured debt.

The mechanism behind this result jives with arguments in the law literature articulated, notably, by Bjerre (1999):

> The [negative pledge] covenant does not prevent third parties from acquiring a security interest, but [is] merely...a hollow promise, for in the very act of breaching the covenant, the borrower places its assets out of reach of the negative pledgee and into the hands of the very third party against which the negative pledgee seeks protection (p. 308).

Indeed, the outcome here is the same as if B borrowed entirely unsecured but without covenants (Proposition 1).

[22] Recall that we assume that B issues with new secured debt, and hence violates the covenants (Assumption 4). Dilution with other forms of debt can (and would optimally) be ruled out, as shown in Section 7.2.

[23] Though inefficient, the sale cannot be renegotiated away because the surplus this would generate is non-pledgeable.

5.2 Mix of Unsecured Debt with and without Covenants

Now, suppose B finances Project 0 via a mix of unsecured debt with and without negative pledge covenants with face values F_0^c and F_0^u. Let ϕ denote the fraction of covenant-protected debt, $\phi := \frac{F_0^c}{F_0^c+F_0^u}$. Is the acceleration threat credible?

Suppose that B violates the covenant, taking on new secured debt F_1^s. And suppose B cannot fully repay these debts even if the projects succeed and that F_0^c is so large that accelerating creditors are not paid in full (as above, this is necessary for dilution, hence without loss). At Date 2, the covenant-protected creditor has a claim on B's asset. Its claim is paid after F_1^s, but pro rata with F_0^u. Hence, it gets $\phi p(X_{\text{tot.}} - F_1^s)$.

However, at Date 1, the covenant-protected creditor can accelerate some or all of its debt, forcing B to sell the asset for $pX_{\text{tot.}}$. But, since the asset serves as collateral, B must first repay F_1^s. Hence, the accelerated debt gets paid from the residual proceeds $pX_{\text{tot.}} - F_1^s$ (assumed to be insufficient to repay F_0^c in full). It is easy to show that the creditor is better off not accelerating all of its debt, which would trigger bankruptcy. Instead, it is better off accelerating exactly $pX_{\text{tot.}} - F_1^s$, which can be repaid from the asset sale proceeds and does not trigger bankruptcy.[24] This way, it gets paid ahead of other unsecured creditors outside bankruptcy, rather than pro rata with them inside bankruptcy (when all debt would be accelerated).

Comparing the payoffs from continuation and acceleration, we see that acceleration is desireable if

$$p\phi(X_{\text{tot.}} - F_1^s) < pX_{\text{tot.}} - F_1^s. \tag{17}$$

Now, acceleration can be credible—the inequality above can be satisfied—provided ϕ is small enough. The reason is that, although acceleration does nothing to reverse dilution by secured debt, it may still benefit the covenant-protected creditor: by diluting the unsecured debt without covenants. The accelerating creditor can get paid at Date 1, gaining effective priority over other unsecured creditors.

The fraction ϕ of debt with covenants determines the strength of the acceleration threat—the smaller ϕ, the larger the fraction $(1-\phi)$ of dilutable debt, and the larger the gain from accelerating.[25] A suitable ϕ may thus make the threat credible in the right state, deterring Date-1 investment in the low-quality but not in the high-quality project, i.e. satisfying the two conditions for efficiency (renegotiation being immaterial under Assumption 5):

[24] In Section 7.7, we consider what happens if acceleration necessarily triggers bankruptcy.

[25] That decreasing ϕ makes acceleration more attractive contrasts with Gennaioli and Rossi's (2013) result that increasing a controlling creditor's share exacerbates its liquidation bias. The difference comes from the fact that their controlling creditor is senior/secured, and hence has the most to gain from liquidation. Together, these results highlight how the effect of creditors' control rights is sensitive to whether their debt is secured (cf. Section 7.1).

1. *B undertakes Project 1 if $Q = H$.* B will borrow secured in violation of covenants only if he anticipates that the covenant-protected creditor will not accelerate,[26] i.e. if condition (17) does not hold for $Q = H$, or

$$p\phi\big(X_0 + X_1^H - F_1^s\big) \geq p\big(X_0 + X_1^H\big) - F_1^s. \tag{18}$$

2. *B does not undertake Project 1 if $Q = L$.* B will not issue secured debt if he anticipates acceleration, i.e. if condition (17) holds for $Q = L$, or,

$$p\phi\big(X_0 + X_1^L - F_1^s\big) < p\big(X_0 + X_1^L\big) - F_1^s. \tag{19}$$

A fraction ϕ of debt with negative pledge covenants exists such that these conditions are satisfied together whenever X_1^L is sufficiently large.

Proposition 4. (Covenants) *The first-best investment policy can be implemented via a mix of unsecured debt with and without negative pledge covenants at Date 0 if and only if*

$$X_1^L \geq X_1^H. \tag{20}$$

Recall that $X_1^L \geq X_1^H$ says the under-investment problem is severe, in that funding high-quality investments requires more dilution that funding low-quality ones. In other words, even though Project 1 has higher NPV when $Q = H$ than when $Q = L$, it is still more difficult to pledge to creditors, e.g., because it is relatively innovative or otherwise relationship-specific. In this case, B cannot implement the efficient investment policy with a mix of secured and unsecured debt at Date 0. This is the collateral overhang problem (Corollary 2): to block bad dilution, secured debt must block good dilution too.

Proposition 4 says that, in this case, B can implement the efficient investment policy with a mix of unsecured debt with and without covenants at Date 0. The reason is that covenants can be violated at Date 1. This gives B flexibility to fund the high-quality, low-pledgeability projects he cannot fund if he borrows secured at Date 0.

But he must anticipate that covenants will be waived following investment in a high-quality project. And, indeed, this is the case when X_1^H is low, because then there is little left

[26]Here, B violates the covenant, which the creditor then waives. This is equivalent to B asking the creditor to waive the covenant before he takes secured debt. I.e. there is no distinction between asking for "forgiveness" and "permission." This suggests that covenant violations could be more frequent than measures of ex post violations imply, especially since, in practice, asking for "permission" could allow a borrower to circumvent any direct costs of covenant violation, beyond the risk of acceleration we model (e.g., due to lost reputation). In this case, it would also be consistent with creditors increasing interest rates, to share in the surplus created by avoiding such costs. Thanks to Adriano Rampini for pointing this out.

for an accelerating creditor to grab following a high-quality investment. Hence, it is better off waiving covenants, hoping the project to succeed at Date 2. In other words, an unsecured creditor is diluted to such an extent that it gambles for resurrection. Still, covenants are valuable to deter investment in low-quality projects (which are relatively pledgeable).

Empirically, covenants violations are reported mainly in times of financial distress (see Section 8.1). Of course, given Assumption 5, our model applies to constrained firms, so both H and L can be viewed as times of relative financial distress, with the positive NPV project representing, e.g., an investment that helps B endure a liquidity shock.

6 Equilibrium

Our analysis implies that a debt structure always exists that implements the first best. Indeed, the condition under which the first-best policy can be implemented via a mix of secured and unsecured debt (equation (14) in Proposition 2) is the complement of that under which it can be implemented via a mix of unsecured debt with and without covenants (equation (20) in Proposition 4).

Proposition 5. (Characterization) *The equilibrium is (first-best) efficient and can be implemented via a suitable debt structure.*

At Date 0, B finances Project 0 by borrowing I_0 via debt with total face value

$$F_0 = \frac{I_0}{p} + \max\left\{0\,,\, \frac{q}{1-q}\left(\frac{I_0}{p} + \frac{I_1^H}{p} - X_0 - X_1^H\right)\,,\, \frac{1-q}{q}\left(\frac{I_0}{p} - X_0\right)\right\}, \tag{21}$$

where the proportions of this debt that are unsecured without covenants, secured, and unsecured with covenants depend on parameters as follows:

- *If $Y_1^L \leq Y_1^*$, the debt is all unsecured without covenants.*
- *Otherwise, if $X_1^H > X_1^L$, an amount $F_0^s \in \left(X_0 + X_1^L - \frac{I_1}{p}\,,\, X_0 + X_1^H - \frac{I_1}{p}\right]$ is secured.*
- *Otherwise, the debt is unsecured, and a fraction $\phi \in \left[\frac{p\left(X_0+X_1^H\right)-I_1/p}{p\left(X_0+X_1^H-I_1/p\right)}\,,\, \frac{p\left(X_0+X_1^L\right)-I_1/p}{p\left(X_0+X_1^L-I_1/p\right)}\right]$ has negative pledge covenants.*

At Date 1, B finances Project 1 by borrowing I_1 via secured debt with face value $F_1^s = I_1/p$ if $Q = H$, and does not finance it if $Q = L$.

This result suggests a rationale for the priority rules observed in practice: given the existing priority rules, B can choose his debt structure to commit to the efficient investment policy. Moreover, because the power of secured debt to dilute existing debt is state contingent, he can do it with non-state-contingent (debt) instruments, even though the policy is state-contingent.

The debt structure B chooses depends on the extent of the under-investment problem induced by financial constraints. If he is unconstrained, he can rely on unsecured debt. If he is constrained, he must overcome the under-investment problem. In this case, he chooses a multi-layered debt structure that depends on how severe the problem is: if it is mild, he mixes secured and unsecured debt; if it is severe, he mixes debt with and without covenants.

7 Extensions

In this section, we present extensions, allowing for (i) secured debt with covenants and deductibles, (ii) dilution with pari passu debt, (iii) a continuum of project qualities, (iv) subordinated debt, (v) renegotiation with a subset of creditors, (vi) an asset sale discount, (vii) bankruptcy due to acceleration, and (viii) imperfect correlation in project cash flows.

7.1 Secured Debt with Covenants and Deductibles

So far, we have assumed B cannot raise more than I_1 at Date 1 (Assumption 4(i)). Thus, any accelerated debt must be paid by selling the asset. Here, we show that this is merely a simplifying assumption that can be easily endogenized.

Suppose B can issue secured debt at Date 0 with a clause prohibiting new debt in excess of I_1/p backed by an option to accelerate. If borrowing at Date 1 exceeds this "deductible," the creditors, being secured, will accelerate their debt; if they do, they are paid for sure rather than only with probability p (cf. Gennaioli and Rossi (2013) and footnote 25 above). Thus, the acceleration threat is credible, and deters B from issuing debt above the deductible. And, in our model, B would choose to use such covenants to rule out borrowing in excess of I_1.

7.2 Dilution with Unsecured Debt and Leverage Covenants

So far, we have assumed that if B borrows at Date 1, he issues secured debt (Assumption 4(ii)). This is merely a simplifying assumption that can easily be endogenized as we now show.

Suppose B can issue debt at Date 0 with a leverage covenant prohibiting any new (secured or unsecured) debt at Date 1. Suppose B finances Project 0 with such covenant-protected unsecured debt with a low face value and other unsecured debt without the covenant. If B takes on unsecured debt at Date 1, the covenant-protected creditor will accelerate its debt: if it does, it is paid in full at Date 1 rather than pro rata only with probability p if it doesn't. Thus, the acceleration threat is credible, and would deter B from issuing new debt. And, in our model, B would choose to rule out dilution via unsecured debt.

The finding here that the acceleration threat always deters B from issuing new unsecured debt underscores why the suggestion that anti-dilution covenants provide only weak protection against dilution is specific to negative pledge covenants and dilution via secured debt.[27] It does not apply to leverage covenants and dilution via unsecured debt. The reason is that acceleration does not undo dilution with new secured debt, whereas it does undo dilution with new unsecured debt—it allows earlier creditors to regain priority over later ones.

7.3 Continuum of Qualities

So far, we have shown that secured (resp. covenant-protected) debt is optimal when the under-investment problem is relatively mild (resp. severe), i.e. when high-quality projects are more (resp. less) pledgeable than low-quality projects. Here, we show that these results are robust to having more than two qualities, as long as pledgeability is monotonic in quality, be it increasing or decreasing.

Suppose Project 1 comes in a continuum of possible qualities Q, with the NPV of a project with quality Q given by $\text{NPV}^Q := X_1^Q + Y_1^Q - I_1$. Equations (12) and (13) imply that for a given level of secured debt F_0^s, B can fund Project 1 with secured debt if and only if

$$X_1^Q \geq X^{Q^s} := \frac{I_1}{p} - (X_0 - F_0^s), \tag{22}$$

while equations (18) and (19) imply that for a given fraction ϕ of unsecured debt with covenants, B can fund Project 1 with secured debt with face value F_1^s if and only if

$$X_1^Q < X^{Q^c} := \frac{1 - p\phi}{p(1-\phi)} F_1^s - X_0 \tag{23}$$

(where $F_1^s = I_1/p$ from Date-1 creditors' break-even condition).

First, suppose that X_1^Q is increasing in Q, i.e. that the under-investment problem becomes milder as Q increases. In this case, B can fund Project 1 whenever Q is above a cutoff Q^s, where X^{Q^s} is defined in equation (22). If B chooses F_0^s such that $\text{NPV}^{Q^s} = 0$, the first best is implemented with a mix of secured and unsecured debt. Now, suppose, conversely, that X_1^Q is decreasing in Q, i.e. that the under-investment problem becomes more severe as Q

[27] It also applies to sale-and-leaseback covenants, which, given a lease is effectively secured debt, are arguably economically equivalent to negative pledge covenants.

increases. In this case, B can fund Project 1 whenever Q is below a cutoff Q^c, where X^{Q^c} is defined in equation (23). If B chooses ϕ such that $\text{NPV}^{Q^c} = 0$, the first best is implemented with a mix of unsecured debt with and without covenants.[28] In summary, our results obtain provided X_1^Q is monotonic in Q.

7.4 Subordinated Debt

So far, we have focused on covenants that limit new secured and unsecured debt. In practice, such covenants typically allow for subordinated debt—i.e. debt only paid after other, "normal" unsecured debt in bankruptcy. Allowing subordinated debt would not change our analysis. Indeed, in our model, B would never find it strictly optimal to issue such debt because he reaches first best without it.

However, in a slight variation of our model, subordinated debt could have a role. Suppose there is an additional type of project with quality $Q = HH$, which is self-financing, i.e. $pX_1^{HH} > I_1$. Such a project could be financed by issuing subordinated debt, and doing so would actually support, not dilute, existing debt. Thus, covenants allowing for new subordinated debt, but restricting new normal or secured debt, could be optimal. Indeed, they are common in practice.

7.5 Coalitional Renegotiation and Intercreditor Agreements

We have shown our results to be robust to renegotiation, under the assumption that renegotiation must make all parties better off. Here, we study whether they are robust to "coalitional renegotiation," in which B renegotiates with only some creditors, and only parties to the renegotiation need to be better off.

In our model, coalitional renegotiation could undermine the acceleration threat. To see why, consider the covenant-protected creditor's incentive to accelerate. B could offer it collateral as a bribe not to accelerate, allowing it to be paid ahead of other unsecured debt without forcing an asset sale.[29]

However, "inter-creditor agreements" prohibit some creditors from altering claims debts at the expense of others, notably changing their relative priorities.[30] If one creditor violates this agreement, he must compensate the injured creditor. As a result, inter-creditor agreements in effect rule out coalitional renegotiation. And, since the first-best is implemented in the

[28]Substituting $X_1^{Q^s} = I_1/p - Y_1^{Q^s}$ into equation (22) gives $F_0^s = X_0 - Y_1^{Q^s}$, and substituting $X_1^{Q^c} = I_1/p - Y_1^{Q^c}$ into equation (23) gives $\phi = 1 - \frac{1-p}{p^2} \frac{I_1}{X_0 - Y_1^{Q^c}}$.

[29]This would be a second lien, paid after F_1^s, but ahead of F_0^u. Its payoff from accepting the bribe is thus (up to) $p(X_{\text{tot.}} - F_1^s)$, which exceeds his payoff from acceleration of $pX_{\text{tot.}} - F_1^s$.

[30]Thanks to Ken Ayotte for pointing this out.

baseline model, if coalitional renegotiation were allowed, B would choose to use inter-creditor agreements to rule it out.

7.6 Asset Sale Discount

So far, we have assumed that selling assets destroys non-pledgeable cash flows but none of the pledgeable cash flows. Here, we consider an additional cost, e.g., because it entails early termination or is organized hastily.

Say the sale's proceeds are $\lambda p X_{\text{tot.}}$ with $\lambda < 1$. The analysis of debt structure without covenants is unchanged, as it does not involve asset sales. That of debt structure with covenants changes, however, since covenant-protected creditors now find it optimal to accelerate if

$$p\lambda\big(X_0 + X_1^Q\big) - F_1^s \geq \phi p'\big(X_0 + X_1^Q - F_1^s\big). \tag{24}$$

Hence, the conditions for efficient investment are as in equations (18) and (19), but with an additional λ on the LHS. Thus, our results on covenants are qualitatively unchanged.

However, the LHS is smaller than in the baseline case, so ϕ should be smaller. Roughly, the discount $(1-\lambda)$ decreases what is left to grab following an asset sale, and thus makes acceleration less tempting; so B must reduce ϕ to compensate. This suggests the additional empirical prediction that when asset sale discounts are larger, firms should use less debt with covenants.

7.7 Bankruptcy due to Acceleration

So far, we have assumed that any fraction of covenant-protected debt can be accelerated at Date 1. This allowed a creditor to "fine tune" the fraction of debt it accelerates to "just" avoid triggering bankruptcy, and therefore maximize the money it could get out before other debts came due. In practice, however, this fine tuning could be difficult. Hence, here we explore the case in which a creditor's decision is coarse, and it accelerates either all of its debt or none of it. Thus, acceleration triggers bankruptcy whenever B cannot raise enough from asset sales at Date 1 to pay the covenant-protected debt in full. We show that our results are unchanged.

We must check that a level of covenant-protected debt F_0^c exists such that acceleration triggers bankruptcy when $Q = H$ (so creditors do not accelerate), but not when $Q = L$ (so they do). I.e.

$$p\big(X_0 + X_1^H\big) - F_1^s < F_0^c \tag{25}$$

and

$$p\big(X_0 + X_1^L\big) - F_1^s \geq F_0^c. \tag{26}$$

These can hold whenever $X_1^L \geq X_1^H$. These conditions replace equations (18) and (19) as long as creditors prefer not to accelerate if this triggers bankruptcy, i.e.

$$\phi\Big(p\big(X_0 + X_1^Q\big) - F_1^s\Big) \leq \phi p\left(X_0 + X_1^Q - F_1^s\right), \tag{27}$$

and to accelerate otherwise (in which case they are made whole), i.e.

$$F_0^c > p\phi\left(X_0 + X_1^Q - F_1^s\right). \tag{28}$$

These conditions are always satisfied.[31]

7.8 Imperfectly Correlated Cash Flows

So far, we have assumed that projects are perfectly correlated. Here we show that this is not essential for our results (albeit under some stricter parameter restrictions).

Say projects may be only imperfectly correlated: each succeeds with probability p, but the probability p' that both do can be less than p. In general, this complicates the analysis because there are four possible outcomes instead of two. To simplify, assume that the cost of Project 1 is sufficiently large that B can repay the debt used to finance it only if both projects succeed, so $F_1^s \in \big[\max\{X_0\,,\, X_1^Q\}, X_0 + X_1^Q\big)$.

When can B implement the first-best investment policy? To answer, we ask when B invests at Date 1 (i) if he has secured debt F_0^s in place and (ii) if he has a fraction ϕ of debt with covenants in place. Focusing, to simplify further, on the case in which B's Date-0 secured debt is in the same range as F_1^s above, we see that he can borrow and invest in Project 1 if

$$p'\big(X_0 + X_1^Q - F_0^s\big) \geq I_1. \tag{29}$$

Hence the conditions for efficient investment are as in equations (12) and (13), but with p replaced by p'. Given a fraction of debt with covenants ϕ, the acceleration threat is credible if

$$p\big(X_0 + X_1^Q\big) - F_1^s \geq \phi p'\big(X_0 + X_1^Q - F_1^s\big). \tag{30}$$

Hence, the conditions for efficient investment are as in equations (18) and (19), but with

[31] Equation (27) is immediate. Equation (28) holds because we can restrict attention to cases in which F_1^s diluted existing debt, i.e. in which $F_0^c + F_0^u > X_0 + X_1^L - F_1^s$, since otherwise the covenants would be waived before the violation.

p replaced by p' on the RHS (but not on the LHS). Thus, our results on collateral and covenants are qualitatively unchanged. However, since $p' \leq p$, this suggests that ϕ should be higher than in the case of perfect correlation.

8 Empirical Content and Discussion

In this section, we describe the empirical relevance of our results, and we discuss their practical and theoretical implications.

8.1 Empirical Relevance

Consistent evidence. Our results are consistent with a number of stylized facts:

1. **Well-capitalized, highly rated borrowers use largely unsecured debt.** See, e.g., Rauh and Sufi (2010) and Benmelech, Kumar, and Rajan (2019).

   In our theory, the borrower uses unsecured debt when pledgeable cash flows are sufficiently high (Proposition 1).

2. **Negative pledge covenants are common.** See, e.g., Billet, King, and Mauer (2007) and Ivashina and Vallée (2018).

   In our theory, the borrower uses negative pledge covenants (rather than secured debt) because they allow for efficient dilution. In other words, their weakness is a feature, not a bug. Thus, we respond to what Bjerre (1999) argues is a puzzle:

   > Some may wonder why, given their weakness, costs, and difficulties, lenders bother with negative pledge covenants at all.... [B]orrowers have strong incentives to breach the covenant if necessary financing is available only on a secured basis. [...] The foregoing simply raises, however, the broader question of why lenders ever agree to lend on an unsecured basis, with or without a negative pledge covenant, if collateral is available (pp. 338–339).

3. **Covenants are frequently violated.** See, e.g., Chava and Roberts (2008), Dichev and Skinner (2002), Nini, Smith, and Sufi (2012), and Roberts and Sufi (2009).[32]

   In our theory, the borrower chooses his debt structure optimally anticipating violating covenants to finance efficient investments in equilibrium.

[32] The covenants violated in these papers are often based on financial ratios, such as interest to earnings. Hence, not all covenant violations need be intentional. Some could result only from, e.g., low earnings. See Bjerre (1999) for case law on violations of negative pledge covenants specifically.

4. **Following violations, covenants are typically waived.** See, e.g., Beneish and Press (1993, 1995), Gopalakrishnan and Prakash (1995), Nini, Smith, and Sufi (2012), and Sweeney (1994).

   In our theory, the borrower violates covenants in anticipation of their being waived. However, covenants are useful nonetheless, because the borrower refrains from violating them in anticipation of their being upheld.

5. **Secured and covenant-protected debt can coexist.** See, e.g., Rauh and Sufi (2010).

   In our theory, the borrower relies on combinations of different types of debt to implement the first-best investment policy. For example, he uses new secured debt to dilute existing unsecured debt, gaining financial flexibility. And he uses negative pledge covenants to prevent excessive dilution.

6. **No pecking order of debt types.** I.e. firms do not use debt claims with the strongest anti-dilution features first. In particular, firms (i) borrow unsecured even when they have assets that could serve as collateral (Badoer, Dudley, and James (2019), Benmelech, Kumar, and Rajan (2019), and Rampini and Viswanathan (2013)), (ii) include deductibles[33] to allow for dilution (Ivashina and Vallée (2018)), and (iii) do not include covenants in all of their unsecured debt (e.g., Billett, King, and Mauer (2007) and Rauh and Sufi (2010)).

   In our theory, debt structure is based on a trade-off between financial flexibility benefits (avoiding under-investment) and its costs (causing over-investment). Specifically, too much secured debt leads to too little flexibility (collateral overhang), whereas too much covenant-protected debt leads to too much flexibility (the acceleration threat becomes non-credible (Proposition 3)). In both cases, unsecured debt without covenants is a necessary layer in the debt structure. It helps maintain flexibility, because it can be diluted by new secured debt, and fosters commitment, because it can be diluted by accelerated debt (and therefore makes the acceleration threat credible).

7. **Collateral overhang.** I.e. secured debt reduces future investment (efficient or not). See, e.g., Badoer, Dudley, and James (2019).

   In our theory, debt secured by collateral cannot be diluted, reducing future debt capacity.[34]

[33] Deductibles relax covenants restrictions, up to a threshold action. E.g., as in Section 7.1, a deductible in a negative-pledge covenant may allow the borrower to issue new secured debt up to a threshold amount.

[34] Although, strictly speaking, the collateral overhang arises only off equilibrium in our baseline model

8. **Debt holdings and terms facilitate modifying/waiving covenants.** See, e.g., Gopalakrishnan and Prakash (1995) on how concentrated debt has more covenants than dispersed debt and Bratton (2006) on how bond covenants can be altered more easily than other bond terms.

   In our theory, creditors holding debt protected by negative pledge covenants must be able to enforce or waive covenants optimally following violations, whereas those holding plain unsecured debt can be passive. Thus, creditors holding debt with covenants must be able to coordinate; they could be large lenders with expertise/information such as banks[35] or informed bond holders that can trade and cooperate, in which case contracts should facilitate collective modification of covenants, e.g., by majority voting.

9. **Covenants in a firm's loans increase the price of its bonds.** See, e.g., Bradley and Roberts (2015).

   In our theory, the covenants in some debt helps discipline the borrower, which increases the value of other debt (see Lemma 3 in the Appendix). Indeed, discipline is only effective when not all debt has covenants (Proposition 3).[36]

New predictions. In our theory, an optimal debt structure arises from the trade-off between the costs of financial flexibility (allowing over-investment) and its benefits (avoiding under-investment). This leads to the following predictions, which have yet to be tested directly (to our knowledge), but seem consistent with existing indirect evidence (cf. Proposition 5).

Prediction 1. *All else equal, firms that are relatively more exposed to under-investment problems, i.e. whose valuable investment opportunities have relatively low pledgeability, use covenants.*

Under-investment problems are severe when firms are inefficiently financially constrained, i.e. they have good investment opportunities but little pledgeable assets. This is likely to be the case for growth firms. With this interpretation, the prediction is in line with the fact that covenant use increases with growth opportunities (Billett, King, and Mauer (2007)).

Under-investment problems are also likely to be severe in firms with, e.g., large, inflexible investment needs, strong rivals (so under-investment leads to decreased market share), and relationship-specific inputs/non-redeployable assets (so under-investment leads to dormant

with two states, it would arise on equilibrium in a model with more (see Section 7.3).

[35]This also provides a possible an explanation for the role of a large creditor: it can easily enforce or waive covenants unilaterally. This complements explanations in the literature, based on, e.g., monitoring incentives (Burkart, Gromb, and Panunzi (1995) and Park (2002)).

[36]See Green (2018), Greenwald (2019), and Matvos (2013) for structural models on the value of covenants.

assets). More generally, firms that must choose between investments with high immediate pledgeability and those with high future cash flows should favor covenants.[37]

Prediction 2. *All else equal, firms that are relatively more exposed to over-investment problems, i.e. whose valuable investment opportunities have high pledgeability, use collateral.*

Dilution problems are likely to be severe in firms in distress/declining industries, which have incentive to gamble for resurrection, tunnel, strip assets, and shift risk. Thus, the prediction is in line with the fact that the use of secured debt, rather than covenants, increases in financial distress (Badoer, Dudley, and James (2019), Benmelech, Kumar, and Rajan (2019), and Rauh and Sufi (2010)).

Prediction 3. *Collateral use increases and covenant use decreases with the tangibility of assets used in (good) investment opportunities.*

As tangible assets are likely to be relatively pledgeable, increasing the tangibility of assets used in good investments is likely to mitigate the under-investment problem. Intangible capital has increased in importance as reflected by the increasing fraction of intangibles on the asset side of corporate balance sheets. Thus, the prediction is in line with the fact that secured debt has become less important on the liabilities side (Benmelech, Kumar, and Rajan (2019)).

Prediction 4. *Covenant use decreases with the costs associated with asset sales.*

Asset sale discounts (see Section 7.6) are likely to be higher when assets are less redeployable, less tangible, harder to value, or more firm-specific and when potential buyers are scarce, outside the industry, or financially constrained.

8.2 Discussion of Implications

Here, we comment on the broad implications of our theory, including how it generates new theoretical insights, captures practical/institutional reality, and matters for policy.

Covenants and collateral can be complements. The literature stresses that covenants and collateral are substitutes (e.g., Schwartz (1989)). Indeed, this is true in our model. But we also show a complementarity: covenants can implement efficiency only in conjunction with collateral. Although covenants are needed to promise not to use collateral when dilution is inefficient, collateral is needed to break that promise and engage in dilution when efficient.

[37] Gilje, Loutskina, and Murphy (2017) show how this trade-off can lead to inefficient investment in highly pledgeable, low-NPV projects in the oil industry.

Security is more than seniority. Indeed, long-term secured debt limits the payoff to short-term (or accelerated) unsecured debt in a way long-term senior debt cannot. By the APR, secured debt is senior in bankruptcy (up to the value of the collateral). But secured debt also has priority outside bankruptcy as assets used as collateral cannot be sold or used as collateral for new debt. This matters in our theory, unlike in others, because it limits what there is to gain from acceleration before bankruptcy.

Covenants manage creditor-creditor conflicts. The literature stresses how covenants address conflicts between debt and equity (e.g., Smith and Warner (1979)). Our theory focuses on conflicts among different debts—indeed, taking our model literally, negative pledge covenants need not exist at all absent multiple creditors holding heterogeneous claims with conflicting priorities.

Unsecured debt is more contingent than equity. In our model, unsecured debt without covenants is paid after both secured debt and accelerated debt. Hence, it is similar to outside equity. But it is not the same. Indeed, it is paid after debt with covenants only in the event of acceleration, and is otherwise paid pro rata with other debt, a contingency necessary to make acceleration credible. Indeed, it is debt that implements the necessary contingent payoffs, even though such contingencies are more commonly associated with equity.

"Good" vs. "bad" dilution. Debt dilution is viewed as a "serious danger" for firms (Schwartz (1997)) and, likewise, a "major problem" for countries (Eyigungor (2013)). Indeed, dilution can be bad in our model as it can trigger over-investment and credit rationing. But it can also be good as it can prevent under-investment, and the possibility of dilution via acceleration creates a threat that deters other, inefficient dilution.[38] The optimal debt structure allows for good dilution while preventing bad dilution.

Absolute vs. partial priority. The absolute priority rule dictates secured debt is paid in full before any other claims are paid. Bebchuk and Fried (1996) argue that this can create inefficiencies, because it gives secured debt the power to defeat other claims. We argue that this has benefits, because dilution can be good, helping to overcome limited pledgeability.

Contingent outcomes via non-contingent debt contracts. The literature rationalizes contingent contracting as a way to implement state-contingent outcomes (e.g., Shavell (1984)). Our model is about implementing a state-contingent outcome too: invest if $Q = H$ but not if $Q = L$. In our theory, contingencies are implemented via contingent dilution, which itself is implemented by mixing non-contingent debts with different covenants and priorities.

[38] Optimal "dilutable debt" also appears in Diamond (1993), Donaldson and Piacentino (2017), and Hart and Moore (1995).

9 Conclusion

We present a model of financial contracting in which contracts are non-exclusive, and hence can conflict: contracts may contain covenants putting restrictions on other contracts, but these covenants can be violated. In this case, a priority rule is needed to resolve conflicts among contracts. Hence, contracts are meaningful only with respect to the priority rule.

In practice, secured debt has priority. This creates the risk of dilution: new secured debt overrides existing unsecured debt. Given this priority, negative pledge covenants restricting new secured debt might seem futile—they can be overridden by the very dilution they are supposedly there to prevent. But we show that this can be a good thing. The reason is that in addition to the usual bad side of dilution (it leads to over-investment), there are good sides as well. First, it can loosen borrowing constraints that could be too tight due to limited pledgeability, and hence prevent over-investment. Second, it subsidizes accelerating creditors, hence making their threat credible and preventing bad dilution. In our environment, a borrower can choose his debt structure to get the good sides of dilution without the bad under the existing priority rules. Hence, our model rationalizes these rules, which some legal scholars have suggested are perverse (e.g., Bjerre (1999) and Bebchuk and Fried (1996)).

A Proofs

A.1 Proof of Lemma 1

The result follows immediately from Assumption 1. □

A.2 Proof of Corollary 1

The result follows immediately from Lemma 1 and Assumption 2. □

A.3 Proof of Proposition 1

Recalling that B always invests efficiently at Date 1 if $Q = H$ (condition (9) is always satisfied by Assumption 1), we can focus on whether he does (i) at Date 1 if $Q = L$ and (ii) at Date 0. We consider these two cases in turn.

Date 1 if $Q = L$. B invests efficiently at Date 1 if condition (10) is satisfied, or, rearranging, if

$$Y_1^L \leq Y_1^* := \max\left\{0\ ,\ X_0 - F_0^u\right\} - \max\left\{0\ ,\ X_0 + X_1^L - F_0^u - \frac{I_1}{p}\right\}, \tag{31}$$

where F_0^u is determined by Date-0 creditors' break-even condition given B follows the efficient strategy. Thus, to calculate Y_1^* explicitly, we must first calculate F_0^u. Doing so requires us to consider three cases, corresponding to the case in which B never defaults, defaults if $Q = H$ but not if $Q = L$, and defaults if $Q = L$ but not if $Q = H$.

Case 1: $X_0 + X_1^H \geq I_0/p + I_1/p$ and $X_0 \geq I_0/p$.

In this case, if the projects succeed, B is able to pay I_0/p to Date-0 creditors irrespective of Q and so

$$F_0^u = I_0/p. \tag{32}$$

Condition (10) becomes

$$Y_1^L + \max\left\{0\ ,\ X_0 + X_1^L - \frac{I_0 + I_1}{p}\right\} \leq X_0 - \frac{I_0}{p}. \tag{33}$$

There are two subcases, depending on whether B defaults on Date-0 creditors if he invests when $Q = L$ and the projects succeed.

Subcase 1.1 $X_0 + X_1^L > I_0/p + I_1/p$.

In this case, B does not default. As a result, he would bear the full negative value of Project 1 when $Q = L$ and so does not undertake it in that case.

Subcase 1.2 $X_0 + X_1^L < I_0/p + I_1/p$.

In this case, in the event of success, B defaults if and only if he undertakes Project 1 ($Q = H$). Hence, condition (10) becomes

$$Y_1^L \leq X_0 - \frac{I_0}{p}. \tag{34}$$

Summing up, B will undertake Project 1 when $Q = L$ if

$$X_0 + X_1^L < \frac{I_0 + I_1}{p} \quad \text{and} \quad Y_1^L > X_0 - \frac{I_0}{p}. \tag{35}$$

Given Assumption 1, i.e. $Y_1^L < I_1/p - X_1^L$, the second inequality above implies the first, and there is over-investment if and only if $Y_1^L > X_0 - I_0/p$.

Case 2: $X_0 + X_1^H < I_0/p + I_1/p$ **and** $X_0 \geq I_0/p$**.**

In this case, if B undertakes Project 1, he defaults on his Date-0 debt if $Q = H$ even in the event of success and defaults if $Q = L$ only in the event of failure. Hence, F_0^u is given by the following break-even condition for Date-0 creditors:

$$I_0 = p\left(q\left(X_0 + X_1^H - \frac{I_1}{p}\right) + (1-q)F_0^u\right) \tag{36}$$

so

$$F_0^u = \frac{I_0/p - q\left(X_0 + X_1^H - I_1/p\right)}{1-q}. \tag{37}$$

Note that given $X_0 + X_1^H < I_0/p + I_1/p$, Assumption 2 implies $F_0^u \leq X_0$, so B does not default if $Q = L$. Thus, condition (10) becomes

$$Y_1^L + \max\left\{0\ ,\ X_0 + X_1^L - F_0^u - \frac{I_1}{p}\right\} \leq X_0 - F_0^u. \tag{38}$$

There are two subcases, depending on whether B defaults if B deviates and undertakes Project 1 when $Q = L$ and the projects succeed.

Subcase 2.1: $X_0 + X_1^L \geq F_0^u + I_1/p$.

In that case, B would not default and so would bear the full negative value of Project 1. Hence, he does not undertake Project 1 if $Q = L$.

Subcase 2.2: $X_0 + X_1^L < F_0^u + I_1/p$. In that case, B would default and condition (10) becomes

$$Y_1^L \leq X_0 - F_0^u, \tag{39}$$

which, plugging in for F_0^u, can be rewritten as

$$(1-q)Y_1^L \leq X_0 - \frac{I_0}{p} + q\left(X_1^H - \frac{I_1}{p}\right). \tag{40}$$

Case 3: $X_0 < I_0/p$. In this case, B defaults if $Q = L$ but not if $Q = H$ and the projects succeed. Thus, Date-0 creditors' break-even condition is

$$I_0 = p\big(qF_0^u + (1-q)X_0\big) \tag{41}$$

so

$$F_0^u = \frac{I_0/p - (1-q)X_0}{q}. \tag{42}$$

Note that given $X_0 < I_0/p$ in this case, Assumption 2 implies that $F_0^u + I_1/p \leq X_0 + X_1^H$, so B does not default if $Q = H$ and the projects succeed. In this case B always defaults if $Q = L$. Hence, inequality (10) reduces to $Y_1^L \leq 0$, which is never satisfied.

Date-1 efficiency condition (i.e. expression for Y_1^*). In summary, efficient investment requires that $X_0 - I_0/p \geq 0$ (from Case 3) and that (from Case 1)

$$Y_1^L \leq X_0 - \frac{I_0}{p} \quad \text{if} \quad X_0 + X_1^H - \frac{I_0 + I_1}{p} \geq 0 \tag{43}$$

and (from Case 2)

$$Y_1^L \leq \frac{pX_0 - I_0 + q(pX_1^H - I_1)}{p(1-q)} \quad \text{if} \quad X_0 + X_1^H - \frac{I_0 + I_1}{p} < 0. \tag{44}$$

Taken together, equations (43) and (44) can be written as

$$Y_1^L \leq Y_1^* \equiv \min\left\{X_0 - \frac{I_0}{p}\, ,\, \frac{pX_0 - I_0 + q(pX_1^H - I_1)}{p(1-q)}\right\}. \tag{45}$$

(Note that we can omit the condition that $X_0 \geq I_0/p$, since it is implied by the condition that $Y_1^L \leq X_0 - I_0/p$.)

Date 0 financing. If $Y_1^L \leq Y_1^*$, B follows the efficient investment policy and as such Date-0 creditors are willing to financing him (by Corollary 1). If $Y_1^L > Y_1^*$, then B has incentive to over-invest if $Q = L$. In this case, he renegotiates his debt, negotiating a lower face value $\hat{F}_0^u$ not to invest (i.e. creditors effectively bribe B not to dilute them). Since B has the bargaining power, he offers $\hat{F}_0^u$ so that they break even:

$$p \min\left\{X_0, \hat{F}_0^u\right\} = p \min\left\{X_0 + X_1^L - F_1^s, F_0^u\right\}. \tag{46}$$

Now, since B has incentive to invest if $Q = L$ only to dilute F_0^u, we can simplify the RHS to $p(X_0 + X_1^L - F_1^s)$. This is what Date-0 creditors get if $Q = L$. If $Q = H$, they get $\min\{X_0 + X_1^H - F_1^s, F_0^u\}$. Thus, using $F_1^s = I_1/p$, we can write the Date-0 break-even condition as

$$I_0 \leq p\left(q \min\left\{X_0 + X_1^H - \frac{I_1}{p}, F_0^u\right\} + (1-q)\min\left\{X_0 + X_1^L - \frac{I_1}{p}, F_0^u\right\}\right). \tag{47}$$

This can be satisfied for some F_0^u if and only if it is satisfied for $F_0^u \to \infty$, or

$$I_0 \leq p\left[q\left(X_0 + X_1^H - \frac{I_1}{p}\right) + (1-q)\left(X_0 + X_1^L - \frac{I_1}{p}\right)\right]. \tag{48}$$

Rearranging gives the condition in the proposition. □

A.4 Proof of Proposition 2

Conditions (12) and (13) are clearly sufficient for efficiency, but they are also necessary.

First, if (12) is violated, B's debt capacity is too small for him to be able to "bribe" creditors into funding Project 1. So the no-investment outcome is renegotiation-proof.

Second, if (13) is violated, creditors may be able to "bribe" B into not investing. However, the conditions for this to be possible are determined as in Proposition 1: $Y_1 \leq Y_1^*$. Indeed, Y_1^*'s derivation only invokes the initial debt's face value F_0^u in Proposition 1, which can be replaced with $F_0^s + F_0^u$ here. Thus, for $Y_1 > Y_1^*$, renegotiation is immaterial when $Q = L$.

Immediately from equations (12) and (13), efficiency is implementable whenever there is a face value F_0^s such that

$$X_0 + X_1^L - \frac{I_1}{p} \leq F_0^s < X_0 + X_1^H - \frac{I_1}{p}. \tag{49}$$

The RHS is positive by Assumption 3; hence, F_0^s exists whenever the LHS is less than the RHS, or $X_1^H > X_1^L$, which is the condition in the proposition. □

A.5 Proof of Corollary 2

The baseline result follows from the observation that the inequalities (12) and (13) cannot be satisfied at once if $X_1^L \geq X_1^H$, which is the condition in the corollary (cf. the proof of Proposition 2).

Renegotiation proofness. First, observe that, by hypothesis, the L-quality project cannot be financed, or

$$p\left(X_0 + X_1^L - F_0^s\right) < I_1 \tag{50}$$

and, also by hypothesis, $X_1^H < X_1^L$, so

$$p\left(X_0 + X_1^H - F_0^s\right) < I_1. \tag{51}$$

Now suppose (in anticipation of a contradiction) that B can renegotiate with his creditors to do the H-quality project at Date 1, i.e. that he can reallocate cash flow to make everyone strictly better off (and hence agree to renegotiation). This requires that Date-0 creditors get at least pF_0^s (which they get if they do not renegotiate) and Date-1 creditors get at least I_1 (which they pay to invest). Since B can promise creditors only the pledgeable cash flow, it must be that there is enough pledgeable cash flow to make all creditors better off, or

$$p\left(X_0 + X_1^H\right) > pF_0^s + I_1, \tag{52}$$

which contradicts inequality (51). Hence, renegotiation is not feasible. □

A.6 Proof of Proposition 3

The argument for why the single creditor never accelerates is in the text. Without the acceleration threat, unsecured debt with negative pledge covenants is equivalent to unsecured debt without covenants. Hence, the outcome is that described in Proposition 1. □

A.7 Proof of Proposition 4

The proof result amounts to showing that the conditions written in the text ((18) and (19)) are necessary and sufficient for investment. To do so, we proceed in the following steps:

1. We show that the payoffs in all relevant cases are as in the text:

- We show that the optimal amount the creditor will accelerate is $\hat{F}_0^c := pX_{\text{tot.}} - F_1^s$ (Lemma 2).
- We find the prices/face values of B's debts, which allows us to characterize when he will default/not (Lemma 3).

2. We show that it is without loss of generality to focus on the case in which B cannot repay covenant-protected debt in full at Date 1 (Lemma 4).

   This implies that the conditions (18) and (19) are sufficient for the first best to be implemented.

3. We combine and rearrange the conditions to derive the expression in the proposition.

4. We argue that the conditions are also necessary (under Assumption 5).

5. We show that acceleration is renegotiation proof.

Step 1: Payoffs and face values. We start by noting that if the covenant-protected creditor accelerates and cannot be repaid in full, it is optimal for him to demand repayment for the most B can repay without defaulting.

Lemma 2. *If $pX_{tot.} - F_1^s < F_0^c$, the optimal amount of debt for the covenant-protected creditor to accelerate is $\hat{F}_0^c := pX_{tot.} - F_1^s$.*

Proof. We show that accelerating either more or less leads to a lower payoff for the creditor:

- If the creditor accelerated more than $\hat{F}_0^c$, B could not repay. This would trigger bankruptcy and the debt would be paid pro rata with other unsecured debt at Date 1. The creditor would get $\phi(pX_{\text{tot.}} - F_1^s) < \hat{F}_0^c$.
- If the creditor accelerated less than $\hat{F}_0^c$, say $\tilde{F}_0^c$, B could repay at Date 1. This would not trigger bankruptcy. Its debt would be paid $\tilde{F}_0^c$ at Date 1 as well as a fraction, say $\tilde{\phi} < 1$, of the remaining sale value at Date 2. The creditor would get $\tilde{F}_0^c + \tilde{\phi}(pX_{\text{tot.}} - F_1^s - \tilde{F}_0^c) = (1-\tilde{\phi})\tilde{F}_0^c + \tilde{\phi}(pX_{\text{tot.}} - F_1^s) < pX_{\text{tot.}} - F_1^s \equiv \hat{F}_0^c$ (since $\tilde{F}_0^c < \hat{F}_0^c$ by assumption.

□

Next, observe that if B borrows at Date 1, he always borrows fully secured, to maximize the benefit of dilution. Hence, from Date-1 creditors' break-even condition, the face value of Date-1 debt is

$$F_1^s = \frac{I_1}{p}. \tag{53}$$

Now we write the payoffs in three relevant cases:

1. **B does not borrow at Date 1.** In this case, B repays in full at Date 2 if $X_{\text{tot.}} \geq F_0^u + F_0^c$ and defaults otherwise, in which case creditors are paid pro rata:

   - Unsecured creditors with covenants get $p\min\{\, F_0^c\,,\, \phi X_{\text{tot.}}\}$.
   - Unsecured creditors without covenants get $p\min\{\, F_0^u\,,\, (1-\phi)X_{\text{tot.}}\}$.

2. **B borrows secured at Date 1, but debt is not accelerated.** In this case, B repays in full at Date 2 if $X_{\text{tot.}} \geq F_0^u + F_0^c + F_1^s$ and defaults otherwise, in which case he repays the secured debt first and the unsecured debt pro rata:

   - Secured creditors break even, getting F_1^s with probability p (recall that $F_1^s = I_1/p$ from equation (53)).
   - Unsecured creditors with covenants get $p\min\left\{\, F_0^c\,,\, \phi(X_{\text{tot.}} - F_1^s)\right\}$.
   - Unsecured creditors without covenants get $p\min\left\{\, F_0^u\,,\, (1-\phi)(X_{\text{tot.}} - F_1^s)\right\}$.

3. **B borrows secured at Date 1, and debt is accelerated.** In this case, if $pX_{\text{tot.}} \geq F_0^u + F_0^c + F_1^s$ he can pay all debt in full: at Date 1, he pays F_1^s and F_0^c and, at Date 2, he pays F_0^u. Otherwise, he cannot pay all debt in full; at Date 1, he pays F_1^s first and what he can of F_0^c out of what he has left and, at Date 2, he repays what he can of F_0^u out of what (if anything) he has left:

   - Secured creditors get F_1^s (given $pX_{\text{tot.}} \geq F_1^s$ by Assumption 3).
   - Unsecured creditors with covenants get $\min\{\, F_0^c\,,\, pX_{\text{tot.}} - F_1^s\}$.
   - Unsecured creditors without covenants get the smaller of their face value and the assets remaining after all other creditors have been repayed: $\min\left\{\, F_0^u\,,\, pX_{\text{tot.}} - F_1^s - \min\{\, F_0^c\,,\, pX_{\text{tot.}} - F_1^s\}\,\right\}$.

Lemma 3. *If B follows the first-best policy, then the interest rates on B's Date-0 unsecured debt with and without covenants coincide: letting I_0^c be the amount lent with covenants and $I_0^u = I_0 - I_0^c$ the amount lent without covenants, $F^c/I_0^c = F_0^u/I_0^u$. Hence, $I_0^c = \phi I_0$ and $I_0^u = (1-\phi)I_0$.*

Proof. There are three cases.

Case 1: $p\big(X_0 + X_1^H\big) > I_0 + I_1$ and $pX_0 \geq I_0$. In this case, all debt is repaid in full in the event of success and repaid nothing otherwise. Thus, $F_0^c = I_0^c/p$ and $F_0^u = I_0^u/p$. Now using that $\phi \equiv \frac{F_0^c}{F_0^c + F_0^u}$ and $I_0^c + I_0^u = I_0$, we find that $I_0^c = \phi I_0$ and $I_0^u = (1-\phi)I_0$.

Case 2: $p(X_0 + X_1^H) < I_0 + I_1$ **and** $pX_0 \geq I_0$**.** In this case, B defaults following success if $Q = H$, but not if $Q = L$. Creditors' break-even conditions are

$$I_0^c = p\left(q\phi\left(X_0 + X_1^H - \frac{I_1}{p}\right) + (1-q)F_0^c\right), \tag{54}$$

$$I_0^u = p\left(q(1-\phi)\left(X_0 + X_1^H - \frac{I_1}{p}\right) + (1-q)F_0^u\right), \tag{55}$$

having used $F_1^s = I_1/p$. Now using that $\phi \equiv \frac{F_0^c}{F_0^c+F_0^u}$ and $I_0^c + I_0^u = I_0$ and solving for I_0^c and I_0^u above gives the result.

Case 3: $pX_0 < I_0$**.** In this case, B defaults given success if $Q = L$, but not if $Q = H$.

$$I_0^c = p\Big(qF_0^c + (1-q)\phi X_0\Big), \tag{56}$$

$$I_0^u = p\Big(q(1-\phi)F_0^u + (1-q)(1-\phi)X_0\Big). \tag{57}$$

Again using that $\phi \equiv \frac{F_0^c}{F_0^c+F_0^u}$ and $I_0^c + I_0^u = I_0$ and solving for I_0^c and I_0^u above gives the result.

□

Step 1: Simplifying to the case in which there is dilution. The next lemma says that the condition for debt not to be accelerated does not depend on whether B can repay accelerated debt in full.

Lemma 4. *Suppose new debt dilutes existing debt, i.e.*

$$X_{\text{tot.}} - F_1^s < F_0^c + F_0^u. \tag{58}$$

The following two inequalities are equivalent:

$$pX_{\text{tot.}} - F_1^s \leq \phi p\big(X_{\text{tot.}} - F_1^s\big) \tag{59}$$

and

$$\min\left\{F_0^c\,,\, pX_{\text{tot.}} - F_1^s\right\} \leq \phi p\big(X_{\text{tot.}} - F_1^s\big). \tag{60}$$

Proof. The "if" part (that equation (59) implies (60)) follows immediately from the definition of the minimum.

The "only if" part (that equation (60) implies (59)) follows from supposing (in anticipation of a contradiction) that equation (60) holds and equation (59) does not. Thus, it must be that $F_0^c < pX_{\text{tot.}} - F_1^s$, so equation (60) reads

$$F_0^c \leq \phi p(X_{\text{tot.}} - F_1^s). \tag{61}$$

Substituting $F_0^c = \phi(F_0^c + F_0^u)$, this reads

$$F_0^c + F_0^u \leq p(X_{\text{tot.}} - F_1^s), \tag{62}$$

which contradicts equation (58). Hence, we conclude that $F_0^c \geq pX_{\text{tot.}} - F_1^s$, in which case we have that $\min\{F_0^c, pX_{\text{tot.}} - F_1^s\} = pX_{\text{tot.}} - F_1^s$, so equation (60) becomes equation (59), as desired. □

Step 3: Rearranging to find the condition $X_1^H \leq X_1^L$. The last lemma implies, as per footnote 24, that the equations in the text (equations (18) and (19)) are sufficient for efficient investment. Solving for ϕ and rearranging these conditions give

$$\frac{p\big(X_0 + X_1^H\big) - I_1/p}{p\big(X_0 + X_1^H - I_1/p\big)} \leq \phi \leq \frac{p\big(X_0 + X_1^L\big) - I_1/p}{p\big(X_0 + X_1^L - I_1/p\big)}. \tag{63}$$

Since the LHS is always less than one and the RHS is greater than zero by Assumption 3, such a ϕ exists whenever the LHS is less than the RHS, which simplifies to $X_1^H \leq X_1^L$, the condition in the proposition.

Step 4: Necessity. The conditions above (equation (18) and (19) are also necessary, per the same reasoning as for conditions (12) and (13) in the proof of Proposition 2: (18) is necessary because it says B's debt capacity is sufficient, and (13) is necessary because if it is violated, $Y_1 > Y_1^*$ ensures renegotiation is immaterial when $Q = L$.

Step 5: Renegotiation proofness. This argument hinges on acceleration being a credible threat when $Q = L$, even though the asset sale is inefficient. To complete the proof, we show that this is robust to the possibility of renegotiation. For renegotiation to be feasible, all parties—i.e. (i) B, (ii) Date-1 secured creditors, (iii) covenant-protected Date-0 creditors, and (iv) other Date-0 creditors—must be strictly better off. However, if B avoids the asset sale and continues, the most he can promise his creditors is $p(X_0 + X_1^L)$. But this is only equal to the sale value that creditors are already dividing up among themselves. Hence, there is no way to make them collectively better off.

A.8 Proof of Proposition 5

The expression face value F_0 follows from equations (32), (37), and (42) in the proof of Proposition 1. The regions in which B uses secured debt or covenants follow from Proposition

2 and Proposition 4 (and their proofs).

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