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, as in practice, covenants convey the right to accelerate if violated, but that the new secured debt retains its priority even if issued in violation of covenants. We find that such covenants are useful nonetheless: they provide state-contingent financing flexibility, balancing over- and under-investment incentives. The optimal debt structure is multi-layered, combining secured and unsecured debt with and without covenants. Our results are consistent with observations about debt structure, covenant violations, and waivers. They speak to a policy debate about debt priority.

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1 Introduction

Firms finance themselves mainly with debt, often combining different types of debt,[1] some with stronger priority rights than others. Notably, secured debt has absolute priority over assets used as collateral.[2] Creditors are therefore vulnerable to dilution by future secured debt issuance. One defense against dilution is secured debt itself: its absolute priority prevents new debt from taking priority. Another defense is so-called negative pledge covenants which, if violated by a secured debt issuance, convey the right to accelerate payment.[3]

Such anti-dilution covenants are no substitute for collateral, however, as new secured debt retains its priority even if issued in violation of covenants. Thus lawyers, pointing to their weakness, advise against relying on them.[4] Yet, many firms employ unsecured debt and negative pledge covenants even when collateral is available.[5] Why? What determines the mix of secured and unsecured debt with and without negative pledge covenants?

To address these questions, we develop a model in which collateral serves to establish priority among different debt claims, overriding any covenants in place. That power of property rights (collateral) to override contractual rights (covenants) is central to our theory. Yet, despite being a good approximation of the law, it is all but absent from the finance literature (the lone exception being Ayotte and Bolton (2011)).

In the model, a borrower chooses his debt structure to manage a trade-off between financial commitment and flexibility. By issuing secured debt, he commits not to dilute it in the future, which can prevent over-investment. But, without the flexibility to dilute, he might be unable to take on new debt, which can cause under-investment. We show how debt structures combining secured and unsecured debt with and without covenants can be used to manage the trade-off between over- and under-investment—they can block "bad," but allow "good dilution." Our results are consistent with several observations about debt structure, including covenant violations and waivers. They also speak to a debate about the efficiency of current priority rules.

[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] In Billett, King, and Mauer's (2007) sample, negative pledge covenants are the fourth most common covenants, included in 44% of 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)).

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

Model preview. A borrower, B, has two risky projects. Project 0's value is positive; Project 1's, revealed after Project 0 is underway, can be positive or negative. Once underway, projects can be liquidated, at a private cost to B.

B must raise funds from creditors. He issues debt to finance Project 0 and, later, possibly more debt to finance Project 1. Financing is subject to two frictions. First, pledgeability is limited in that projects' values comprise not only cash flow, which can be pledged to creditors, but also private benefits, which cannot. Second, contracts are non-exclusive in that contracting with one creditor cannot prevent contracting with another.

These frictions lead to distinct roles for covenants and collateral. Negative pledge covenants are promises not to take on new secured debt. If the promise is broken by a secured debt issuance, the debt contracts are in conflict: upholding one is violating the other. We assume that collateral resolves such conflicts by establishing priority: debt secured by collateral trumps other debt, including debt protected by covenants. Covenant-protected debt has one defense against such dilution: the right to accelerate, but even in this case, the new secured debt retains its priority.

Results preview. Our first set of results (Proposition 1 and Proposition 2) characterizes when B invests efficiently in Project 1 if he finances Project 0 via only unsecured and/or secured debt. A tension exists between over- and under-investment. On the one hand, unsecured debt breeds over-investment when Project 1's value is negative. Indeed, due to non-exclusivity, B can finance Project 1 with secured debt, thereby transferring its cost onto existing unsecured creditors while capturing its private benefits. Thus, dilution by new secured debt can be "bad." On the other hand, financing Project 0 via secured debt alone breeds under-investment in Project 1 when its value is positive. The reason is that, due to limited pledgeability, Project 1's cost could be less than the debt capacity it creates (its expected cash flow) even if its value (private benefits included) is positive; as a result, diluting existing debt could be necessary to finance it. Thus, dilution can be "good," and preventing it via secured debt could cause under-investment, i.e. a "collateral-overhang" problem as in Donaldson, Gromb, and Piacentino (2020a). We show that a suitable mix of unsecured and secured debt can foster efficient investment if and only if the under-investment problem is "mild" relative to the over-investment problem, in the sense that positive-value projects have a smaller financing shortfall than negative-value ones. If so, indeed, secured debt can be set at a level that reduces B's borrowing capacity sufficiently to prevent investment if Project 1's value is negative while leaving it sufficient to finance Project 1 if its value is positive.

Our second set of results characterizes when B invests efficiently in Project 1 if he finances Project 0 via only unsecured debt with and without negative pledge covenants. A priori, covenants could deter dilution via the threat of acceleration and the costly liquidation it can imply. However, we find a negative result (Proposition 3): if all debt is covenant protected, the acceleration threat is not credible—the covenant has no teeth (subject to a condition on outstanding debt). Acceleration is unattractive as it not only fails to undo dilution by new secured debt, but can even subsidize it: by forcing risky projects to be liquidated, it reduces their risk which benefits secured debt.

We next show that with less covenant-protected debt and more unprotected debt, the threat can be credible (Proposition 4). The reason is that the acceleration of protected debt dilutes the value of the unprotected debt due later on. We show that a suitable mix of unsecured debt with and without covenants can foster efficient investment whenever unsecured and secured debt cannot, namely whenever the under-investment problem is "severe," in that positive-value projects have a larger financing shortfall than negative-value projects. In this case, positive-value projects create less cash flow for accelerating creditors to seize. Thus covenants are waived to allow investment in them, but upheld to prevent investment in negative-value projects. In sum, we show that anti-dilution covenants and collateral each have a role to play, despite covenants' weakness.

Finally we characterize the equilibrium debt structure (Proposition 5): it involves secured and unsecured debt with and without covenants. Covenants are sometimes violated, and when they are, they are waived: the acceleration is "off path." This rationalizes why covenants exist despite being rarely enforced and suggests that collateral and covenants are complementary tools in managing agency problems. The debt structure is consistent with several stylized facts, including that (i) well-capitalized firms, which are unlikely to dilute existing debt, rely heavily on unsecured debt, whereas other firms (ii) use a mix of 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, and (vii) have less financial flexibility when they have more secured debt; see Section 5.1.

The results also speak to the policy debate around the strong priority of secured debt (Bebchuk and Fried (1996)).[6] They suggest a counter-argument to the concerns that it harms unsecured debt, as borrowers in our model choose a debt structure to commit not to engage in bad dilution, while maintaining the flexibility to engage in good dilution. (Creditors, meanwhile, are compensated fairly for dilution risk.)

Literature. We add to the large finance theory literature on debt structure.[7] In most of

[6]Other legal studies on secured debt and priority include Bebchuk and Fried (1996), Hansmann and Kraakman (2002), Hansmann and Santilli (1997), Kronman and Jackson (1979), Schwarcz (1997), and Schwartz (1984, 1994, 1997)); papers on contracting subject to legal rules include Aghion and Hermalin (1990), Gennaioli (2006), and Ravid et al. (2015).

[7]For more on collateral, see, e.g., Bester (1985), Eisfeldt and Rampini (2009), Hart and Moore (1994,

that literature, covenants and collateral mitigate conflicts between borrowers and creditors; in our paper, they mitigate conflicts among creditors, as in DeMarzo (2019), Donaldson, Gromb, and Piacentino (2020a, 2020b), Longhofer and Santos (2003), and Stulz and Johnson (1985). Collateral mitigates conflicts between creditors and derivatives holders in Bolton and Oehmke (2015) and between creditors and asset buyers in Donaldson, Gromb, and Piacentino (2021). In Attar et al. (2019b), covenants not only mitigate conflicts among creditors, but facilitate collusion among them.[8]

The spirit of our paper in which "hard claims" are chosen to constrain investment, but could constrain it too much, follows Hart and Moore (1995), in which debt and equity are chosen to control an empire-building manager. We show how different claims—covenants and collateral—emerge as complementary ways to manage the over-/under-investment trade-off. We show that, unlike those in Hart and Moore (1995), these claims are effective even when they can be freely renegotiated.

Ayotte and Bolton's (2011) paper, the closest to ours, also studies negative pledge covenants. Like ours, it analyzes how property/priority rights affect investment, and rationalizes aspects of current law. We go a step further by considering efficient dilution, rationalizing covenant violations and waivers, and studying acceleration and renegotiation.

Layout. Section 2 presents the model, Section 3 the results, and Section 4 extensions. Section 5 discusses related evidence, new predictions, and other implications. Section 6 concludes. All proofs are in the Appendix.

2 Model

We develop a three-date model, $t \in \{0, 1, 2\}$, of a borrower B funding two projects sequentially. There is universal risk neutrality, limited liability, and no discounting.

2.1 Projects

B is penniless but has two projects: Project 0 at Date 0 and Project 1 at Date 1. Project 0 costs I_0 at Date 0 and pays off at Date 2: with probability p it succeeds and yields cash flow

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, e.g., Bolton and Scharfstein (1996), Gennaioli and Rossi (2013), and Gertner and Scharfstein (1991).

[8] 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).

$X_0 > 0$ and private benefit $Y_0 > 0$; otherwise, it fails and pays nothing. Its value is positive:

$$p\big(X_0 + Y_0\big) > I_0. \tag{1}$$

Project 1 costs I_1 at Date 1 and pays off at Date 2: with probability p, it succeeds and yields cash flow $X_1^Q > 0$ and private benefit $Y_1^Q > 0$, which depend on its quality $Q \in \{H, L\}$; otherwise it fails and pays nothing.Quality Q is revealed at Date 1, with $\mathbb{P}[Q = H] =: q$. The project has positive value if and only if its quality is high:

$$p\big(X_1^H + Y_1^H\big) > I_1 > p\big(X_1^L + Y_1^L\big). \tag{2}$$

We assume, for simplicity, that the two projects are perfectly correlated: both succeed or both fail; e.g., Project 1 could be an extension of Project 0.[9,10]

Projects can be liquidated at Date 1 for their expected cash flow $p(\mathbb{1}_0 X_0 + \mathbb{1}_1 X_1^Q)$ with $\mathbb{1}_t := 1$ if Project t is undertaken, $\mathbb{1}_t := 0$ otherwise. This is what competitive buyers would bid for the projects if, as assumed below, only B enjoys Y_t. (We abstract from partial and random liquidation for simplicity only.)

2.2 Financing

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

1. *Limited pledgeability:* B cannot transfer more than the projects' cash flow to creditors, i.e. he cannot pledge private benefits.[11]

2. *Non-exclusive contracting:* B's contract with initial creditors at Date 0 cannot prevent or constrain new contracts with other creditors at Date 1.

Non-exclusivity does not mean that B's contract with initial creditors cannot contain a covenant not to enter new contracts with other creditors, but only that such covenants can always be violated. Although punishments for such violations could establish effective exclusivity, they are limited by limited pledgeability. In that sense, non-exclusivity can be seen as deriving from limited pledgeability.[12]

[9] This assumption simplifies the analysis by reducing the number of outcomes (see, however, Section B.2).

[10] Under this interpretation, I_1 can also represent a "liquidity shock" that must be paid to preserve the value of a single project.

[11] Private benefits can be linked to control (Aghion and Bolton (1992), Grossman and Hart (1988)) and can also capture output B diverts or opportunities created by the project but out of the legal reach of creditors. They can also be mapped explicitly to cash diversion models: with $X_1^L = 0$, undertaking the negative-value project can be interpreted as diverting I_1 to get Y_1^L at deadweight cost $I_1 - Y_1^L$.

[12] Other foundations for non-exclusivity are possible. One is imperfect information. That is not suitable here, as we assume that all contracts, and covenant violations in particular, are observable.

Instruments. We focus on three financing instruments.

1. *Secured debt* is a promise to pay a fixed face value at Date 2 with projects as collateral. (The role of collateral is determined by the priority rules described below.)

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

3. *Unsecured debt with negative pledge covenants* (hereinafter "covenant-protected debt") is like unsecured debt but also conveys the right to accelerate if B takes on new secured debt, i.e. to demand payment at Date 1 of part or all of the face value.[13] Covenants can be waived both ex post and ex ante, i.e. creditors can opt not to accelerate after a violation or to give up their right to in anticipation of one.

We show that focusing on these claims is without loss in the sense that no agent can benefit from other claims being introduced. We also assume that a single creditor holds all unsecured debt with negative pledge covenants. This turns out to be optimal ex ante, hence also without loss, and allows us to bypass creditor coordination issues (e.g., runs and hold-outs).[14]

Priority rules. Given non-exclusivity, B can enter into conflicting contracts with different creditors, e.g., can violate covenants. The following priority rules resolve such conflicts:

1. *Secured debt has priority over unsecured debt:* unsecured debt is not paid unless secured debt is paid in full.

2. *Secured debt issued earlier has priority over that issued later:* secured debt taken at Date 1 is not paid unless that taken at Date 0 is paid in full.

3. Unsecured debt (with or without covenants) due earlier has priority over that due later: unsecured debt due at Date 2 is not paid unless that due at Date 1 (possibly due to acceleration) is paid in full.

We assume that in the event that not all claims are satisfied at a given date—a "payment default"—all debt is accelerated and paid according to priority. If so, all unsecured debt becomes due at the same time and is, thus, pari passu.

These rules reflect practice.[15] Moreover, in conjunction with the available instruments, they are (weakly) optimal in our model (Proposition 5).

[13] Section B.1 studies the case in which they can only demand payment of none or all of the face value.

[14] This captures the case of a lender holding a large stake or that of multiple lenders coordinating to waive covenants, e.g., via collective action clauses, secondary market trading, or active cooperation. Indeed, even for public firms' bonds, covenants can be and are often modified by simple majority vote (Bratton (2006), Kahan and Tuckman (1993)). More generally, coordination among dispersed bondholders does not seem to delay restructuring (Helwege (1999)).

[15] See, e.g., Hahn (2010), Merrill and Smith (2001), and Schwartz (1989).

2.3 Timeline and Solution Concept

To sum up, the sequence of moves is as follows. At Date 0, B chooses whether and how to fund Project 0 from competitive creditors.[16] At Date 1, sequentially, (i) the quality Q is revealed; (ii) B funds Project 1 from competitive creditors or does not; (iii) if a covenant is violated, covenant-protected creditors choose a fraction of their debt to accelerate; and (iv) debt, if due, is paid in full or projects are liquidated and debt is paid according to priority. At Date 2, (i) projects, if not liquidated, succeed or fail (together) and (ii) debt, if due, is paid according to priority. Additionally, contracts can be renegotiated if B and all his creditors can be made strictly better off at any time. We assume, for simplicity, that B has the bargaining power in such renegotiations. (Section 4.1 discusses renegotiation by sub-coalitions of parties.)

We solve for the subgame perfect equilibrium.

2.4 Assumptions

We make three assumptions. The first two are parameter restrictions.

Assumption 1. *If B undertakes Project 0 and undertakes Project 1 only if it is efficient (when $Q = H$), then expected cash flows exceed funding needs:*

$$pX_0 - I_0 + q\big(pX_1^H - I_1\big) \geq 0. \tag{3}$$

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

Assumption 2. *Irrespective of Project 1's quality, the expected cash flow of both projects exceeds the face value needed to finance Project 1, i.e. for $Q \in \{H, L\}$,*

$$p\big(X_0 + X_1^Q\big) > \frac{I_1}{p}. \tag{4}$$

Thus the projects' liquidation value suffices to repay the secured debt needed to finance Project 1.

We also assume the following behavior for B, shown later to be without loss.[17]

Assumption 3. *To finance Project 1 at Date 1, B borrows secured and raises exactly I_1.*

[16] We assume that if B funds Project 0, he borrows exactly I_0, which we later show to be (weakly) optimal (Proposition 5).

[17] Section 4.1 relaxes Assumption 3 and shows it merely imposes restrictions on B's behavior that he would otherwise choose to adopt, and can impose with realistic instruments we abstract from in the baseline model.

2.5 First Best Policy

The first best policy is to undertake a project if and only if it has positive value and never to liquidate (which destroys private benefits):

Lemma 1. *The first-best policy is to undertake Project 0, to undertake Project 1 if and only if $Q = H$, and not to liquidate at Date 1.*

3 Results

We study whether the first-best can obtain via a suitable debt structure at Date 0. Limited pledgeability and non-exclusivity both present potential impediments. These frictions create a tension between the need to do "good dilution" to loosen financial constraints stemming from limited pledgeability and the temptation to do "bad dilution" made possible by non-exclusivity.

Although we have to analyze each case to solve for the equilibrium, the tension can be illustrated in general. As Project 1's value includes not only cash flow, which is pledgeable, but also private benefits, which are not, funding could require pledging some unencumbered cash flow from Project 0, possibly expropriating value from existing creditors. That could be good if it creates new debt capacity to fund investment if $Q = H$ (good dilution) but bad if it creates the temptation to invest even if $Q = L$ (bad dilution).

3.1 Unsecured Debt

We first study when the first best can be implemented by borrowing solely unsecured at Date 0.

Say B funded Project 0 at Date 0 with unsecured debt with face value F_0^u. At Date 1, B can pledge all cash flows—from Project 0 and Project 1—to new secured creditors, possibly diluting existing unsecured debt. B's debt capacity is thus $p\big(X_0 + X_1^Q\big)$ and funding Project 1 is feasible provided it covers I_1, which it does by Assumption 2. Under-investment is thus not a concern: unsecured debt at Date 0, which can be diluted at Date 1, ensures that B has enough debt capacity to invest if $Q = H$, i.e. it allows good dilution.[18]

But, by the same token, unsecured debt might allow bad dilution, leading to possible over-investment. The following proposition characterizes when the first best obtains nonetheless.

[18]In Stulz and Johnson (1985), diluting unsecured debt with new secured debt relaxes a debt-overhang problem (Myers (1977)), thus improving investment efficiency. Here, instead, dilution loosens financial constraints. Moreover, here, renegotiation does not remove the need for dilution whereas it would there.

Proposition 1. (Unsecured debt) *Define*

$$Y_1^* := \min\left\{X_0 - \frac{I_0}{p}\,,\, X_0 - \frac{I_0}{p} + \frac{q}{1-q}\Big(X_0 - \frac{I_0}{p} + X_1^H - \frac{I_1}{p}\Big)\right\}. \tag{5}$$

The first-best is implementable via unsecured debt without covenants at Date 0 if and only if

$$Y_1^L \leq Y_1^* \quad \text{or} \quad p\Big(X_0 + qX_1^H + (1-q)X_1^L\Big) \geq I_0 + I_1. \tag{6}$$

Here is the idea. The first inequality says that private benefit Y_1^L is too small to tempt B into a negative NPV investment. If instead $Y_1^L > Y_1^*$, B is tempted to over-invest but his existing unsecured creditors will renegotiate their debt to "bribe" him not to. The second inequality says that, despite the anticipated bribe, they are still willing to lend at Date 0. If neither holds, unsecured debt financing is infeasible as paying the bribe when $Q = L$ at Date 1 is so costly for creditors that funding Project 0 is infeasible at Date 0. We focus on this case from now on:

Assumption 4. *Unsecured debt cannot implement the first-best: condition (6) is violated.*

3.2 Secured Debt

We now ask when the first best can be implemented by borrowing via a mix of secured and unsecured debt at Date 0.

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

$$X_1^L \leq X_1^H. \tag{7}$$

Here is the idea. At Date 1, B can promise new secured creditors all but only cash flows not already promised to secured debt at Date 0. This dilutes existing unsecured debt, but not existing secured debt. Date-1 financing is thus feasible as long as

$$p\big(X_0 + X_1^Q - F_0^s\big) \geq I_1, \tag{8}$$

where F_0^s is the face value of the secured debt taken at Date 0.

The first best is implemented if and only if financing is feasible when it is efficient, and not when it is not, or, said differently, when good dilution is possible but bad dilution is not, i.e. when inequality (8) holds if $Q = H$ but not if $Q = L$. That can happen for some amount of secured debt F_0^s when the LHS of the inequality is larger for a high-quality project than a low-quality one or, per condition (7), when $X_1^H \geq X_1^L$.

That condition can be interpreted as the under-investment problem being relatively "mild," in the sense that the financing shortfall is smaller for positive-value projects than negative-value projects. Otherwise, the under-investment problem is relatively "severe," and secured and unsecured debt cannot implement the first-best. Indeed, any level of secured debt preventing investment when $Q = L$ would do so too when $Q = H$. (This is the "collateral overhang problem" in Donaldson, Gromb, and Piacentino (2020a).)

3.3 Negative Pledge Covenants

We now ask when the first best can be implemented by borrowing at Date 0 via a mix of unsecured debt with and without negative pledge covenants. If B issues new secured debt at Date 1, the covenant-protected creditor can accelerate. Although that does not undo dilution, as the new secured debt retains its priority, it forces liquidation, which destroys B's private benefits.[19] Thus the acceleration threat has the potential to deter (over-)investment. Yet we find that too much covenant protection can be self-defeating.

Proposition 3. (Covenant irrelevance) *Suppose B financed Project 0 at Date 0 via unsecured debt with face value F_0^u, a fraction ϕ of which is covenant-protected, and that $Q = L$ at Date 1.*

- *If $X_0 + X_1^L \geq F_0^u + I_1/p$, B will not finance Project 1 irrespective of whether this would trigger acceleration, i.e. the outcome is the same as for $\phi = 0$.*
- *Otherwise, financing Project 1 triggers acceleration if and only if $\phi \leq \phi^*$ with*

$$\phi^* := 1 - \frac{(1-p)I_1/p}{p(X_0 + X_1^L - I_1/p)} \in (0,1)\,. \tag{9}$$

Here is the idea. There is no dilution if $X_0 + X_1^L \geq F_0^u + F_1^s$, where $F_1^s = I_1/p$ is the face value of (secured) debt used to finance Project 1. In that case, covenants have no bite, as B would bear the costs of investment and therefore have no incentive to invest in a negative-value project anyway. That is the first part of the proposition. The second part says that if

[19] This is reminiscent of the disciplining role of demand deposits in the banking literature (notably, Calomiris and Kahn (1991) and Diamond and Rajan (2001)) and of short-term debt more broadly (e.g., Bolton and Scharfstein (1990)). One distinction is that here covenant-protected debt can be accelerated only in the event of a covenant violation. Moreover, the threat is credible only if some debt is not covenant-protected (per Proposition 3).

there is dilution, they have bite only if the proportion of covenant-protected debt ϕ is small enough. To see why, consider the cost and benefit of acceleration in this case:

- The cost is the subsidization of secured debt. Indeed, acceleration forces liquidation, leading secured debt F_1^s, which retains its priority, to get paid with probability 1 rather than p. The secured debt's gain is thus $(1-p)F_1^s$.[20]
- The benefit is the dilution of the unprotected unsecured debt. Absent acceleration, that debt shares cash flows net of secured debt payment with the covenant-protected debt, so its payoff is $(1-\phi)p(X_0+X_1^L-F_1^s)$. Under acceleration, it would get nothing since the other debts get paid all cash flows at Date 1, so acceleration implies a loss to unprotected unsecured debt of $(1-\phi)p(X_0+X_1^L-F_1^s)$.[21]

Since it leaves the expected cash flows unaffected, liquidation is a zero sum game among creditors. Thus, acceleration benefits the covenant-protected debt if the unprotected unsecured debt's loss exceeds the secured debt's gain, which amounts to $\phi \leq \phi^*$.[22]

Note that for $\phi = 1$ acceleration has no benefit. But for a smaller fraction ϕ, the benefit could outweigh the cost, making the threat credible. Hence we ask whether a ϕ exists that can implement the first best.

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

$$X_1^L \geq X_1^H. \tag{10}$$

This condition is also necessary if, additionally, $p(X_0 + X_1^H) - I_1 < \bar{F}_0^u$*, with* $\bar{F}_0^u$ *defined as the unique solution to* $I_0 = qz + (1-q)p\min\{X_0, z\}$*.*

Here is the idea. Unless debt is renegotiated, implementing the first best requires the threat to be credible if $Q = L$ but not if $Q = H$. That way, B will not violate the covenant

[20]This expression makes use of Assumption 2, which implies that liquidation proceeds suffice to repay secured debt in full, or $p(X_0+X_1^Q) > F_1^s$. If the assumption were violated, secured debt would get everything after liquidation and accelerated debt nothing, rendering the acceleration threat non-credible. In that case, covenants would again be irrelevant. See Section 4.1 for a discussion of how other instruments could have a role to play in such cases.

[21]This assumes that the covenant-protected creditor accelerates exactly $p(X_0 + X_1^Q) - F_1^s$, which can be repaid from the liquidation proceeds, rather than accelerating all of its debt, which would trigger bankruptcy, thus accelerating other unsecured debt. (Section B.1 considers an extension in which acceleration necessarily triggers bankruptcy.)

[22] That acceleration is most attractive for low ϕ contrasts with Gennaioli and Rossi's (2013) result that liquidation bias is strongest when a controlling creditor's share is high. The difference comes from the fact that their controlling creditor is senior/secured, and hence has the most to gain from liquidation.

to invest in negative-value projects, knowing it will be upheld, but does to invest in positive-value ones, knowing it will be waived.[23] As the cost of accelerating is $(1-p)F_1^s$ no matter Q, the benefit $(1-\phi)p(X_0+X_1^Q)$ must be greater for $Q=L$ than $Q=H$. That is ensured by the condition $X_1^L \geq X_1^H$, which says, intuitively, that there is more to grab if $Q=L$ than $Q=H$, so the covenant-protected creditor has a stronger incentive to accelerate and get it ahead of other unsecured creditors. This corresponds to the under-investment problem being "severe," in the sense that positive-value projects have a relatively larger financing shortfall than negative-value projects.

Sometimes, B can also implement the first best with renegotiation when $Q=H$, i.e. B "bribes" the creditors into not accelerating. The condition in the proposition that $p(X_0+X_1^H)-I_1$ be small enough ensures B does not have sufficient financial slack to do so (analogously to Proposition 1).

3.4 Optimal Debt Structure

Our analysis implies that a debt structure always exists that implements the first best. What instruments are effective depends on the projects. Collateral is optimal if positive-value projects have higher cash flows than negative-value projects ($X_1^H \geq X_1^L$); covenants otherwise.

Proposition 5. **(Debt structure)** *The equilibrium policy is first-best efficient. There are values F_0, F_0^s, and ϕ such that the policy can be implemented as follows.*

At Date 0, B finances Project 0 by borrowing I_0 with the following debt structure.

- *If Assumption 4 is violated, the debt is unsecured without covenants with face value F_0.*
- *Otherwise,*
  - *if $X_1^H > X_1^L$, the debt is a mix of secured and unsecured debt without covenants with face values F_0^s and $F_0 - F_0^s$;*
  - *if $X_1^H \leq X_1^L$, the debt is a mix of unsecured debt with and without covenants, with face values ϕF_0 and $(1-\phi)F_0$.*

At Date 1:

[23] 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.

- *If $Q = H$, negative pledge covenants, if any, are waived and B finances Project 1 by borrowing I_1 via secured debt with face value I_1/p.*
- *If $Q = L$, B does not finance Project 1.*

The optimal debt structure can be understood as follows. Limited pledgeability reduces debt capacity, which sometimes leads to under-investment when $Q = H$. If it does not, B can rely on unsecured debt without covenants. If it does, B must overcome the under-investment problem via a multi-layered debt structure that depends on the problem's severity: if the problem is mild, B mixes secured and unsecured debt; if it is severe, he mixes unsecured debt with and without covenants. Either way, he invests in Project 1 when $Q = H$, financed by secured debt that dilutes debt in place. Thus covenants implement efficiency only in concert with collateral. Although they are needed to promise not to use collateral when dilution is inefficient, collateral is needed to break that promise and engage in "good dilution."

This result suggests a role for observed priority rules: they allow debt to be structured so as to implement an efficient investment policy by permitting borrowers to dilute unsecured debt when, but only when, needed to overcome financial constraints that would otherwise frustrate efficient investment.

4 Extensions

4.1 Other Instruments

Our baseline model considers secured debt and unsecured debt with and without covenants. These three claims suffice to achieve the first best. However, variations of the model can suggest a rationale for other types of debt that arise in practice.

1. **Secured debt with covenants** arises if we relax the assumption that B raises exactly I_1 at Date 1 (Assumption 3). It allows B to commit not to borrow more than I_1 at Date 1, per the baseline, which is indeed optimal (Proposition 5). To see why, suppose B issues 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 threat is credible as the covenant-protected secured creditors are paid for sure in the event of acceleration (per the argument in Section 3.3). Thus, B prefers not to violate the covenant to avoid acceleration and the liquidation it implies.

2. **Unsecured debt with covenants limiting unsecured debt** arises if we relax the assumption that any Date-1 borrowing must be secured (Assumption 3). It allows

B to commit not to borrow unsecured at Date 1, per the baseline, which is indeed optimal (Proposition 5). To see why, suppose B finances Project 0 with such covenant-protected unsecured debt. If B takes on unsecured debt at Date 1, the covenant-protected creditor will accelerate its debt and be paid in full—in that sense, acceleration does undo dilution by unsecured debt—so acceleration at Date 1 is always attractive, and B prefers to issue secured debt at Date 1.

3. **Intercreditor agreements** (among different types of debt in the same issuance) arise if we relax the assumption that renegotiation must make all parties better off, i.e. if we allow B to renegotiate with some creditors at the expense of others.[24] Such renegotiation could undermine the acceleration threat, since B could offer the covenant-protected creditor collateral as a bribe not to accelerate, allowing it to be paid ahead of other unsecured debt without forcing liquidation.[25] Hence B would like creditors to commit not to engage in such renegotiation (Proposition 5). To do so, B can include an intercreditor agreement in its Date-0 issuance specifying that one creditor cannot change its claim without consent of the others. This deters new debt at Date 1.

4. **Subordinated debt**, with priority below other unsecured debt, arises if we relax the assumption that there are only two qualities. It allows B to finance "very high quality projects" without violating covenants, while preserving the baseline outcome for high- and low-quality ones, which is optimal (Proposition 5). To see why, assume an additional project quality $Q = HH$, which is self-financing, i.e. $pX_1^{HH} > I_1$. Such a project could be financed by issuing subordinated debt without harming existing debt. But, due to the dilution benefits of acceleration (Section 3.3), it could still lead to acceleration if the issuance violates a covenant. That could deter efficient investment. Thus a covenant prohibiting all but subordinated debt could be preferable.

4.2 Continuum of Qualities

We have shown secured (resp. covenant-protected) debt to be optimal when the under-investment problem is relatively mild (resp. severe), i.e. when positive-value projects are more (resp. less) pledgeable than negative-value projects. Here we show, under some simplifying assumptions, that these results are robust to including more than two qualities under a condition on the distribution of qualities. We then show that when the condition is violated not even a mix of secured and covenant-protected debt can implement the first best.

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

[25] 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) $p(X_0 + X_1^Q - F_1^s)$, which exceeds his payoff from acceleration of $p(X_0 + X_1^Q) - F_1^s$.

Suppose Project 1 has a continuum of possible qualities Q, with the value of a project with quality Q given by $p(X_1^Q + Y_1^Q) - I_1$. For simplicity, we assume that (i) there is no renegotiation and (ii) covenant-protected debt is never paid in full after being diluted with secured debt. From Section 3.2, we know that for a given level of secured debt F_0^s, B can fund Project 1 if

$$X_1^Q \geq \frac{I_1}{p} - (X_0 - F_0^s) =: X_1^{Q^s} \tag{11}$$

and, from Section 3.3, that for a given fraction ϕ of unsecured debt with covenants, B can fund Project 1 if

$$X_1^Q < \frac{1 - p\phi}{p(1-\phi)} F_1^s - X_0 =: X_1^{Q^c} \tag{12}$$

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

That says that B can commit to do only projects with $X_1^Q \geq X^{Q^s}$ via secured debt and only those with $X_1^Q \leq X^{Q^c}$ via covenants. So if every positive-value project has higher X_1^Q than any negative-value one, then the first best is implemented via secured debt with F_0^s chosen so $p(X_1^{Q^s} + Y_1^{Q^s}) = I_1$; likewise, if every positive-value project has lower X_1^Q than any negative-value one, then the first best is implemented via a fraction ϕ of covenant-protected debt chosen so $p(X_1^{Q^c} + Y_1^{Q^c}) = I_1$.[26] That says that our results generalize when there is a clear relationship between the sign of projects' value and their cash flow/pledgeability.

We now show that if there is no such relationship, then not only does the first best not obtain with secured or covenant-protected debt, it does not obtain with a mix either. If in that case, there must be either two positive-value projects with qualities H_0 and H_1 and one negative-value one with value L such that $X_1^{H_0} < X_1^L < X_1^{H_1}$ or two negative- and one positive-value projects satisfying an analogous condition. As the analysis is the same in these two cases, we focus on the first. With an amount F_0^s of secured debt and a fraction ϕ of unsecured covenant-protected debt in place, B invests, per the analysis above, if $X_1^Q \in [X_1^{Q^s}, X_1^{Q_c})$ (where the definitions of $X_1^{Q^s}$ and $X_1^{Q^c}$ are as in equations (11) and (12) except F_1^s is replaced by the total amount of secured debt $F_0^s + F_1^s$ in the latter). Thus for B to invest in positive- but not negative-value projects—i.e. for the first best to be implemented—it must be that $X_1^{H_0}, X_1^{H_1} \in [X_1^{Q_s}, X_1^{Q_c}]$ but $X_1^L \notin [X_1^{Q_s}, X_1^{Q_c}]$. That contradicts the assumption that $X_1^L \in (X_1^{H_0}, X_1^{H_1})$. Thus when neither secured nor covenant-protected debt implements the first best, neither does a mix.

[26] A sufficient condition for every positive-value project to have higher (resp. lower) X_1^Q than any negative-value one is that X_1^Q be increasing (resp. decreasing) in Q.

5 Empirical Content and Discussion

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

5.1 Empirical Relevance

Our model is consistent with a number of stylized facts about corporate debt structure, including that (i) per Proposition 1, well-capitalized/highly rated firms, corresponding to those with high cash flows or minimal incentive problems (cf. Assumption 4), use unsecured debt (e.g., Rauh and Sufi (2010) and Benmelech, Kumar, and Rajan (2019)); (ii) per Proposition 4, negative pledge covenants are common (Billett, King, and Mauer (2007) and Ivashina and Vallée (2018)) but, per Proposition 5, covenants are frequently violated and/or renegotiated/waived (e.g., Beneish and Press (1993, 1995), Chava and Roberts (2008), Dichev and Skinner (2002), Gopalakrishnan and Prakash (1995), Nini, Smith, and Sufi (2012), Roberts and Sufi (2009), and Sweeney (1994));[27,28] (iii) per Proposition 4, covenants in some debt decrease the yield on other debt because they decrease default risk; e.g., Bradley and Roberts (2015).[29]

5.2 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). Firms are exposed to under-investment problems if X_1^H is low, so financing high-quality projects is hard, and over-investment problems if X_1^L is low, so financing low-quality ones is easy.[30] This leads to the following predictions, which, to our knowledge, have yet to be tested directly, but seem consistent with existing indirect evidence (cf. Proposition 5).

[27] These papers often study covenant violations in general; they do not single out negative pledge covenants. As some covenants could be based on financial ratios, such as interest to earnings, not all 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.

[28] Upholding negative pledge covenants stays off path all the time in the model and, it seems, most of the time in practice too. But there are examples of their being successfully upheld, consistent with their providing a credible threat in the model; see, e.g., McDaniel (1983).

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

[30] This mapping from cash flows in the model to ease of financing in practice is predicated on incentive distortions stemming from debt-equity conflicts, and from the debt dilution option in particular. These problems are likely to be first order for high credit risk firms. For other firms, managerial agency problems could be first order. These firms, however, typically use neither covenants nor collateral, using other devices to manage incentives (see, e.g., Jensen (1986)).

Prediction 1. *All else equal, firms that are relatively more exposed to under-investment problems use covenants.*

Proxies for under-investment problems could be growth opportunities, financial constraints indices, high fixed costs, inflexible investment needs, strong rivals (so under-investment leads to decreased market share), and non-redeployable assets (so under-investment leads to dormant assets).

Prediction 2. *All else equal, firms that are relatively more exposed to over-investment problems 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.

To the extent that what creditors can seize in the model (X_0 and X_1^Q) reflects asset tangibility, we have the following.

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

Tangible assets include real estate, equipment, and inventories (see, e.g., Rampini and Viswanathan (2013)).

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

Asset sale discounts (see Appendix B.3) 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.

6 Conclusion

We present a model in which financial contracts are non-exclusive: although contracts may include covenants putting restrictions on other contracts, these can be violated. Therefore, financial contracts can conflict and priority rules are needed to resolve such conflicts.

In practice, secured debt enjoys strong priority. This allows dilution of unsecured debt by new secured debt, increasing the cost of debt and reducing debt capacity. Negative pledge covenants, which convey the right to accelerate following new secured debt issuance, have limited bite—they generally cannot reverse secured debt's issuance or the priority it enjoys over collateral. Thus the wide use of negative pledge covenants—contracts ruling out secured debt but which are themselves defeated by it—is puzzling, according to Bjerre (1999), for instance, who argues

> 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).

We find that, on the one hand, dilution by secured debt can be good: it can prevent under-investment by loosening borrowing constraints due to limited pledgeability. On the other hand, when dilution can lead to over-investment, it can be bad. Secured debt, whose priority rights prevent dilution, can block it. So can a mix of unsecured debt with and without negative pledge covenants, the acceleration threat discouraging new secured debt issuance. The acceleration threat is credible not because it reverses the issuance of secured debt, but because it allows accelerated debt to dilute other unsecured debt.

But covenants can implement efficiency only in concert 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 "good dilution."

More broadly, our analysis can contribute to the policy debate about the strong priority rights of secured debt. It suggests that they can play a useful role by allowing debt dilution when it is efficient, but safeguarding against it when it is not.

A Proofs

A.1 Proof of Proposition 1

Say B can only issue unsecured debt at Date 0. An equilibrium is efficient if Project 0 is funded, and Project 1 is funded provided $Q = H$. Creditors being competitive, B gets all the surplus. Hence if any equilibrium is efficient, all are. Thus, we derive conditions for an efficient equilibrium to exist.

By Assumption 2, B is able to fund Project 1 at Date 1, borrowing secured with face value I_1/p. By condition (2), B is also willing to do so if $Q = H$, i.e.

$$p\Big(Y_1^H + \max\big\{0, X_0 + X_1^H - I_1/p - F_0^u\big\}\Big) \geq p \max\big\{0, X_0 - F_0^u\big\}. \tag{13}$$

Project 1 being efficient if $Q = H$, this is renegotiation-proof. Thus two types of efficient equilibria may a priori exist, which we call Type 1 and Type 2. In Type 1 equilibria, B will not fund Project 1 if $Q = L$, an efficient, and thus renegotiation-proof outcome; in Type 2, B would fund Project 1 if $Q = L$, but this inefficient outcome is renegotiated away.

Consider each type of equilibria in turn after a preliminary lemma.

Lemma A.1. *An efficient equilibrium exists if and only if B's Date-0 unsecured debt capacity exceeds I_0.*

Proof. We show that if B fund Project 0 via unsecured debt B takes the efficient action at Date 1 for both $Q = H$ and $Q = L$. If $Q = H$, B invests per equation (13). Now, suppose $Q = L$. Investing being inefficient, renegotiation would see creditors bribe B not to whenever he has the incentive and ability to. □

Type 1 equilibria. Creditors being competitive, if, in a Type 1 equilibrium, B borrows unsecured with face value F_0^u, B raises an amount equal to creditors' expected payoff under the efficient Date-1 policy. This amount is a function f of the face value of debt:

$$f(z) := p\Big(q \min\big\{z, X_0 + X_1^H - I_1/p\big\} + (1-q)\min\big\{z,\ X_0\big\}\Big). \tag{14}$$

Lemma A.2. *A unique $\hat{F}_0^u$ exists such that $f(\hat{F}_0^u) = I_0$.*

Proof. Let $F_0^{\max} := \max\{X_0 + X_1^H - I_1/p, X_0\}$. f is continuous and strictly increasing over $[0, F_0^{\max}]$ and constant over $[F_0^{\max}, \infty)$, with $f(0) = 0$ and $f(F_0^{\max}) = p(q(X_0 + X_1^H - I_1/p) + (1-q)X_0) > I_0$, by Assumption 1. Hence, by the Intermediate Value Theorem, $\hat{F}_0^u$ exists and is unique. □

A Type 1 equilibrium exists, by its definition, only if B will not fund Project 1 if $Q = L$, or

$$p\Big(Y_1^L + \max\big\{0, X_0 + X_1^L - I_1/p - \hat{F}_0^u\big\}\Big) \leq p\,\max\big\{0, X_0 - \hat{F}_0^u\big\} \tag{15}$$

(where $\hat{F}_0^u$ is as defined in Lemma A.2).

Lemma A.3. *Condition (15) is equivalent to* $Y_1^L \leq X_0 - \hat{F}_0^u$.

Proof. Condition (15) can be rewritten as

$$Y_1^L \leq \max\big\{0, X_0 - \hat{F}_0^u\big\} - \max\big\{0, X_0 - \hat{F}_0^u + X_1^L - I_1/p\big\}, \tag{16}$$

which, because condition (2) implies $X_1^L - I_1/p < 0$, can be rewritten as

$$Y_1^L \leq \max\Big\{0, \min\big\{X_0 - \hat{F}_0^u, I_1/p - X_1^L\big\}\Big\}, \tag{17}$$

which, because $Y_1^L \geq 0$, is equivalent to

$$Y_1^L \leq \min\big\{X_0 - \hat{F}_0^u, I_1/p - X_1^L\big\},$$

which, because $Y_1^L \leq I_1/p - X_1^L$ (by condition (2)), amounts to $Y_1^L \leq X_0 - \hat{F}_0^u$. □

Lemma A.4. $Y_1^L \leq X_0 - \hat{F}_0^u$ *is equivalent to* $Y_1^L \leq X_0 - \widetilde{F}_0^u$*, with* $\hat{F}_0^u$ *as defined in Lemma A.2 and* $\widetilde{F}_0^u$ *the unique solution to*

$$I_0 = p\Big(q\,\min\big\{X_0 + X_1^H - I_1/p, z\big\} + (1-q)z\Big) =: g(z) \tag{18}$$

Proof. g is continuous and strictly increasing with $g(0) = 0$ and $\lim_{y\to\infty} g(y) = \infty$. So, by the Intermediate Value Theorem, $\widetilde{F}_0^u$ exists and is unique.

If $Y_1^L \leq X_0 - \hat{F}_0^u$, then $\hat{F}_0^u \leq X_0$ and so $\hat{F}_0^u = \widetilde{F}_0^u = \min\{\hat{F}_0^u, X_0\}$. Conversely, if $Y_1^L \leq X_0 - \widetilde{F}_0^u$ then $\widetilde{F}_0^u \leq X_0$ and so $\hat{F}_0^u = \widetilde{F}_0^u = \min\{\hat{F}_0^u, X_0\}$. □

Lemma A.5. $Y_1^L \leq X_0 - \widetilde{F}_0^u$ *is equivalent to* $Y_1^L \leq Y_1^*$ *(with* $\tilde{F}_0^u$ *and* Y_1^* *as defined in Lemma A.4 and equation (5)).*

Proof. If $X_0 + X_1^H - I_1/p \geq I_0/p$, then $\widetilde{F}_0^u = I_0/p$. Otherwise, $\min\{\widetilde{F}_0^u, X_0 + X_1^H - I_1/p\} = X_0 + X_1^H - I_1/p$. Hence, either way, $\min\{\widetilde{F}_0^u, X_0 + X_1^H - I_1/p\} = \min\{I_0/p, X_0 + X_1^H - I_1/p\}$ which implies

$$\widetilde{F}_0^u = \frac{I_0/p - q \cdot \min\{I_0/p, X_0 + X_1^H - I_1/p\}}{(1-q)}. \tag{19}$$

Hence $Y_1^L \leq X_0 - \widetilde{F}_0^u$ amounts to $Y_1^L \leq Y_1^*$. □

In sum, if $Y_1^L \leq Y_1^*$, B has no incentive to invest in Project 1 if $Q = L$ and an efficient Type 1 equilibrium exists.

Type 2 equilibria. A Type 2 equilibrium exists, by its definition, only if B would fund Project 1 if $Q = L$. Thus assume now that $Y_1^L > Y_1^*$.

Lemma A.6. *B's Date-0 unsecured debt capacity is*

$$p(q(X_0 + X_1^H - I_1/p) + (1-q)(X_0 + X_1^L - I_1/p)). \tag{20}$$

Proof. Say, B borrowed unsecured with face value F_0^u. If $Q = H$, B borrows secured with face value I_1/p and the unsecured creditors' expected payoff is $p\min\{X_0 + X_1^H - I_1/p, F_0^u\}$. If $Q = L$, B having full bargaining power, renegotiation sees creditors get their expected payoff in the status quo, i.e. if B did invest, which is $p \cdot \min\{X_0 + X_1^L - I_1/p, F_0^u\}$. The creditors' Date-0 expected payoff is thus $p(q\min\{X_0 + X_1^H - I_1/p, F_0^u\} + (1-q)\cdot\min\{X_0 + X_1^L - I_1/p, F_0^u\})$, which is (weakly) increasing in F_0^u and equals the expression in the statement of the lemma for F_0^u large enough. Being creditor's maximum expected payoff, that expression is also B's Date-0 borrowing capacity. □

That B's Date-0 borrowing capacity exceeds I_0 follows from condition (6).

A.2 Proof of Proposition 2

Lemma A.7. $X_1^H > X_1^L$ *is sufficient for an efficient equilibrium to exist.*

Proof. Let $F_0^s := X_0 + X_1^L - I_1/p + \epsilon$ with $\epsilon > 0$, and $F_0^u = \hat{F}_0^u - F_0^s$, where $\hat{F}_0^u$ is as defined in Lemma A.2. For ϵ sufficiently small, (i) Assumption 2 implies $F_0^s \geq 0$ and (ii) Assumption 4 and $X_1^H > X_1^L$ imply $F_0^s < I_0/p$, which implies $F_0^u > 0$.

Now say B issues secured and unsecured debt with face values F_0^s and F_0^u. If so, he raises $f(F_0^s + F_0^u) \geq f(\hat{F}_0^u) = I_0$ at Date 0 if he follows the efficient Date-1 policy, which we now show he does for ϵ small enough. Given $X_1^H > X_1^L$, in this case we have

$$X_0 + X_1^H - F_0^s > I_1/p > X_0 + X_1^L - F_0^s. \tag{21}$$

Thus B can fund Project 1 via secured debt with face value I_1/p if $Q = H$ but not if $Q = L$. Condition (2) implies B is also willing to invest if $Q = H$, i.e.

$$p\Big(Y_1^H + \max\big\{0, X_0 + X_1^H - I_1/p - F_0^s - F_0^u\big\}\Big) \geq p\max\big\{0, X_0 - F_0^s - F_0^u\big\}. \tag{22}$$

Hence B invests if $Q = H$ but not if $Q = L$. This is efficient and thus renegotiation-proof. $\square$

Lemma A.8. *If $X_1^L \geq X_1^H$, a necessary condition for an efficient equilibrium to exist in which B issues secured debt with face values F_0^s is $I_1 \leq p(X_0 + X_1^H - F_0^s)$.*

Proof. Say $I_1 > p(X_0 + X_1^H - F_0^s)$. Investment requires that both new and existing creditors be better off than in the status quo, hence better off collectively:

$$p \min\{X_0, F_0^u + F_0^s\} \leq p(X_0 + X_1^H) - I_1. \tag{23}$$

That cannot hold as (i) $p(F_0^u + F_0^s) > p(X_0 + X_1^H) - I_1$ by hypothesis and (ii) $pX_0 > p(X_0 + X_1^H) - I_1$ by the hypothesis that $X_1^L \geq X_1^H$ and condition (2). $\square$

Lemma A.9. *If $X_1^L \geq X_1^H$, if B borrows secured and unsecured with face values F_0^s and F_0^u and $I_1 \leq p(X_0 + X_1^H - F_0^s)$, the equilibrium outcome of the Date-1 subgame is the same as if B borrowed unsecured with face value $(F_0^s + F_0^u)$.*

Proof. $X_1^L \geq X_1^H$ and $I_1 \leq p(X_0 + X_1^H - F_0^s)$ imply $I_1 \leq p(X_0 + X_1^L - F_0^s)$. Thus B can fund Project 1 if $Q = H, L$ by borrowing secured. The rest of the proof follows that of Proposition 1 replacing F_0^u with $F_0^s + F_0^u$. $\square$

Lemma A.10. *$X_1^H > X_1^L$ is necessary for an efficient equilibrium to exist.*

Proof. If $X_1^L \geq X_1^H$, efficiency requires $I_1 \leq p(X_0 + X_1^H - F_0^s)$, which implies that the equilibrium outcome is as if B borrowed unsecured with face value $(F_0^s + F_0^u)$, which by Assumption 4 cannot be efficient. $\square$

A.3 Proofs of Proposition 3 and Proposition 4

Lemma A.11–Lemma A.14 characterize equilibrium of the subgame at Date 1 for $Q = L, H$, assuming B issued unsecured debt at Date 0 with face value F_0^u, a fraction $\phi \in (0, 1]$ being covenant-protected.

Lemma A.11. *If B funds Project 1 at Date 1 by borrowing secured with face value F_1^s, then $F_1^s \geq I_1$.*

Proof. Say $F_1^s < I_1$. Absent renegotiation, the Date-1 creditor's payoff is at most F_1^s. With renegotiation, it is too, as B has full bargaining. That violates the creditor's break-even constraint, contradicting the hypothesis that it lends. $\square$

Lemma A.12. *If $Q = L$, B does not borrow secured at Date 1 if doing so would result in acceleration.*

Proof. If B does not fund Project 1, his expected payoff is $Y_0^L + p\max\{X_0 - F_0^u, 0\}$. If B funds Project 1 with secured debt with face value F_1^s and acceleration follows, his payoff is $\max\{p(X_0 + X_1^L) - F_1^s - F_0^u, 0\}$. Lemma A.11 and condition (2) imply $pX_1^L < F_1^s$. Hence

$$\max\left\{p(X_0 + X_1^L) - F_1^s - F_0^u, 0\right\} \leq \max\left\{pX_0 - F_0^u, 0\right\} < Y_0^L + p\max\left\{X_0 - F_0^u, 0\right\}. \quad (24)$$

Therefore B is worse off under acceleration. □

Lemma A.13. *If the covenant-protected creditor accelerates some of its debt, it accelerates (only) the maximum amount of debt payable from the liquidation proceeds, i.e.* $\min\{p(X_0 + X_1^Q) - F_1^s, \phi F_0^u\}$.

Proof. Define $\Psi := \min\{p(X_0 + X_1^Q) - F_1^s, \phi F_0^u\}$ and $\alpha^* := \Psi/(\phi F_0^u) \in [0, 1]$. Say the covenant-protected creditor accelerates $\alpha\phi F_0^u$ with $\alpha \in [0, 1]$. For $\alpha \in [0, \alpha^*]$, it gets $\alpha\phi F_0^u$, which reaches its maximum Ψ for $\alpha = \alpha^*$.

There are two cases corresponding to the two arguments in the "min" in the definition of Ψ. First, if $\Psi = \phi F_0^u$, $\alpha^* = 1$ and thus $\alpha = \alpha^*$ is optimal. Otherwise, if $\Psi = p(X_0 + X_1^Q) - F_1^s$, $\alpha > \alpha^*$ triggers default, all unsecured debt comes due, and the covenant-protected creditor gets $\phi\Psi$, which is less than Ψ, its payoff for $\alpha = \alpha^*$, which is thus optimal. □

Lemma A.14. *Suppose* $p(X_0 + X_1^Q) \leq F_0^u + I_1$*:*

(i) acceleration is renegotiation proof;

(ii) funding Project 1 with secured debt with face value F_1^s *triggers acceleration if and only if*

$$\phi < \phi^*(X_1^Q; F_0^u, F_1^s) := \frac{X_0 + X_1^Q - F_1^s/p}{\min\left\{X_0 + X_1^Q - F_1^s, F_0^u\right\}} > 0; \quad (25)$$

(iii) ϕ^* *is strictly increasing in* X_1^Q *and strictly decreasing in* F_1^s*.*

Proof. Statement (i): $F_1^s \geq I_1$ implies $p(X_0 + X_1^Q) \leq F_0^u + F_1^s$. Under acceleration, creditors thus get the liquidation proceeds, $p(X_0 + X_1^Q)$. Absent acceleration, B can only pledge expected cash flows $p(X_0 + X_1^Q)$. So, creditors cannot all be strictly better off.

Statement (ii): The covenant-protected creditor does not accelerate if and only if

$$\min\{p(X_0 + X_1^Q) - F_1^s, \phi F_0^u\} \leq p\phi\min\{X_0 + X_1^Q - F_1^s, F_0^u\}, \quad (26)$$

given it accelerates only $\min\{p(X_0 + X_1^Q) - F_1^s, \phi F_0^u\}$ (Lemma A.13). The second term under the min on the LHS always exceeding the RHS ($\phi F_0^u > p\phi F_0^u$), this can be written as

$$p(X_0 + X_1^Q) - F_1^s \leq p\phi\min\left\{X_0 + X_1^Q - F_1^s, F_0^u\right\}. \quad (27)$$

Solving for ϕ gives the threshold in the lemma.

Statement (iii). The monotonicity of ϕ^* follows from inspection. □

Lemma A.16–Lemma A.18 characterize the equilibrium, including B's decision at Date 0.

Lemma A.15. *Let $\bar{F}_0^u$ be the unique solution to*

$$I_0 = qz + (1-q)p\min\{X_0, z\} =: h(z). \tag{28}$$

We have that $I_0 < \bar{F}_0^u < \hat{F}_0^u$ (with $\hat{F}_0^u$ as defined in Lemma A.2).

Proof. h is continuous, strictly increasing with $h(0) = 0$ and $\lim_{z\to\infty} h(z) = \infty$. So, by the Intermediate Value Theorem, $\bar{F}_0^u$ exists and is unique. Moreover, $h(z) < z$, so $\bar{F}_0^u > I_0$.

We also have $h > f$ (defined in equation (14)). Hence $h(\hat{F}_0^u) > f(\hat{F}_0^u) = I_0$ by definition of $\hat{F}_0^u$ (Lemma A.2) and so $\hat{F}_0^u > \bar{F}_0^u$. □

Lemma A.16. *If $p\left(X_0 + X_1^H\right) > \bar{F}_0^u + I_1$, an efficient equilibrium exists.*

Proof. We construct an efficient equilibrium with $F_0^u = \bar{F}_0^u$ and $\phi < \phi^*$.

Assumption 4 and the hypothesis together with $\bar{F}_0^u > I_0$ imply $p(X_0 + X_1^L) < \bar{F}_0^u + I_1$ and thus $X_1^H > X_1^L$. Hence $\phi < \phi^*(X_1^Q, F_0^u, F_1^s)$ for $Q \in \{L, H\}$ and all $F_1^s \leq I_1/p$ from Lemma A.14 (statement (iii)).

First consider $Q = L$. Raising I_1 requires a face value $F_1^s \in [I_1, I_1/p]$, and would trigger acceleration as $\phi < \phi^*$ for $X_1^Q = X_1^L$ and $F_1^s \in [I_1, I_1/p]$ (Lemma A.14). Hence B does not invest (Lemma A.12).

Now consider $Q = H$ and say B borrows with face value I_1. Absent renegotiation, acceleration would follow as $\phi < \phi^*$ for (Lemma A.14). The liquidation value $p\left(X_0 + X_1^H\right)$ exceeding the total face value $\bar{F}_0^u + I_1$, unsecured and secured creditors would get $\bar{F}_0^u$ and I_1. However, acceleration is renegotiated away as the expected cash flow $p\left(X_0 + X_1^H\right)$ that B can pledge exceeds creditors' payoff $\bar{F}_0^u + I_1$. B having full bargaining power, the secured creditor gets payoff I_1 and breaks even, while unsecured creditors get payoff $\bar{F}_0^u$ and break even as their Date-0 expected payoff is $q\bar{F}_0^u + (1-q)\cdot p\min\{X_0, \bar{F}_0^u\} = I_0$. The Date-1 outcomes are efficient. □

Lemma A.17. *If $X_1^L > X_1^H$, an efficient equilibrium exists.*

Proof. If there is a $\phi \in (0,1)$ such that $\phi^*(X_1^H) < \phi \leq \phi^*(X_1^L)$ for $F_0^u = \hat{F}_0^u$ (where $\hat{F}_0^u$ and ϕ^* are as defined in Lemma A.2 and Lemma A.14), then B issuing secured debt triggers acceleration if $Q = L$, deterring B from doing so (Lemma A.12) but not if $Q = H$, allowing

B to do so. The Date-1 outcomes are efficient and thus renegotiation-proof, and B can raise I_0 at Date 0 via unsecured debt with face value $\hat{F}_0^u$.

We thus need to show only that such a ϕ exists. As Lemma A.14 implies that $\phi^*(X_1^H) < \phi^*(X_1^L)$, we need to show only that $\phi^*(X_1^H) < 1$. This follows from the fact that $\hat{F}_0^u > X_0 + X_1^H - I_1/p$ by the hypothesis that $X_1^L > X_1^H$, Assumption 4, and the fact that $\hat{F}_0^u \geq I_0/p$ (from the definition of $\hat{F}_0^u$ in Lemma A.2). Thus $\phi^*(X_1^H) = \frac{X_0 + X_1^H - I_1/p^2}{X_0 + X_1^H - I_1/p} < 1$. □

Lemma A.18. *If $X_1^L < X_1^H$ and $p(X_0 + X_1^H) < \bar{F}_0^u + I_1$, an efficient equilibrium does not exist.*

Proof. If $p(X_0 + X_1^H) < F_0^u + I_1$, efficiency requires $\phi \geq \phi^*(X_1^H)$ at $F_1^s = I_1/p$ (Lemma A.14), and so $\phi > \phi^*(X_1^L)$ as $X_1^H > X_1^L$. Hence the covenant is irrelevant and efficiency cannot obtain (Assumption 4).

Now say $p(X_0 + X_1^H) \geq F_0^u + I_1$, which implies $F_0^u < \bar{F}_0^u$ and, first, consider $Q = H$, B borrows with face value $F_1^s \geq I_1$. Acceleration is renegotiated away and unsecured creditors get F_0^u. Now consider $Q = L$. If B has no incentive to invest or if investment would trigger accelation, B will not invest (Lemma A.12) and unsecured investors get payoff $p \min\{X_0, F_0^u\}$. If B has an incentive to invest and if investing would not trigger acceleration, investment will be renegotiated away. B having full bargaining power, creditors' payoff equals what they would get under investment, i.e. $p \min\{X_0 + X_1^L - I_1/p, F_0^u\}$. By condition (2), this is less than $p \min\{X_0, F_0^u\}$. Hence unsecured creditors' expected payoff is at most $qF_0^u + (1-q)p \min\{X_0, F_0^u\} - I_0$. This negative since $F_0^u < \bar{F}_0^u$. That contradicts the premise that B funds Project 0 at Date 0. □

A.4 Proof of Proposition 5

The result is a corollary of Proposition 1, Proposition 2, Proposition 4, and their proofs.

B Robustness

Here we consider several generalizations of our model. We make a couple of assumptions to simplify the analysis: (i) there is no renegotiation (other than waiving covenants) and (ii) covenant-protected debt is not paid in full following a secured debt issuance (so the issuance is in fact dilutive).

B.1 Bankruptcy due to Acceleration

So far, we have assumed a covenant-protected creditor can choose the fraction of debt it accelerates. Here we explore the case in which a creditor must accelerate either all of its debt or none of it. We show our results do not change.

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

$$p\big(X_0 + X_1^H\big) - F_1^s < F_0^c \tag{29}$$

and

$$p\big(X_0 + X_1^L\big) - F_1^s \geq F_0^c. \tag{30}$$

These can hold whenever $X_1^L \geq X_1^H$, affirming the conclusion of Proposition 4.[31]

B.2 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 $F_1^s \in \big[\max\{X_0\,,\, X_1^Q\}, X_0 + X_1^Q\big)$. We also assume that, if B uses secured debt at Date 0, its face value F_0^s is in this range.

Under these assumptions, the first best is implementable via a mix of secured and unsecured debt at Date 0 whenever there is a face value of secured debt F_0^s such that B can finance Project 1 if and only if it has positive value,

$$p'\big(X_0 + X_1^Q - F_0^s\big) \geq I_1 \tag{32}$$

or Date 1 if $Q = H$ but not if $Q = L$. That is the same condition as in the baseline model except with p replaced by p' (see (8)).

[31] For completeness, we should also check that the covenant-protected creditor indeed chooses not to accelerate if it triggers bankruptcy, in which case all unsecured debt is accelerated and therefore is pari passu (Section 2.2). That condition is

$$\phi\Big(p\big(X_0 + X_1^Q\big) - F_1^s\Big) \leq \phi p\left(X_0 + X_1^Q - F_1^s\right). \tag{31}$$

The first best is implementable via a mix of covenant-protected and unprotected debt whenever there is a fraction ϕ of covenant-protected debt such that the acceleration threat is credible following investment if and only if the investment has negative value, or

$$p\big(X_0 + X_1^Q\big) - F_1^s \geq \phi p'\big(X_0 + X_1^Q - F_1^s\big) \tag{33}$$

if $Q = L$ but not if $Q = H$. That coincides with the condition (described in Section 3.3) with p replaced by p' on in the event of continuation (of acceleration/liquidation).

Overall, the analysis here suggests that relaxing our assumption that projects are perfectly correlated does not change our qualitative results. It suggests, however, that it could generate further testable predictions. In the case analyzed here, it follows from $p' > p$ that the fractions of secured debt needed to implement the first best is higher than in the baseline and that of covenant-protected debt is lower. (But we think a fuller analysis, without such stark simplifying assumptions, would be desirable before any actual empirical tests.)

B.3 Asset Sale Discounts

So far, we have assumed that selling assets destroys private benefits but not 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 $\lambda p(X_0 + X_1^Q)$ 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

$$p\lambda\big(X_0 + X_1^Q\big) - F_1^s \geq \phi p\big(X_0 + X_1^Q - F_1^s\big). \tag{34}$$

Hence this the same condition as in the baseline (Section 3.3), but with the LHS multiplied by λ, reflecting that the asset sale discount makes acceleration more costly.

So including the discount does not change our qualitative results, but suggests an additional testable prediction: the higher the discount $(1 - \lambda)$ the lower ϕ should be to induce creditors to accelerate optimally.

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