CONFLICTING PRIORITIES: A THEORY OF COVENANTS AND COLLATERAL*

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Abstract

Debt secured by collateral is repaid ahead of unsecured debt, even if taken in violation of covenants. We develop a model in which this priority leads to conflicts among debt contracts, but can be optimal nonetheless. Whereas creditors' option to accelerate following covenant violations can deter dilution by new secured debt, preventing over-investment, their option to waive covenants allows some dilution, preventing under-investment. The optimal debt structure trades off over- and under-investment, blocking "bad" but not "good" dilution. It is multi-layered, including secured and unsecured debt with and without covenants. Our results are consistent with several debt structure regularities.

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1 Introduction

Firms finance themselves mainly with debt. They often combine several types of debt, including debt protected by covenants and debt secured by collateral.[1] Secured debt has priority over assets used as collateral—until it is paid in full, the assets cannot be sold, pledged as collateral for new debt, or used to pay other debt.[2] Hence, new secured debt may "leapfrog" existing unsecured debt. For protection, unsecured debt commonly includes negative pledge covenants that give unsecured creditors the option to accelerate their debt if the borrower takes on new secured debt.[3] However, these covenants are weak, as secured debt retains its priority even if issued in violation of the covenant, leaving unsecured creditors with little more than the right to demand repayment from a borrower with assets already pledged elsewhere. As a result, legal scholars doubt whether negative pledge covenants are of any use at all:

> The 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 (Bjerre (1999), p. 308).

Indeed, unsecured creditors seeking to recoup assets secured to third parties have been consistently denied in court.[4] Hence, lawyers warn against relying solely on negative pledge covenants as protection against dilution, saying that they are no substitute for collateral.[5] Yet, borrowers issue unsecured debt including such covenants even when they have assets available to pledge as collateral[6]—they do not follow a pecking order of debt, in which they

[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, both outside bankruptcy, when its priority prevents assets from being sold or pledged elsewhere, and in bankruptcy, when the absolute priority rule (APR) dictates that secured debt gets paid first, unsecured debt next, and equity last. Deviations from the APR between unsecured debt and equity are not uncommon (Eberhart, Moore, and Roenfeldt (1990), Franks and Torous (1989), and Weiss (1990)), if declining (Bharath, Panchapegesan, and Werner (2007)). However, the priority of secured over unsecured debt is typically respected, deviations occurring in none of Ch. 7 and only 11% of Ch. 11 bankruptcies in Bris, Welch, and Zhu (2006).

[3]E.g., 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]The oldest known ruling on the subject, Knott v. Shepherdstown Mfg. Co., 5 S.E. 266, 269 (W. Va. 1888), stresses that a negative pledge covenant "creates no lien on or pledge of any property" (p. 269), but is merely a personal promise, a view upheld in later cases (see Bjerre's (1999) footnote 40 for a list (p. 317)).

[5]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)).

[6]See, e.g., Badoer, Dudley, and James (2019) and Rauh and Sufi (2010).

would borrow unsecured only after exhausting their secured debt capacity.

If negative pledge covenants cannot enforce priority, why are they so widespread? Why isn't there a pecking order, in which borrowers first borrow secured, and use unsecured debt only once all pledgeable assets are used as collateral? What determines the mix of secured and unsecured debt with and without negative pledge covenants? And, taking a step back, why is secured debt given such strong priority, underminining other types of debt?

To address these questions, we develop a model in which collateral serves to establish priority over assets, as in, e.g., Donaldson, Gromb, and Piacentino (2018) and DeMarzo (2019). This assumption departs from much of the literature which emphasizes collateral's role in enhancing their pledgeability (e.g., Hart and Moore (1994, 1998) and Rampini and Viswanathan (2010, 2013)).

In the model, as in practice, secured debt retains its priority even if taken in violation of negative pledge covenants, a perspective new to the finance literature (see, however, Ayotte and Bolton (2011)). Thus, the strong priority given to secured debt leads to conflicts among debt contracts. But we find that it can be optimal nonetheless. Whereas creditors' option to accelerate following violations can deter dilution by new secured debt, preventing over-investment, their incentive to waive covenants allows some dilution, preventing under-investment. A multi-layered debt structure, including secured and unsecured debt with and without covenants, trades off over-investment and under-investment by blocking "bad," but not "good" dilution. Our results are consistent with a number of facts about debt structure, including covenant violations and waivers. They also 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. The NPV of the first project is positive, but whether that of the second project is positive or negative is not revealed until after the first project is underway.

Financing is subject to two frictions. First, pledgeability is limited: B cannot borrow against the full value of his projects. As a result, B could be inefficiently financially constrained. Second, contracts are non-exclusive: B's debt contract with initial creditors cannot rule out new debt contracts with later creditors. In particular, B could take on new secured debt, possibly diluting his existing unsecured debt. While B can use a negative pledge covenant to promise not to do so, he can break his promise. In this case, the different debt contracts are in conflict.

We assume that, as in practice, collateral serves to resolve such conflicts, establishing priority among conflicting contracts: debt secured by collateral trumps other debt, including debt protected by covenants. Hence, even if taken on in violation of a covenant, secured debt has the first claim on the assets used as collateral. In the event of a violation, creditors with covenants can accelerate their debt, demanding immediate repayment, and forcing B to sell his assets prematurely, destroying value. Nonetheless, secured debt is still paid first. It has the first claim on B's assets not only in bankruptcy, when it is paid first out of their liquidation value, but also outside bankruptcy, when it has priority over the proceeds of the asset sale. Hence, unsecured creditors' gain from acceleration is limited.

Results preview. We study how the debt structure B chooses when he finances his first project determines the conditions under which he invests in his second project. Does he undertake it only when it has positive NPV? Or does he under- or over-invest? We derive five main results. They characterize, first, how B's debt structure—i.e. the mix of secured and unsecured debt with and without negative pledge covenants—can distort and/or correct B's investment policy and, ultimately, how the optimal debt structure depends on projects' characteristics.

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

Our second main result is that financing the first project entirely via secured debt prevents over-investment, but can lead to under-investment. Since secured debt has priority, it cannot be diluted, thus it limits over-investment. However, some dilution may be necessary to loosen financial constraints stemming from limited pledgeability—dilution can be good, because it can prevent under-investment. Thus, by blocking dilution, secured debt can cause a "collateral-overhang," a problem that financial restructuring (i.e. renegotiation) cannot solve (Donaldson, Gromb, and Piacentino (2018)). This resonates with practitioners' intuition that secured borrowing "encumbers assets":

> Asset encumbrance not only poses risks to unsecured creditors...but also has wider...implications since encumbered assets are generally not available to obtain...liquidity (Deloitte Blogs (2014)).

Financing the first project via a mix of secured and unsecured debt, hence allowing for some limited dilution, can mitigate this inefficiency. Indeed, if less dilution is needed to finance positive-NPV projects than negative-NPV ones, B can choose a fraction of secured debt that at the same time allows enough flexibility to finance his second project if it is positive NPV, but not enough if it is negative NPV. However, if more dilution is needed to finance positive-NPV projects than negative-NPV ones, under-investment persists.

Since a simple mix of secured and unsecured debt is not always efficient, we consider the role of negative pledge covenants. Suppose the first project is financed via unsecured debt with negative pledge covenants, i.e. B promises not to borrow secured in the future. While B can still issue new secured debt, the threat of acceleration could deter him from doing so, since demanding early repayment could force him to sell his assets, in which case he loses (at least) the value of his non-pledgeable cash flows.

Our third main result is that financing the first project entirely with unsecured debt with negative pledge covenants cannot deter over-investment, because creditors' acceleration threat is not credible: they are paid after the new secured debt whether they accelerate or not and, thus, have nothing to gain from acceleration. This resonates with legal scholars' doubts on the effectiveness of negative pledge covenants (Bjerre (1999)).

Our fourth main result is that financing the first project with an appropriate mix of unsecured debt with and without negative pledge covenants can deter over-investment, without inducing under-investment. Indeed, if the debt with covenants is accelerated, it dilutes the unsecured debt without covenants. Thus, creditors have something to gain from acceleration—namely, priority—and their threat is credible. This contrasts with legal scholars' view that negative pledge covenants are ineffective.

The incentive to uphold covenants is stronger when the fraction ϕ of debt with covenants is small, because creditors benefit more from acceleration when the fraction $(1-\phi)$ of debt that can be diluted is larger. Yet, decreasing ϕ need not be desirable. Indeed, if B needs to dilute existing debt to finance a positive-NPV project, then upholding covenants can be inefficient. Thus, the fraction ϕ should be set, if possible, so that covenants are upheld if B is tempted to finance a negative-NPV investment, but waived if he wants to finance a positive-NPV one.

Our fifth main result is that a debt structure can be chosen to implement the efficient investment policy. The optimal debt structure is multi-layered, and depends on the characteristics of B's projects. If less dilution is needed to finance positive-NPV projects than negative-NPV ones, it contains only secured and unsecured debt. Otherwise, it contains debt with covenants as well, which balance the need to avoid under-investment with that to block over-investment. This points to a trade-off theory of debt structure, in which the borrower chooses the mix of secured and unsecured debt to manage the trade-off between financial rigidity and flexibility.

This result rationalizes the priority of secured debt (in and outside bankruptcy): B can choose an appropriate debt structure to prevent "bad dilution," but allow "good dilution," and, ultimately, avoid both over- and under-investment. Since the quality of the second project is random, this optimal policy is state contingent. But it can be implemented using only non-state-contingent (debt) instruments. To do so, B exploits the option to dilute unsecured debt with new secured debt. The priority of secured debt is useful: it facilitates efficient contingent dilution.

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 a fundamental and longstanding feature of bankruptcy law: the principle that a secured creditor is entitled to receive the entire amount of its secured claim...before any unsecured claims are paid (p. 859),

arguing that the absolute priority of secured debt facilitates dilution. While our model is consistent with this conclusion, our analysis reveals that (i) relaxing the absolute priority rule could block dilution too much, reducing financial flexibility and leading to under-investment, and that (ii) the downsides of the current priority rule may be limited, because borrowers can structure their debt to block inefficient dilution but allow for efficient dilution.[7]

Stylized facts. Our model is consistent with a number of stylized facts, including that borrowers frequently (i) use debt structures including a mix of simple instruments, (ii) use negative pledge covenants, (iii) violate covenants, (iv) receive covenant waivers following violations, (v) use covenants and collateral as parts of a multi-tiered debt structure, (vi) borrow unsecured despite having assets available to use as collateral (there is no pecking order of debt), (vii) have less financial flexibility for investment if they borrow secured (collateral overhang), and (viii) borrow both from banks and markets, using more covenants in bank debt (see Section 8.1).

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.[9] We focus on how they mitigate conflicts of interest among creditors, by establishing priority among otherwise conflicting debt contracts. Although this is arguably the main legal role of collateral and the express objective of anti-dilution covenants, it has received relatively

[7]See Ravid et al. (2015) for a model of debt structure 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, e.g., Tirole (2006) on collateral and Smith (1993) on covenants.

little attention in the finance literature. DeMarzo (2019), Donaldson, Gromb, and Piacentino (2018), 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.[10]

Ayotte and Bolton's (2011) paper is the closest to ours. It is the only other paper that explicitly takes negative pledge covenants into account. Like us, they analyze how the scope of property/priority rights can enhance/distort investment efficiency, and they rationalize aspects of current law. Unlike us, however, they do not consider efficient dilution, and they do not rationalize covenant violations (and waivers). They also abstract from acceleration and renegotiation proofness, two important features of our analysis.

Attar, Casamatta, Chassagnon, and Décamps (2019b) also study covenants in credit markets with non-exclusivity and limited pledgeability. They focus on how covenants can backfire, acting as anti-competitive devices, an issue that does not arise in our setting in which the borrower offers the contracts.

Our result on the disciplining effect of the acceleration threat 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/short-term debt, 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 there could be too much acceleration otherwise. Moreover, unlike in models of demandable/short-term debt, in our model, the acceleration threat is effective only if some debt is not covenant protected. This matters in our model because there is too little acceleration otherwise.[11] Overall, our analysis points to the importance of a multi-layered debt structure to implement efficient investment.

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

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

[11] Note that we rule out "acceleration runs" by assuming that unsecured debt with negative pledge covenants is held by a single creditor or has a collective action clause. This optimal in our model. It prevents excessive acceleration and leads to the efficient outcome.

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 access to 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. We refer to project payoffs as "cash flows." However, as the pledgeable part could represent the value of assets used in a project, we use "pledgeable cash flows" and "assets" interchangeably (cf. footnote 14).

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 assume that Project 1 succeeds if and only if Project 0 does (i.e. the projects are perfectly correlated). Thus, Project 1 can be viewed as an extension of Project 0. This assumption simplifies the analysis, because it reduces the number of cases to consider, given there is only one outcome ("success") with positive payoffs (see, however, Section 7.8).

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

Projects mature at Date 2 but can be scrapped/sold early, before Date 2, for the expected value of their pledgeable cash flows $pX_{\text{tot.}}$. Thus, selling assets is inefficient in that it destroys all (but only) non-pledgeable cash flows.[12]

[12] The sale value is the price competitive buyers would bid for the pledgeable cash flows, reflecting our

2.2 Financing

Frictions. At Date $t \in \{0, 1\}$, B can borrow 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 thus 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.[13]

Instruments. We focus on three debt instruments: secured debt and unsecured debt with or without negative pledge covenants. We will show that it is without loss of generality in our model, in that allowing for other instruments could not improve the outcome.

1. *Secured debt* is a promise to repay a fixed face value at Date 2 with pledgeable cash flows as collateral.[14] (The role of collateral depends on 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 (but no obligation) to accelerate, i.e. to demand repayment of any fraction[15] of the face value at Date 1, after B takes on new secured debt (i.e. violates the covenant). Covenants can be waived at any time, both ex post—if B violates covenants, creditors need not accelerate—and ex ante—if B asks for covenants to be relaxed, creditors have the option to accept or reject.[16]

For simplicity, we assume that unsecured debt with negative pledge covenants is held by a single creditor. This could represent bank debt or dispersed debt with a collective action

assumption that outsiders cannot capture non-pledgeable cash flows. However, we allow for an additional asset sale cost in Section 7.5.

[13] Other papers on non-exclusive financial contracting include Acharya and Bisin (2014), Attar, Casamatta, Chassagnon, and Décamps (2019a, 2019b), Bisin and Gottardi (1999, 2003), Bisin and Rampini (2005), Bizer and DeMarzo (1992), Kahn and Mookherjee (1998), Leitner (2012), and Parlour and Rajan (2001).

[14] As touched on above, these pledgeable cash flows can represent specific assets. However, they need not: 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, rather than 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 based on these assets in place, rather than any possible future cash flows. See Lian and Ma (2019).

[15] We analyze "all-or-nothing" acceleration, in which this fraction can be only zero or one, in Section 7.6.

[16] This assumption about ex ante covenant waivers plays only a small role in our analysis: since creditors are willing to relax covenants when violations do not harm (i.e. do not dilute their debt), it allows us to restrict attention to violations that do (see the proofs of Proposition 3 and Proposition 4).

clause. This turns out to be optimal (hence without loss), and allows us to abstract from inter-creditor coordination issues (cf. footnote 11).

Priority rules. Given non-exclusivity, B can enter into different contracts with different creditors that need not be consistent. In particular, B can take on more debt than he can ever repay or violate negative pledge covenants. As such, there must be rules specifying how to resolve conflicting priorities among contracts. We consider the following priority rules.

1. *Secured debt* has priority over assets used as collateral:
   (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 collateral is sold, secured debt is paid ahead of other claims. Specifically, if B sells assets used as collateral, he must pay the secured debt in full before other claims can get any part of the proceeds of the sale. (This reflects how security differs from seniority in practice: whereas seniority gives creditors priority over the proceeds of asset sales only in bankruptcy, security gives them priority outside of bankruptcy as well.)
2. *Unsecured debt (with or without covenants)* is paid in the order it matures. Specifically, unsecured debt due at Date 1 (i.e. accelerated debt) is paid ahead of that due at Date 2. However, in bankruptcy, all debt is accelerated and unsecured debt is paid pro rata.

These priority rules reflect practice, as detailed in the law literature. 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 ahead not only of other creditors, but also ahead of potential purchasers—intuitively, 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...seems somewhat futile (p. 240).

Observe that maturity and collateral are two ways to establish priority, but that collateral is stronger. Short-maturity (viz. accelerated) unsecured debt gets paid before long-maturity unsecured debt, but not before secured debt, because collateral assets cannot be sold to pay unsecured debt.

Beyond being realistic, these priority rules turn out to be (weakly) optimal in our model (Proposition 5).

Restructuring and bankruptcy. At any time, all parties (i.e. B and all creditors) can engage in financial restructuring, i.e. renegotiate their contracts, if it makes them all (strictly) better off.[17] To simplify the analysis, we assume that B has the bargaining power in renegotiation. And, to simplify the presentation, we assume that he cannot raise more than the cost of Project 1 at Date 1. In particular, to pay accelerated debt, he must sell assets, not take on new debt. In Section 7.7, we show that this is without loss of generality.

If, at any date, B is unable to meet debt payments, he is in bankruptcy: all claims are accelerated and paid as per the APR.[18]

2.3 Timeline

The timeline is as follows:

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 via secured debt from competitive creditors or does not.[19]

If a covenant is violated, creditors accelerate (forcing B to sell his assets) or do not.

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

[17] Section 7.4 discusses renegotiation by just sub-coalitions of the parties.

[18] While ours is not a model of bankruptcy per se, we interpret bankruptcy as Chapter 7 bankruptcy (liquidation). Since the model ends at Date 2, and no pledgeable cash flow is destroyed by liquidation at Date 1, there is no scope for Chapter 11 bankruptcy (reorganization).

[19] In Section 7.2, we show that restricting attention to secured debt at Date 1 is without loss.

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.

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:

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

As we will show, this assumption implies that the efficient investment policy is implementable with exclusive contracts. This ensures that our results are driven by non-exclusivity, not just by limited pledgeability.

Assumption 3. Irrespective of Project 1's quality, the total sale value of Project 0 and Project 1 exceeds the face value needed to finance Project 1, i.e. for $Q \in \{H, L\}$,

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

The LHS above is the sale value of both projects and the RHS is the face value of secured debt F_1^s that B must take on to finance Project 1 (secured creditors' break-even condition is $pF_1^s = I_1$, given that projects succeed with probability p and pay zero otherwise). Thus, this assumption implies that dilution is not so severe that there is nothing left to pay unsecured debt after new secured debt has been paid out of the proceeds of an asset sale. Therefore, it is not a foregone conclusion that acceleration cannot benefit unsecured debt.

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.

Our results are driven by the trade-off between the over- and under-investment problems. However, Assumption 2 implies that the limited pledgeability problem is not so severe that it would prevent B from investing efficiently if he could borrow with exclusive contracts:

Lemma 2. (Second best) *The first best investment policy is implementable with exclusive contracts.*

We now ask whether B can achieve the first best with the available instruments (under the associated priority rule).

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 all assets. If Project 1 has quality Q, his debt capacity is $p\big(X_0 + X_1^Q\big)$. Financing Project 1 is feasible whenever B's debt capacity exceeds its cost, or

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

Given Assumption 3, this condition always holds. But B does not necessarily invest when feasible. He must also have incentive to do so. I.e. what he gets—the total non-pledgeable cash flows plus any residual pledgeable cash flows not used to pay creditors—must be higher if he invests than if he does not, or

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

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

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

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 invest in the high-quality project, but not in the low-quality one:

1. *B undertakes Project 1 if $Q = H$.* From equation (8) with $Q = H$, B has incentive to undertake Project 1 if

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

which is satisfied by Assumption 1 with $Q = H$. This simply reflects that Project 1 has positive NPV if $Q = H$—B captures at least 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 does *not* have incentive to undertake Project 1 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, provided Project 1's non-pledgeable cash flow Y_1^L is sufficiently low, B does not invest in it. Otherwise, he has incentive to over-invest, since Date-0 creditors would bear part of the investment cost, but B would capture (at least) the entire non-pledgeable part of it—dilution is effectively a tax imposed on existing debt that subsidizes new financing/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. Renegotiation thus improves efficiency. But it does not necessarily make the first best attainable. The reason is that, if Y_1^L is large, the cost of bribing B not to undertake Project 1 is so high that, anticipating it, the creditor is unwilling to fund Project 0 in the first place. Combined with the conditions above, this gives our first main result.

Proposition 1. (Unsecured debt) *There is a threshold Y_1^* 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*

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

(even if Date-0 debt can be renegotiated).

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 is not satisfied, then creditors can renegotiate, bribing B not to invest. Condition (11) says that this bribe is not prohibitively costly, i.e. there is enough pledgeable cash flow for creditors to break even on average, even if they bear the cost of dilution when $Q = L$. If these conditions are not satisfied, unsecured debt can lead to inefficiencies, because B has incentive to over-invest, benefiting from dilution. Hence, we focus on this case from now on:

Assumption 4. *Unsecured debt cannot implement the first best, i.e.* $Y_1^L > Y_1^*$ *and condition (11) is violated.*

4.2 Secured Debt and Under-investment

Now, suppose B has issued a mix of secured debt with face value F_0^s and unsecured debt with face value 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 can issue 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 B has enough debt capacity to finance Project 1 when $Q = H$, but not enough when $Q = L$, then he 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 4, renegotiation is immaterial—if condition (13) above 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, if all debt is secured, i.e. cannot be diluted, there could be no investment. Thus, to allow for investment, B must reduce the fraction of secured debt, thereby allowing for dilution and increasing his debt capacity. The condition in equation (14) implies that debt capacity is larger if $Q = H$ than if $Q = L$, so 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. If this condition is violated, however, B cannot implement first best, but may under-invest.

Corollary 1. (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 (even if Date-0 debt can be renegotiated).

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. Here, the problem arises whenever the pledgeable cash flows are lower if the project is high quality than if it is low quality (equation (15)). Ex interim renegotiation (i.e. at Date 1, after the project quality is revealed) cannot resolve this inefficiency because limited pledgeability prevents compensation of Date-0 creditors.

5 Negative Pledge Covenants

So far, we have shown that a debt structure containing a mix of secured and unsecured debt can implement the first best sometimes, but not always. In this section, we show negative pledge covenants can help. We consider, first, Date-0 financing entirely with unsecured debt with covenants and, next, with a mix of 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, even in violation of covenants, but in that case the creditor has the option to accelerate the debt. Since acceleration forces B to sell his assets, which destroys non-pledgeable cash flows, the threat of acceleration 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. *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 covenants, taking on new secured debt F_1^s, which is prioritized ahead of his existing debt F_0^c.[20] And suppose B cannot fully repay these debts if his projects pay off (this is necessary for dilution, hence without loss). At maturity, the unsecured creditor has a claim on B's assets, which are worth $X_{\text{tot.}}$ with probability p and zero otherwise. But it is paid after F_1^s (secured debt has priority in bankruptcy), so it gets $p(X_{\text{tot.}} - F_1^s)$. Given the covenant violation, the covenant-protected creditor can, however, accelerate its debt. Acceleration forces B to sell the assets, which are worth $pX_{\text{tot.}}$. But, since the assets serve as collateral for the secured debt, he must first repay F_1^s (secured debt has priority over assets even outside bankruptcy), so it gets $pX_{\text{tot.}} - F_1^s$. Comparing these payoffs, 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 selling assets subsidizes 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 does not accelerate. Thus, B is not deterred from taking new secured debt.

The mechanism behind this result jives with the legal arguments that the negative pledge covenant is a "hollow promise," because, by violating it, B puts his assets out of reach of his unsecured creditors. Indeed, given the acceleration threat is not credible, the outcome is the same as if B borrowed entirely unsecured but without covenants (Proposition 1).

In practice, however, not all unsecured debt has negative pledge covenants (see Section 8.1). Could using negative pledge covenants in only a fraction of the debt be more effective than using them in all of it? We address this question next.

5.2 Mix of Unsecured Debt with and without Covenants

Suppose B finances Project 0 via a mix of unsecured debt with and without negative pledge covenants, with respective face values F_0^c and F_0^u. Let ϕ denote the fraction of the debt with

[20] Recall that we assume that B dilutes with new secured debt, and hence violates the covenants (footnote 19). Dilution with other forms of debt is easy (and optimal) to rule out, as discussed in Section 7.2.

them, $\phi := \frac{F_0^c}{F_0^c+F_0^u}$. The acceleration threat could deter dilution, but it is credible only if the creditor with covenants gains from acceleration. It is still paid behind any new secured debt F_1^s, but now it is paid ahead of the other unsecured debt F_0^u—acceleration dilutes F_0^u. Hence, acceleration is incentive compatible if the benefit of this dilution is large enough.

To see this, suppose that B violates his covenants, taking on new secured debt F_1^s. And suppose B cannot fully repay these debts if his projects pay off (as above, this is necessary for dilution, hence without loss). At maturity, the covenant-protected creditor has a claim on B's assets, which are worth $X_{\text{tot.}}$ with probability p and zero otherwise. Its claim is paid after F_1^s, but pro rata with F_0^u. Hence, it gets $\phi p(X_{\text{tot.}} - F_1^s)$. Given the covenant violation, the covenant-protected creditor can, however, accelerate (some or all of) its debt. Acceleration forces B to sell the assets for $pX_{\text{tot.}}$. But, since the assets serve as collateral, B must first repay F_1^s. Hence, the accelerated debt gets paid from the residual proceeds $pX_{\text{tot.}} - F_1^s$. Given the new debt dilutes the covenant-protected debt, this amount does not suffice to repay F_0^c in full. It is easy to show that the accelerating creditor is better off not accelerating all of its debt, which cannot be paid without triggering bankruptcy, but accelerating exactly $\hat{F}_0^c := pX_{\text{tot.}} - F_1^s$, which can be.[21]

Comparing these payoffs, we see that acceleration is credible if

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

(where the RHS is the amount of accelerated debt, $\hat{F}_0^c$). Now, acceleration can be credible. The reason is that, although acceleration does nothing to reverse dilution by secured debt, it now has a benefit for the covenant-protected creditor: it dilutes the unsecured debt without covenants. The accelerating creditor can get paid at Date 1, before B defaults at Date 2—if it can get its money out before B goes bankrupt, it gains effective priority over other unsecured creditors. Here is yet another side of dilution: the covenant protected-creditor's option to dilute other unsecured debt (via acceleration) creates a credible threat to deter dilution with secured debt (with collateral).

The fraction ϕ of debt with covenants determines the strength of the acceleration threat—the smaller ϕ is, the larger the fraction $(1-\phi)$ of dilutable debt, and the more there is to gain from accelerating.[22] B may thus be able to choose ϕ to make the threat credible in

[21] This way, it gets paid ahead of other unsecured creditors (outside bankruptcy), rather than pro rata with them (in bankruptcy, when all debt would be accelerated). In practice, the creditor might not know exactly how much debt to accelerate. Thus, there is the risk that acceleration forces the firm into bankruptcy, which could undermine creditors' incentives to accelerate. In Section 7.6, however, we show that our results are unchanged if acceleration always triggers bankruptcy.

[22] This finding that decreasing ϕ makes acceleration more attractive contrasts with Gennaioli and Rossi's (2013) that increasing the controlling creditor's share exacerbates its liquidation bias. The difference comes

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 4):

1. *B undertakes Project 1 if $Q = H$.* B will borrow secured in violation of covenants, only if he anticipates that the creditor with covenants will not accelerate,[23] 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 that the creditor with covenants will accelerate, 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*

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

(even if his Date-0 debt can be renegotiated).

This says that if financing the low-quality project dilutes existing debt less than financing the high-quality project does—i.e. if $X_1^L \geq X_1^H$—then negative pledge covenants implement the first best. The result stems from there being a gain from acceleration when dilution is less severe, making the threat credible when dilution is relatively small, but not when it is large. To see why, observe that if B issues new secured debt, the existing unsecured debt is ipso facto junior. Hence, it is both debt-like and equity-like. And the more it is diluted,

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 7.7).

[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 (see also footnote 16). Thanks to Adriano Rampini for pointing this out.

the closer it is to a residual claim—the more it resembles equity, a call option on B's assets that creditors are reluctant to exercise early—and the less credible the acceleration threat is. When dilution is large, it is better not to accelerate, but to "gamble for resurrection" as in the prototypical problem of a firm in distress. Unlike in the prototypical problem, however, this gambling incentive is what leads to the efficient action: it makes the acceleration threat credible in the right state, and hence covenants allow for some dilution—good dilution—despite their stated objective not to.

It is worth stressing that although the asset sale is inefficient, B cannot renegotiate it away with his creditors, thus undermining the acceleration threat. The reason is that the extra cash flows from continuation are non-pledgeable. Hence, creditors (weakly) prefer to force B to sell his assets at Date 1. See, however, Section 7.8 on "coalitional renegotiation."

6 Equilibrium

Our analysis implies that B can always find a debt structure to implement the first best, but the debt structure itself depends on parameters. In particular, observe that 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). Thus, B can always choose a debt structure to implement the first best.

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

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

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

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 rationalizes the real-world priority structure, in the sense that it allows B to use the instruments at his disposal to implement the first-best outcome. The way he uses the instruments also reflects practice, as we discuss in Section 8.1.

7 Extensions

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

7.1 Continuum of Qualities

So far, we have shown the optimality of secured (resp. covenant-protected) debt when high-quality projects are more (resp. less) pledgeable than low-quality projects. Here, we show that this result is robust to having more than two qualities, as long as plegeability 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 is able to fund Project 1 with new secured debt if and only if

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

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

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

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

If X_1^Q is increasing in Q, B can fund Project 1 with secured debt whenever Q is above a cutoff Q^s, where X^{Q^s} equals the RHS of (22). Choosing F_0^s such that $\text{NPV}^{Q^s} = 0$ implements the first best. Conversely, if X_1^Q is decreasing in Q, B can fund Project 1 with a mix of unsecured debt with and without covenants whenever Q is below a cutoff Q^c, where X^{Q^c}

equals the RHS of (23). Choosing ϕ such that $\text{NPV}^{Q^c} = 0$ implements the first best.[24] In summary, our results obtain as long as X_1^Q is monotonic in Q.

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, which dilutes unsecured debt. In theory, he could also borrow via (same priority) unsecured debt at Date 1, which could also dilute unsecured debt. Here, we point out that this option to dilute via unsecured debt (i) does not implement the first best, because it does not create state-contingent incentives to uphold covenants and (ii) does not affect our baseline results, as long as we allow covenants that limit total leverage, not just new secured debt.

To see why dilution via unsecured debt cannot implement the first best, suppose that B can issue debt with a leverage covenant, prohibiting new (secured or unsecured) debt. Suppose B has such covenant-protected debt with face vale F_0^c and other unsecured debt with face value F_0^u. And suppose that he takes on unsecured debt at Date 1 with face value F_1^u, which dilutes this existing debt. Without acceleration, the covenant-protected creditor gets the pro rata share $\frac{F_0^c}{F_0^c+F_0^u+F_1^u}X_{\text{tot.}}$ at Date 2 with probability p and zero otherwise. By accelerating, it gets the first claim on the sale value $pX_{\text{tot.}}$ at Date 1, since it can get its money out before B defaults on its other debt, none of which is secured. Hence, it always accelerates because[25]

$$\frac{F_0^c}{F_0^c + F_0^u + F_1^u} pX_{\text{tot.}} < \min\{F_0^c\,,\, pX_{\text{tot.}}\}. \tag{24}$$

Hence, covenants are never waived, and therefore cannot deter bad dilution without deterring good dilution too. The first best is not implementable via dilution with unsecured debt.

Still, in principle, B could take on new unsecured debt as a way to dilute existing debt without violating negative pledge covenants. Hence, it is optimal to include leverage covenants as well to prohibit such dilution, and preserve our implementation of the first best (Proposition 5).

The weak-covenant puzzle is specific to negative pledge covenants[26]: acceleration does not undo dilution with new secured debt, whereas it does undo dilution with new unsecured debt—it allows old creditors to regain priority over new ones.

[24] 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 $\phi = 1 - \frac{1-p}{p^2}\frac{I_1}{X_0 - Y_1^{Q^c}}$.

[25] Since the accelerating creditor gets at most F_0^c, it must also be that $F_0^c > p\frac{F_0^c}{F_0^c+F_0^u+F_1^u}X_{\text{tot.}}$, which is always satisfied by the assumption that F_0^c is diluted.

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

7.3 Subordinated Debt

So far, we have focused on covenants that limit new secured and unsecured debt. In practice, such covenants typically allow for another type of debt: subordinated debt—debt with a clause specifying that it is only paid after other, "normal" unsecured debt in bankruptcy. B would never find it optimal to issue such debt in our baseline model, because he implements first best without it, enforcing covenants to prevent bad dilution and waiving them to allow for good dilution. However, in practice, some projects might not require any dilution at all—they could be self-financing. In our model, this would correspond to an additional type of project with $Q = HH$, where $pX_1^{HH} > I_1$. If waiving covenants is costly or imperfect in practice, then negative pledge covenants (as in our baseline model) and leverage covenants (as in Section 7.2) allowing B to issue subordinated debt could be useful, since they would allow B to undertake this HH-quality project without requiring any waivers, and this would be efficient.

7.4 Coalitional Renegotiation and Intercreditor Agreements

So far, we have shown that our results are robust to renegotiation that makes all parties better off. Here, we study whether our results are robust to "coalitional renegotiation," in which B renegotiates with only some creditors, and only parties to the renegotiation need to be better off.

The possibility of coalitional renegotiation matters in our model, because it 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.[27] Without the acceleration threat, B would no longer be deterred from over-investing.

In practice, however, "inter-creditor agreements" prohibit some creditors from altering their debts at the expense of others, and from changing the relative priorities of their debts, in particular.[28] If one creditor violates this agreement, he must compensate the injured creditor. As a result, inter-creditor agreements allow creditors to benefit from coalitional renegotiation only if they are collectively better off, as per our baseline feasibility criterion for renegotiation. In our model, as a result, such inter-creditor agreements can provide protection against coalitional renegotiation and thereby preserve our implementation of the first best.

[27] 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 $pX_{\text{tot.}} - F_1^s$.

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

7.5 Asset Sale Discount

So far, we have assumed that selling assets destroys non-pledgeable cash flows, which cannot be captured by outsiders, but none of the pledgeable cash flows. Here, we consider an additional cost of selling (e.g., because it entails early termination, the fire sale is organized hastily, or the asset is specific to the borrower). Say that the proceeds of the asset sale are $\lambda p X_{\text{tot.}}$ with $\lambda < 1$. The analysis of debt structure without covenants does not change, as it does not involve asset sales. The analysis of debt structure with covenants changes, however, since covenant-protected creditors now find it optimal to accelerate if

$$p\lambda\big(X_0 + X_1^Q\big) - F_1^s \geq \phi p'\big(X_0 + X_1^Q - F_1^s\big). \tag{25}$$

Hence, the conditions for efficient investment are as in equations (18) and (19) in the baseline case, except 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. This suggests the additional empirical prediction that when asset sale discounts are larger, firms should use less debt with covenants.

7.6 Bankruptcy due to Acceleration

So far, we have assumed that any fraction of covenant-protected debt F_0^c can be accelerated, making $\hat{F}_0^c \in [0, F_0^c]$ due at Date 1. Here, we show that our results are unchanged if either none or all of it must be, making $\hat{F}_0^c \in \{0, F_0^c\}$ due at Date 1, so acceleration triggers bankruptcy whenever B cannot pay F_0^c in full at Date 1.

In this case, B chooses his debt structure so that if the covenant-protected debt F_0^c is accelerated, it triggers bankruptcy when $Q = H$ (so creditors do not want to accelerate), but not when $Q = L$ (so they do). I.e.

$$p(X_0 + X_1^H) - F_1^s < F_0^c \tag{26}$$

and

$$p(X_0 + X_1^L) - F_1^s \geq F_0^c, \tag{27}$$

which can be simultaneously satisfied whenever $X_1^L \geq X_1^H$. These conditions replace the conditions for the acceleration threat to lead to efficient investment in the baseline model (equations (18) and (19)) as long as (i) creditors prefer to wait than to accelerate and trigger bankruptcy, i.e.

$$\phi\Big(p(X_0 + X_1^Q) - F_1^s\Big) \leq \phi p\left(X_0 + X_1^Q - F_1^s\right) \tag{28}$$

and (ii) creditors prefer to accelerate and be repaid in full than to wait, i.e.

$$F_0^c > p\phi\left(X_0 + X_1^Q - F_1^s\right). \tag{29}$$

These conditions are always satisfied.[29]

7.7 Secured Debt with Covenants and Deductibles

To streamline the exposition, we have assumed B cannot issue new debt in excess of $F_0^s = I_1/p$ at Date 1. Thus, B must pay any accelerated debt by selling assets, not by issuing new debt. Otherwise, he would not be forced to sell assets to pay accelerated debt, which could potentially undermine the acceleration threat, inducing B to invest in the low-quality project. We now show how B can choose his debt structure at Date 0 to commit not to raise more than I_1 at Date 1 (which is optimal, since it implements first best). Say B can enrich his debt structure with debt that is both secured by collateral and protected by negative pledge covenants, but has a clause (i.e. a so-called deductible) that allows him to take on new secured debt up to I_1/p. If B exceeds this deductible, this debt will be accelerated. Indeed, secured creditors will not waive covenants because their debt is paid for sure if accelerated, making secured creditors biased toward assets sales and bankruptcy (cf. Gennaioli and Rossi (2013) and footnote 22 above). Thus, as long as the repayment on this accelerated debt is large enough,[30] B will be forced to sell assets, which defeats the purpose of issuing new debt.

7.8 Imperfectly Correlated Cash Flows

So far, we have assumed that projects are perfectly correlated, so that Project 1 could be seen as an extension of Project 0. Here, we argue that this is not essential for our results (albeit under some stricter parameter restrictions).

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

[29] Equation (28) is immediate. Equation (29) 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.

[30] This could require a penalty rate for violation in the event of acceleration. (In practice, so-called "make whole premiums," which are common contractual provisions which effectively increase the payout on some debt in bankruptcy, could be a way to implement such an effective penalty rate.)

When can B implement the first-best investment policy? To answer, we ask when B invests at Date 1 if (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

$$p'\big(X_0 + X_1^Q - F_0^s\big) \geq I_1. \tag{30}$$

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

$$p\big(X_0 + X_1^Q\big) - F_1^s \geq \phi p'\big(X_0 + X_1^Q - F_1^s\big). \tag{31}$$

Hence, the conditions for efficient investment are as in equations (18) and (19) in the baseline case, except with 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. **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) in part because of their weakness: because they allow for efficient dilution. Thus, we respond to the puzzle stressed by, e.g., Bjerre (1999):

   > 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).

2. **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).[31]

   In our theory, the optimal debt structure allows the borrower to violate covenants by borrowing secured to finance efficient investments.

3. **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 does not violate them in anticipation of their being upheld.

4. **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.

5. **No pecking order of debt types.** I.e. firms do not use the claims with highest priority first and then lower priority claims. In particular, firms (i) borrow unsecured even when they have assets that could serve as collateral (Rampini and Viswanathan (2013)), (ii) include deductibles[32] in senior debt 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 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)).

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

[31] 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 (cf. footnotes 4 and 23).

[32] Deductibles relax covenants restrictions, saying that these restrictions are not applied until after a threshold action. E.g., as in Section 7.7, a deductible in a negative-pledge covenant may allow the borrower to issue new secured debt up to a threshold amount.

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

7. **Public and private debt coexist, and private debt has tighter covenants.** See, e.g., Gopalakrishnan and Prakash (1995).

   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 should be passive. Thus, debt with covenants is more likely to be held by large creditors with expertise/information such as banks, whereas debt without covenants should be held by more dispersed creditors/bondholders.[33]

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

   In our theory, having covenants in some debt helps to discipline the borrower, which increases the price of his other debt (see Lemma 4 in the Appendix). Indeed, discipline is only effective when not all debt has covenants (Proposition 3).[34]

New predictions. In our theory, an optimal debt structure arises from the trade-off between financial flexibility's benefits (avoiding under-investment) and costs (causing over-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. firms that need to do good dilution, 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 in growth opportunities (Billett, King, and Mauer (2007)). Under-investment problems are also likely to be severe in firms with, e.g., (i) large, inflexible investment needs, (ii) strong rivals (so under-investment leads to decreased market share), and (iii) relationship-specific inputs/non-redeployable assets (so under-investment leads to dormant assets). More abstractly, firms that face a trade-off between investments with high immediate pledgeability and high future cash flows should favor covenants.[35]

[33]Thus, we provide an explanation for the role of a large creditor: it needs to be able to enforce or waive covenants unilaterally. This complements explanations in the literature, based on, e.g., creating incentives to monitor (Burkart, Gromb, and Panunzi (1995) and Park (2002)).

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

[35]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.

Prediction 2. *All else equal, firms that are relatively more exposed to over-investment problems, i.e. that need to block bad dilution, 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.*

Over time, good investment opportunities seem to have become more likely to rely on intangible capital, as reflected by the increasing fraction of intangibles on 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)).

Another new prediction is based on the extension in Section 7.5, in which we introduce an asset sale discount.

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

Asset sale discounts 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 the substitutability of covenants and collateral (e.g., Schwartz (1989)). Indeed, this is true in our model. But we show that there is also a complementarity: covenants can implement efficiency only in conjunction with collateral. Although covenants are needed to promise not to use collateral—not to dilute unsecured debt inefficiently—collateral is needed to break that promise—to dilute efficiently.

Security is more than seniority. By the APR, secured debt is senior in bankruptcy (up to the value of the collateral). But secured debt also has priority outside bankruptcy. Assets used as collateral cannot be sold or used as collateral for new debt. This matters because long-term secured debt limits the payoff to short-term (or accelerated) unsecured debt in a way long-term senior debt cannot.

Covenants manage creditor-creditor conflicts, not only borrower-creditor conflicts. The literature stresses how covenants address conflicts between debt and equity. Notably, Smith and Warner (1979) say

> In this paper, we examine how debt contracts are written to control the bondholder-stockholder conflict. We investigate the various kinds of bond covenants which are included in actual debt contracts (p. 117).

Our analysis suggests that conflicts among different debts could be as important as conflicts between debt and equity—indeed, in our model, negative pledge covenants need not exist at all absent multiple creditors holding heterogenous 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.

A role for creditor concentration. In our model, the threat of acceleration helps to mitigate conflicts among debts. But to make the acceleration threat credible, creditors are pitted against each other—one unsecured creditor has the incentive to accelerate only to dilute another's debt. Such a creditor must hold a significant fraction ϕ of unsecured debt, and must act strategically, deciding whether to uphold or waive its covent. Such a large, strategic creditor could represent a bank or other large debt holder. Other creditors, without negative pledge covenants, are passive by comparison, and could represent bondholders, for example. Indeed, in practice, bank debt is concentrated and relatively covenant heavy, whereas bonds are dispersed and relatively covenant lite.

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: dilution via secured debt can trigger over-investment, and dilution via acceleration can lead to an inefficient asset sale. But it can also be good: dilution via collateral can prevent under-investment and dilution via acceleration creates a threat that deters other, inefficient dilution.[36] The optimal debt structure—the amount of secured debt and the amount of unsecured debt with negative pledge covenants—allows for good dilution while preventing bad dilution.

Contingent outcomes via non-contingent contracts (and contingent debt structure). The literature rationalized contingent contracting as a way to implement state-

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

contingent outcomes (e.g., Shavell (1984)). Our model is about implementing a state-contingent outcome too: under the efficient policy, B invests if $Q = H$, but not if $Q = L$. We show that this policy can be implemented with only a variety of debt contracts, which do not depend on the state at all. Rather, contingencies are implemented via contingent dilution, which itself is implemented by mixing debts with different covenants and priorities. The mix of debt contracts B uses resembles firms' real-world funding structure: it is almost all debt, but the debt is heterogeneous.

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.

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 Lemma 2

We show that B and a creditor can commit to an exclusive contract at Date 0 with Date-2 repayments R^H given success if $Q = H$ and R^L given success if $Q = L$ such that:

1. Irrespective of Project 1's quality, B's pledgeable cash flow suffices to meet the promised repayments given success at Date 2 (under the first-best investment policy):

$$X_0 + X_1^H \geq R^H, \tag{32}$$

$$X_0 \geq R^L. \tag{33}$$

2. Given repayments R^H and R^L, the creditor is willing to participate at Date 0, i.e. her expected repayment exceeds her expected investment costs (under the first-best investment policy):

$$p\big(qR^H + (1-q)R^L\big) \geq I_0 + qI_1. \tag{34}$$

Assumption 2 and Assumption 3 imply these inequalities can be satisfied. One easy way to see this is to make the first two bind, so $R^H = X_0 + X_1^H$ and $R^L = X_0$.[37] In this case, the third (inequality (34)) reduces to 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.

[37] Let us note here that this result does not rely on debt being state-contingent. It is also implementable with defaultable debt: letting F_0 be the face value associated with lending I_0 at Date 0 and F_1 with lending I_1 at Date 1, just set

$$R^H \equiv \min\{X_0 + X_1^H, F_0 + F_1\} \quad \text{and} \quad R^L \equiv \min\{X_0, F_0\}. \tag{35}$$

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

$$Y_1^L \leq Y_1^* := \max\left\{0\ ,\ X_0 - F_0^u\right\} - \max\left\{0\ ,\ X_0 + X_1^L - F_0^u - \frac{I_1}{p}\right\}, \tag{36}$$

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

$$F_0^u = I_0/p. \tag{37}$$

Condition (10) becomes

$$Y_1^L + \max\left\{0\ ,\ X_0 + X_1^L - \frac{I_0 + I_1}{p}\right\} \leq X_0 - \frac{I_0}{p}. \tag{38}$$

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

$$Y_1^L \leq X_0 - \frac{I_0}{p}. \tag{39}$$

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

$$X_0 + X_1^L < \frac{I_0 + I_1}{p} \quad \text{and} \quad Y_1^L > X_0 - \frac{I_0}{p}. \tag{40}$$

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:

$$I_0 = p\left(q\left(X_0 + X_1^H - \frac{I_1}{p}\right) + (1-q)F_0^u\right) \tag{41}$$

so

$$F_0^u = \frac{I_0/p - q\left(X_0 + X_1^H - I_1/p\right)}{1-q}. \tag{42}$$

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

$$Y_1^L + \max\left\{\ 0\ ,\ X_0 + X_1^L - F_0^u - \frac{I_1}{p}\ \right\} \leq X_0 - F_0^u. \tag{43}$$

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

$$Y_1^L \leq X_0 - F_0^u, \tag{44}$$

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

$$(1-q)Y_1^L \leq X_0 - \frac{I_0}{p} + q\left(X_1^H - \frac{I_1}{p}\right). \tag{45}$$

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

$$I_0 = p\big(qF_0^u + (1-q)X_0\big) \tag{46}$$

so

$$F_0^u = \frac{I_0/p - (1-q)X_0}{q}. \tag{47}$$

Note that given $X_0 < I_0/p$ in this case, Assumption 2 implies that $F_0^u + I_1/p \le X_0 + X_1^H$, 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 $Y_1^L \le 0$, which is never satisfied.

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

$$Y_1^L \le X_0 - \frac{I_0}{p} \quad \text{if} \quad X_0 + X_1^H - \frac{I_0 + I_1}{p} \ge 0 \tag{48}$$

and (from Case 2)

$$Y_1^L \le \frac{pX_0 - I_0 + q(pX_1^H - I_1)}{p(1-q)} \quad \text{if} \quad X_0 + X_1^H - \frac{I_0 + I_1}{p} < 0. \tag{49}$$

Taken together, equations (48) and (49) can be written as

$$Y_1^L \le Y_1^* \equiv \min\left\{X_0 - \frac{I_0}{p}, \frac{pX_0 - I_0 + q(pX_1^H - I_1)}{p(1-q)}\right\}. \tag{50}$$

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

Date 0 financing. If $Y_1^L \le Y_1^*$, B follows the efficient investment policy and as such Date-0 creditors are willing to financing him (by Lemma 2). 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:

$$p \min\left\{X_0, \hat{F}_0^u\right\} = p \min\left\{X_0 + X_1^L - F_1^s, F_0^u\right\}. \tag{51}$$

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

$$I_0 \le p\left(q \min\left\{X_0 + X_1^H - \frac{I_1}{p}, F_0^u\right\} + (1-q)\min\left\{X_0 + X_1^L - \frac{I_1}{p}, F_0^u\right\}\right). \tag{52}$$

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

$$I_0 \leq p \left[q \left(X_0 + X_1^H - \frac{I_1}{p} \right) + (1-q) \left(X_0 + X_1^L - \frac{I_1}{p} \right) \right]. \tag{53}$$

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

$$X_0 + X_1^L - \frac{I_1}{p} \leq F_0^s < X_0 + X_1^H - \frac{I_1}{p}. \tag{54}$$

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 1

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

$$p \left(X_0 + X_1^L - F_0^s \right) < I_1 \tag{55}$$

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

$$p \left(X_0 + X_1^H - F_0^s \right) < I_1. \tag{56}$$

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

$$p\left(X_0 + X_1^H\right) > pF_0^s + I_1, \tag{57}$$

which contradicts inequality (56). 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. Hence, the outcome is that described in Proposition 1. □

A.7 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. Hence, the outcome is that described in Proposition 1. □

A.8 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 3).
   - We find the prices/face values of B's debts, which allows us to characterize when he will default/not (Lemma 4).
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 5).

   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 4).

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 3. *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 $\tilde{F}_0^c$ 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.

$\square$

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

$$F_1^s = \frac{I_1}{p}. \tag{58}$$

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 (58)).
- 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: $\min\Big\{ F_0^u , pX_{\text{tot.}} - F_1^s - \min\{ F_0^c , pX_{\text{tot.}} - F_1^s\} \Big\}$.

Lemma 4. *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

$$I_0^c = p\left(q\phi\left(X_0 + X_1^H - \frac{I_1}{p}\right) + (1-q)F_0^c\right), \tag{59}$$

$$I_0^u = p\left(q(1-\phi)\left(X_0 + X_1^H - \frac{I_1}{p}\right) + (1-q)F_0^u\right), \tag{60}$$

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 $Q = H$.

$$I_0^c = p\Big(qF_0^c + (1-q)\phi X_0\Big), \tag{61}$$

$$I_0^u = p\Big(q(1-\phi)F_0^u + (1-q)(1-\phi)X_0\Big). \tag{62}$$

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 5. *Suppose new debt dilutes existing debt, i.e.*

$$X_{\text{tot.}} - F_1^s < F_0^c + F_0^u. \tag{63}$$

The following two inequalities are equivalent:

$$pX_{\text{tot.}} - F_1^s \le \phi p\big(X_{\text{tot.}} - F_1^s\big) \tag{64}$$

and

$$\min\left\{F_0^c\,,\, pX_{\text{tot.}} - F_1^s\right\} \le \phi p\Big(X_{\text{tot.}} - F_1^s\Big). \tag{65}$$

Proof. The "if" part (that equation (64) implies (65)) follows immediately from the definition of the minimum.

The "only if" part (that equation (65) implies (64)) follows from supposing (in anticipation of a contradiction) that equation (65) holds and equation (64) does not. Thus, it must be that $F_0^c < pX_{\text{tot.}} - F_1^s$, so equation (65) reads

$$F_0^c \le \phi p(X_{\text{tot.}} - F_1^s). \tag{66}$$

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

$$F_0^c + F_0^u \le p(X_{\text{tot.}} - F_1^s), \tag{67}$$

which contradicts equation (63). Hence, we conclude that $F_0^c \ge pX_{\text{tot.}} - F_1^s$, in which case we have that $\min\left\{F_0^c\,,\, pX_{\text{tot.}} - F_1^s\right\} = pX_{\text{tot.}} - F_1^s$, so equation (65) becomes equation (64), as desired. □

Step 3: Rearranging to find the condition $X_1^H \leq X_1^L$. The last lemma implies, as per footnote 21, that the equations in the text (equations (18) and (19)) are sufficient for efficient investment. Solving for ϕ and rearranging these conditions give

$$\frac{p\big(X_0 + X_1^H\big) - I_1/p}{p\big(X_0 + X_1^H - I_1/p\big)} \leq \phi \leq \frac{p\big(X_0 + X_1^L\big) - I_1/p}{p\big(X_0 + X_1^L - I_1/p\big)}. \tag{68}$$

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 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.9 Proof of Proposition 5

The expression face value F_0 follows from equations (37), (42), and (47) 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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