COLLATERAL*

Jason Roderick Donaldson† Giorgia Piacentino‡

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Abstract

What is collateral? What does it do? We set up a general model to illustrate the current thinking on these questions. The model captures classical ideas on how collateral improves bilateral enforcement by conveying rights of seizure that a creditor can exercise against a borrower. It also captures how collateral improves multilateral enforcement by conveying rights of exclusion that a creditor can exercise against other creditors, something we argue is especially useful to distinguish between secured and unsecured debt. It sets the stage to analyze the restructuring of dispersed claims in and out of bankruptcy, which we describe in more specific models. The framework captures numerous empirical patterns even absent risk, dynamics, and asymmetric information. It thus suggests that those ingredients, while essential in applications, might not be fundamental to what collateral is/does.

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†USC and CEPR.

‡USC, CEPR, ECGI, and NBER.

1 Introduction

For households, firms, banks, countries, or anyone else to borrow money, they need to promise to give it back with interest. But, once they have borrowed, they do not want to keep the promise. That commitment problem can make borrowing limited or impossible, preventing capital from flowing to where it is needed.

To mitigate the problem, a borrower can grant the right to seize assets in default: If he does not fulfill his promise, his creditors can take his stuff. That might be the best he can do absent draconian punishments or an established reputation. A large literature studies how that right can give protection to a unique creditor in an exclusive relationship with a borrower. We set up a model to capture the essence of this literature in Section 2. We then illustrate, inter alia, how the right to seize assets can decrease losses given default, ensuring the creditor gets something even if it is not repaid (Section 2.3); how it can decrease the propensity to default, incentivizing the borrower to repay to avoid giving up everything (Section 2.4); and how it can mitigate opportunistic renegotiation, giving the creditor the threat of liquidating if negotiations break down.

In line with some everyday usage, that literature typically refers to the assets that can be seized in default as "collateral." Legally, however, the word "collateral" is used more narrowly; it is reserved for assets attached to so-called secured debt—which conveys rights to property at inception—and not for assets available to unsecured debt—which conveys rights only in default (following a court judgment). By and large, the models on borrowing under exclusivity do not admit a distinction between different types of debt, and therefore not between assets and collateral either.

The difference between assets explicitly attached to secured debt and those im-

plicitly supporting unsecured debt is more meaningful when the borrower is in a non-exclusive relationship with multiple creditors. Then one creditor's right to seize something can be diluted by another's. The difference is thus the difference between a reserved parking spot—the right to exclude others from parking in a specific spot—and a public lot—the right to seize a spot if one is available. In practice, reserved spots have notices attached to them informing you not to park there. So it is with secured debt. The legal process of notice and attachment is called perfection, achieved by possession at the pawnbroker's and by registration in other debt markets. It creates the right to exclude, informing everyone else of their corresponding duty to heed it (Hohfeld (1913)).

Another literature, which we are devoted to ourselves, explores what happens when collateral conveys the right to exclude. To capture the essence of that literature, we set up a model in which collateral serves to establish the priority of secured debt ahead of unsecured debt (Section 3). We show how, as a result, collateral allows new (secured) creditors to dilute old (unsecured) creditors, leapfrogging them in the priority order. That dilution can be "bad," fostering over-investment, or "good," preventing under-investment in what Donaldson, Gromb, and Piacentino (2020a) call a "collateral overhang problem" (Section 3.3 and Section 3.4). Secured debt is no longer dominant. Instead, the optimal ex ante debt structure mixes secured and unsecured debt to allow for some dilution but not too much in a balancing act between flexibility and commitment, a result that the speaks to the prevalence of unsecured debt nowadays (Benmelech, Kumar, and Rajan (2019)).

Under non-exclusivity, we can distinguish not only between secured and unsecured debt, but also between so-called pledgeable output, which all debt has a claim to, and explicit collateral, which secured debt has priority over. We show

how higher pledgeable output can, paradoxically, make it harder to borrow without collateral. The reason is that it becomes easier to dilute with collateral later on, forcing creditors to require collateral as protection today in a "collateral rat race" (Section 3.5).

Almost no claim is immutable. They can be restructured. In Section 4.1, we use a reduced-form model to illustrate how collateral then presents another trade-off between commitment and flexibility. It grants protection against opportunistic restructurings, when a borrower can impose coercive write-downs on unsecured creditors, but can also impede efficient restructurings, when secured creditors hold out from write-downs that could be collectively beneficial. The institution that is supposed to address that market failure is bankruptcy.

In bankruptcy, unsecured and secured debts alike are stayed; typically, claims are mutually incompatible, as the borrower's assets are insufficient to satisfy his debts. Claims are paid in the order of perfection, so earlier secured debts are paid ahead of later, which are paid ahead of unsecured, which are all treated equally, almost by necessity—absent public notice, who could say which were taken first? A new line of research, which we outline in Section 4.2, explores how bankruptcy law must weigh the competing incentives of claims of various priorities, creating a trilemma as (i) unsecured debt rushes to find collateral, creating a commons problem, (ii) secured debt blocks their efforts, creating a so-called anti-commons problem, and (iii) other agents, whose expertise is necessary for efficient restructuring, are prone to shirk or skim. In this framework, as in the other models of non-exclusive borrowing, collateral strengthens a debt claim, but might not always be a good thing.

We hardly talk at all about risk, dynamics, or even prices. As much as they

matter for applications,[1] our analysis here suggests those ingredients might not be essential to understand what collateral is and does. We largely abstract from differences among different types of secured debt, as, to date, the finance and economics literature does not distinguish between things called pledges, charges, mortgages, hypothecs, and so on. It does single out leases, which are heavily used as super secured financing (see Eisfeldt and Rampini (2009)).

The power of collateral is not in dispute. There is consensus in the literature that it conveys a property right and, as such, constitutes a stronger claim than a mere contract. For example, an unsecured debt specifying that an asset not be used as collateral for another can be effectively overridden by the selfsame contract it supposedly defends against: Once the asset is collateral for a new debt, the original debt is excluded from it (see, e.g., Bjerre (1999) and Donaldson, Gromb, and Piacentino (2025)). Even though property rights are by now canonical in economic thought, as sanctified by the Nobel Prizes awarded to Coase, Williamson, and Hart, the literature falls short on explaining why they achieve something that other claims cannot.

To understand collateral, we still need to pin down what makes property rights special. That remains, we think, the most pressing task for future research. In the Conclusion (Section 5), we suggest some possible paths forward. One is to zero in on how it is hard to establish priority definitively, requiring laws and institutions for public notice; one is to start with the question of how to codify laws, institutions, and property registries in a (natural or formal) language; another is to take

[1] Hart and Moore (1989/1998, 1994) connect collateral to repayment dynamics, whereas Rampini and Viswanathan (2010) show that in an environment in which collateral is the only way to enforce repayment, you cannot to better than you can one-period contracts. That paper and Rampini and Viswanathan (2022) show how collateral constraints matter for risk management. Alvarez and Jermann (2000), Kehoe and Levine (1993), Kiyotaki and Moore (1997) Geanakoplos (1997), and Rampini (2019) show how collateral constraints matter for asset prices.

a broader view of what rights are and what makes them distinct from markets and contracts; and yet another is to acknowledge that people make mistakes, leading to inconsistencies or so-called "landmines" in their contracts that are naturally resolved by a priority rule.

2 Collateral under Exclusivity

We start by setting up a flexible model of exclusive finance between a borrower and a single creditor (Section 2.1). After a brief summary of what happens with commitment (Section 2.2), we analyze what collateral is and what it does under various forms of limited commitment, showing how it provides value to the creditor in the event of default (Section 2.3), how it provides incentives to the borrower not to default (Section 2.4), and how it provides the creditor with protection against renegotiation (Section 2.5). We touch on some empirical issues as we go, notably the debate about asset- and cash flow-based debt.

2.1 Framework under Exclusivity

We consider a penniless borrower B seeking finance from a competitive creditor C; the relationship is exclusive by fiat—there is no one else around. B needs an amount I to invest in a project that pays off $X + Y$ tomorrow. We refer to X as "pledgeable output," often thought of as tangible assets in the literature, and Y as "non-pledgeable output," often thought of as stuff that can be diverted for private use or as pure private benefits/perks. For our purposes, the action comes from the assumptions about and the interpretation of outsiders' claims on X and Y. We fill those in to capture various roles of collateral below. We assume throughout that

$X + Y > I$, so that investment is efficient, but consider both cases, $X \lesseqgtr I$, so that the pledgeable output might not suffice to cover the investment cost.

For brevity, we omit details that we hope you can guess or do without (e.g., we might not be explicit about bargaining protocols, solution concepts, or even preferences); we refer you, with apologies, to the original sources if we end up being too terse. We note only that we assume that there is no time discounting.

2.2 Full Commitment Benchmark under Exclusivity

The model is set up so that the efficient outcome is to invest in the project, $X+Y > I$. With full commitment (and absent any other frictions), B and C will contract to implement it. As C is competitive and there is no discounting, how to do that is almost immediate: B always borrows I from C today. Then, tomorrow, he repays I from its proceeds.[2] The surplus is the project's NPV $= X + Y - I$.

2.3 Collateral as Protection in Default

The starting point for limited commitment is strategic default. B can borrow I promising to repay F to C; then, having borrowed, he naturally prefers to renege and default.[3]

The notion of collateral here comes from the assumption that B can freely keep or consume the nonpledgable part of the output Y, but X is fixed and seizable by the creditor. X is called collateral.[4]

[2]There is no unique implementation of the outcome, however. For example, if public randomization is possible, he could pay $2I$ to C half the time. For the most part, we focus on standard implementations, which, it so happens, also resonate with what happens in practice.

[3]An early analysis of strategic default, applied to a sovereign borrower, is Eaton and Gersovitz (1981).

[4]This definition of collateral is also used in models based on asymmetric information. But the role of pledging collateral is different, helping borrowers to signal their quality, not creditors to

In this set-up, B can credibly promise any $F \leq X$. So there are two cases, for $X \lessgtr I$. If $X \geq I$—the value of collateral exceeds the investment cost—C lends, B repays, and the outcome is efficient. If $X < I$, there is nothing doing.

This model captures what kind of things should be used as collateral—pledgeable assets that cannot be diverted—and captures how such assets boost debt capacity, in line with evidence (e.g., Benmelech and Bergman (2009), Rajan and Zingales (1995), and Rampini and Viswanathan (2013)).

The model does not permit a distinction between secured and unsecured debt, however. Collateral and pledgeable assets coincide by fiat here; in practice, unsecured debt could also seek X as a remedy in default.[5] Unsecured debt has not only the right to seek a judgment to seize assets, as stressed in the Introduction, it also has a claim on the (liquidated or reorganized) borrower in bankruptcy, as we discuss in Section 4.2.

2.4 Collateral as the Incentive not to Default

A twist on the environment in Section 2.3 shows how collateral creates value even in excess of the pledgeable output X.

Here we assume that if C seizes X, B forgoes not only X itself but also Y, the idea being that Y accrues to B by dint of ownership or possession, as in the literature that interprets Y as private benefits of control (of the assets).[6] It is usually still only X (or the asset worth X in the market) that is called collateral, as Y has no value to outsiders such as C.

enforce repayment. Notably, in Bester (1985) and Besanko and Thakor (1987), borrowers who are less likely to default are more willing to pledge assets as collateral because, by construction, they give them up with lower probability.

[5] Benmelech, Kumar, and Rajan (2025) show how assets matter for unsecured debt capacity.

[6] Bolton and Scharfstein (1990) is the canonical model in this vein.

In this case, B prefers to repay a debt F whenever it is less than what he gives up in default, or $F \leq X + Y$. So B can finance any efficient project. (Yay!)

This model has the same shortcomings as the last, but, arguably, has an additional strength. It can explain how collateral facilitates borrowing in excess of its market value. As above, it creates not only the incentive for the creditor to seize assets (C gets X), but also a greater incentive for the borrower not to give them up (B loses $X + Y$).

The model can thus speak to an ongoing discussion about what bankers call "asset based" and "cash flow based" debts (Ivashina, Laeven, and Moral-Benito (2022), Kermani and Ma (2022), and Lian and Ma (2021)). The interpretation is that the stock of debt that exceeds the market value of assets is cash flow based and the rest is asset based. Here that would say that the first X dollars of debt is asset based and the rest is cash flow based, or, asset based $= \min\{F, X\}$ and cash flow based $= F - \min\{F, X\}$. But, in this model, we can reasonably say that all debt, even that in excess of the asset value, is "based on" assets, as the threat to seize assets is the only thing that makes B repay at all, and it makes him repay more than the market value of his assets X. That dispels as nonsense any assertion that the ubiquity of cash flow based debt invalidates models with asset-based borrowing constraints, termed "collateral constraints" in the macro literature.[7] It is just that the right constraint here is $F \leq X + Y$, not $F \leq X$.

You could respond that to calculate what debt is "asset based" we should use the borrower's private value, not the market value and, under this model, you would be justified. But you would confront (at least) two rejoinders. First, under other models (e.g., that of Section 2.3), the other definition is more appropriate and,

[7]Rampini and Viswanathan (2024) make this point painstakingly clear, albeit based on a different model.

second, almost by definition, it is hard for anyone to know the private value of assets.

2.5 Collateral as Protection against Renegotiation

Things change again if debt can be renegotiated, a possibility that is hard to rule out (cf. Section 4.1); indeed, for bilateral contracts, it can be more the norm than the exception (see, e.g., Roberts and Sufi (2009)).

The twist here is that, in the event of default, B and C can renegotiate, agreeing on a new repayment in lieu of seizure (that is efficient, because, per Section 2.4, the nonpledgeable output is destroyed in seizure).[8] We assume that the renegotiated repayment is determined by bilateral bargaining, where B and C get respective fractions β and $1-\beta$ of the surplus created by avoiding seizure. So B gets βY and C gets $X + (1-\beta)Y$.

In this set-up, B repays anything up to $F = X + (1-\beta)Y$. Otherwise, he defaults. So there are two cases, for $X + (1-\beta)Y \lesseqgtr I$. If $X + (1-\beta)Y \geq I$, C lends, B repays, and the outcome is efficient. Otherwise, things are not so rosy.

The model shares the attractive features of the models above. Both pledgeable and nonpledgeable output matter, but pledgeable output matters more—in the sense that, as $1-\beta < 1$, B's debt capacity $X + (1-\beta)Y$ is more sensitive to X than Y. Thus, if you interpret all output $X + Y$ as collateral, it is true that pledgeable assets are the ideal collateral, but they are not the only collateral, in line with the prevalence of "cash flow based" debt discussed in Section 2.4.

The model also shares the shortcomings of those above. Moreover, to say what debt capacity is, we need to know the split of surplus in renegotiation. Following

[8] A representative model is Hart and Moore (1989/1998).

what Williamson (1985) terms the "fundamental transformation" from competition in the market before contracting to bilateral monopoly afterward, there is no way to say what that is.

3 Collateral under Non-exclusivity

We now modify the framework of Section 2 to include non-exclusivity, in that a borrower can dilute debt to one creditor with new debt to another (Section 3.1). That allows us to capture how a claim to collateral conveys not only the right to seize it, but also the right to stop others from doing so—securing a debt with collateral conveys priority over it. After saying what happens under full commitment (Section 3.2), we analyze two symmetric roles of collateral as priority. We show, first, how it can serve to dilute existing debt and foster investment, for better or worse (Section 3.3) and, second, how it can also protect against such dilution, impeding investment, also for better or worse (Section 3.4 and Section 3.5). We touch on whether policies manufacturing collateral are always good, noting how it depends on what you mean when you say "collateral."

3.1 Framework under Non-exclusivity

We now extend the model in Section 2.1 to admit non-exclusivity and, therefore, the role of collateral to establish exclusivity. The set-up resembles that in Donaldson, Gromb, and Piacentino (2020a, 2025).

We keep the ingredients from above: A borrower B has an investment project that costs I and pays off the mix of pledgeable and nonpledgeable output $X + Y$; he is penniless and can seek to finance it from a creditor C.[9]

[9]A relationship between two parties is non-exclusive if (at least) one of them can enter into

The addition here is that there is a second project analogous to the first financed from a second creditor $\tilde{\text{C}}$. The second project requires financing $\tilde{I}$ after the first is underway and pays off output $\tilde{X} + \tilde{Y}$, with pledgeable and nonpledgeable output denoted analogously. We assume, for simplicity, that B prefers to do the project even if it has negative NPV (as is indeed optimal for B under appropriate, albeit omitted assumptions; see footnote 14). We allow the second project to have either positive or negative NPV but maintain the assumption that the first project is positive NPV: $\tilde{X} + \tilde{Y} \lesseqgtr \tilde{I}$ and $X + Y > I$.

We assume throughout that B gets the nonpledgeable output Y and $\tilde{Y}$ no matter what, as in Section 2.3; the deterrence effect of Section 2.4 is thus switched off.

3.2 Full Commitment Benchmark

The model is set up so that the efficient outcome is to invest in the first project and to invest in the second if it has positive NPV. With full commitment (and absent any other frictions), B and the creditors will contract to implement it. As creditors are competitive and there is no discounting, how to do that is almost immediate: B always borrows I from C and, if $\tilde{X} + \tilde{Y} > 0$, he also borrows $\tilde{I}$ from $\tilde{\text{C}}$. Then, tomorrow, he repays what he borrowed from the proceeds. The surplus is the NPV of the funded project(s): $X + Y - I + \mathbb{1}_{\{\tilde{X}+\tilde{Y}\geq\tilde{I}\}}\big(\tilde{X} + \tilde{Y} - \tilde{I}\big)$. (The caveat from Section 2.2 applies here as well: This implementation, while standard and realistic, is not unique; see footnote 2.)

another relationship with a third party. Here that third party is a creditor. It need not be. It could also be an asset buyer, for example; see Donaldson, Gromb, and Piacentino (2021).

3.3 Collateral to Dilute Existing Debt

We start with the possibility that using collateral for new debt could dilute existing debt (as in, notably, Stulz and Johnson (1985) and Ayotte and Bolton (2011)). Having promised to repay one debt without collateral, the borrower can give his assets to another as collateral.[10,11] That can loosen financial constraints and foster investment, which, we show, could be good or bad from the ex interim point of view. (For now we take debt in place as given; we turn to what happens ex ante in Section 3.5 below.)

The key assumption here is that if B has not used pledgeable output X as collateral for debt to C—his first debt is "unsecured"—he can use X as collateral for debt to $\tilde{\text{C}}$—his second debt is "secured," where secured debt, by definition, has higher priority than unsecured.[12] Thus B can promise the pledgeable output of both projects, $X + \tilde{X}$, to $\tilde{\text{C}}$.[13]

In this case, B can promise to repay $\tilde{\text{C}}$ anything up to $\tilde{F}^s = X + \tilde{X}$. So there are two cases, for $X + \tilde{X} \lessgtr \tilde{I}$. If $X + \tilde{X} \geq \tilde{I}$, $\tilde{\text{C}}$ lends, B invests, and B repays $\tilde{\text{C}}$. Otherwise, the second project does not get off the ground. That comparison between pledgeable output and investment cost resembles what happens under exclusivity when collateral serves to protect against default (Section 2.3). A distinction is that

[10]Such leapfrogging in the priority order is not necessary for debt dilution; indeed, Bizer and DeMarzo (1992) show that even junior debt can dilute (it causes higher leverage which can decrease managerial effort and thereby decrease the probability of repayment on all debt); see also Admati et al. (2013) and DeMarzo and He (2016).

[11]Short-maturity can have an effect analogous to collateral; see Brunnermeier and Oehmke (2013).

[12]So financing the second project constitutes so-called "priority spreading," by which borrowers with mostly unsecured debt take on secured debt as well (Badoer, Dudley, and James (2019)).

[13]The premise that unsecured debt is vulnerable to dilution and secured debt is not is grounded in the Hohfeldian concept of higher order rights, viz. rights over rights and their limits, termed "power" and "immunity." A priori, unsecured debt barely limits a borrower's power to convey rights in his assets to new claimants, thereby diluting it. Secured debt, in contrast, has immunity to such dilution by new claims, a carve-out of the borrower's power.

here what matters is the comparison between the financing cost of one project with the pledgeable output of two, instead of just one.

There are two more meaningful differences between what happens here and under exclusivity in Section 2.3. The first is that B's new debt could dilute his old debt, in that even though he always repays $\tilde{\text{C}}$, he could default on his debt to C. C gets at most $X + \tilde{X} - \tilde{I}$, i.e. the total pledgeable output minus the repayment to secured debt; if that is less than what he promised to C, B's new debt to $\tilde{\text{C}}$ dilutes his old debt to C.[14]

Another difference, at the heart of Donaldson, Gromb, and Piacentino (2025), is that such dilution could be good or bad, depending on the NPV of the second project. If $\tilde{X} + \tilde{Y} \geq \tilde{I}$, dilution is good. It loosens the financial constraints that prevented efficient investment above. But now, per the benefit of dilution above, there is also the possibility of overinvestment. If $\tilde{X} + \tilde{Y} < \tilde{I}$, dilution is bad. It allows B to invest in a project he should not have, just to rip off C. That is the first bad thing collateral does that we have seen so far. Financing the first project with secured debt protects against that, as we turn to next.

3.4 Collateral Overhang

We now turn to how having promised collateral to old debt impedes taking on new debt. Tightening financial constraints, it can lead to underinvestment, which, we show, can be good or bad from the ex interim point of view.

The key assumption here is that if B has used (part of the) pledgeable output X as collateral for debt to C—his first debt is secured—he can*not* use it as collateral for debt to $\tilde{\text{C}}$. The relevant role of collateral here is to constrain leapfrogging by new

[14]Thus B has incentive to invest in the second project just to benefit from the reduced repayment to C, supporting our assumption that B always wants to borrow (Section 3.1).

debt. Thus B can offer $\tilde{\text{C}}$ only what is not already promised to C, or $X + \tilde{X} - F^s$, where F^s denotes B's existing debt.

In this case, B can promise $\tilde{\text{C}}$ only up to $\tilde{F}^s = X + \tilde{X} - F^s$. So there are two cases, for $X + \tilde{X} - F^s \lesseqgtr \tilde{I}$. If $X + \tilde{X} - F^s \geq \tilde{I}$, there is plenty of pledgeable output to go around. $\tilde{\text{C}}$ lends, B invests, and B repays all his debt in full. Otherwise, the project does not get off the ground.

That is the flip side of the previous case (Section 3.4). It can likewise be efficient or inefficient: It can provide commitment not to invest in bad projects—blocking the "bad dilution" above—but it can also limit flexibility to invest in good ones—preventing the "good dilution" above. That is the collateral overhang problem of Donaldson, Gromb, and Piacentino (2020a), another bad thing collateral can do, on top of the "bad dilution" in Section 3.3.

3.5 Collateral as Protection against Dilution

We now turn to the ex ante choice of whether to use collateral or not. We explore how the types of assets available for collateral—namely, more- or less-pledgeable output—interacts with the types of claims chosen—namely, secured and unsecured debt. For brevity, we focus on the case in which new debt dilutes old debt, assuming that the total investment cost exceeds the pledgeable output: $I + \tilde{I} > X + \tilde{X}$.

We first study the case in which B borrows from C via unsecured debt. B repays C in full as long as he does not dilute the debt with new debt to $\tilde{\text{C}}$, i.e. as long as he is too constrained to finance the second project. Per Section 3.3, that is the case when $\tilde{X} < \tilde{I} - X$. Thus, with sufficiently *low* pledgeable output, B does not dilute his initial debt and C is willing to lend unsecured.

Things change if pledgeable output is higher ex interim (i.e. $\tilde{X} > \tilde{I} - X$). In that

case, B can (and does) borrow from $\tilde{C}$. C is diluted and, anticipating as much, is unwilling to lend unsecured in the first place. That is the "paradox of pledgeability" in Donaldson, Gromb, and Piacentino (2020a): Higher pledgeability can undermine unsecured lending. That resonates with the evidence in Vig (2013), who finds that lending declined following an increase in creditor rights in India, and it suggests that policies aimed to manufacture collateral might not make it any less scarce, as they could increase the demand for collateral as much as the supply.

B can offer C protection in the form of collateral.[15] Indeed, with the risk of dilution, and without other remedies, he must. One creditor requires assets as collateral to just prevent the assets from being used as collateral for another. That is what we call a "collateral rat race" in Donaldson, Gromb, and Piacentino (2020a).

The rat race is inefficient in that it can induce a collateral overhang problem, by which B cannot invest in the second project even if it has positive NPV ($\tilde{X}+\tilde{Y} > \tilde{I}$): In that case, the surplus is less than under full commitment (Section 3.2). But, as the first project has positive NPV, it is still better than what happens if collateral is not available to give to C (i.e. nothing).

That said, as discussed in Donaldson, Gromb, and Piacentino (2020a), there could be circumstances in which secured debt is unavailable to finance the first project, so that high pledgeability of the second project prevents its financing altogether, decreasing overall efficiency.[16]

Moreover, secured debt is not an optimal mechanism to finance the first project, as offering collateral with some probability—so dilution happens sometimes but

[15] See DeMarzo (2019) for a dynamic model of collateral as dilution protection.

[16] For example, it might be impossible to ring fence assets away from other claimants ex ante, even if they can be seized ex post. In Donaldson, Gromb, and Piacentino (2020a, 2020b), we discuss that distinction—between what we call "pledgeability" and "collateralizability"—and other sources of inefficiencies from increasing what can be promised to creditors.

C still breaks even—would be better.[17] Not to mention that, in the real world, secured debt comes with costs that unsecured debt does not, such as maintaining public registries and forgone privacy (by dint of that public registration).

Covenants provide widely-used alternative mechanisms (see, e.g., Billett, King, and Mauer (2007)). Not being perfected, they convey weaker rights than collateral, as touched on in the Introduction. In the event of a breach, creditors have limited rights to recoup collateral from third parties. They have a mere claim against the borrower, who likely has little left to seize (see, e.g., Bjerre (1999) and Hahn (2010)). That need not be a bug, however. It can be a feature because, as Donaldson, Gromb, and Piacentino (2025) show, those weaker rights can provide the borrower the flexibility to avoid the collateral overhang problem, while still disciplining him enough to prevent over-investment.

4 Collateral in Restructurings under Non-exclusivity

Here we study a borrower restructuring multiple debts at once, in a return to renegotiation (Section 2.5) but now under non-exclusivity. We first discuss two of the problems of out-of-court bond restructuring, the hold-out and hold-in problems, when each creditor's individually optimal decision to accept a haircut does not align with the collectivity's, for better or worse (Section 4.1). We then turn to the institution designed to solve problems of out-of-court restructuring: bankruptcy. We show how it must balance the problems of unsecured and secured debt, trading off between what is called the commons problem, in which creditors race to grab assets too much, and the anti-commons problem, in which they stop others from grabbing enough of them.

[17] Financing mechanisms based on stochastic control date back to Aghion and Bolton (1992).

4.1 Collateral in Bond Restructurings

We start with the hold-out problem, a market failure that arises in bond restructuring under non-exclusivity, and elsewhere (see, notably, Yu (2024)). Collateral as a dilution device mitigates the problem but can also backfire, creating the so-called hold-in problem. So there is a trade-off between good and bad dilution parallel to that in Section 3.3.

To illustrate the problems, we set up a reduced-form framework in which a borrower B has one unit of unsecured debt outstanding, owing one unit to each of a continuum of creditors (think: dispersed bond holders). B can offer a haircut h_i to each creditor $\mathrm{C}_i, i \in [0,1]$, and each individually chooses whether to accept or reject. We denote the average offer by $\bar{h}$, so if all creditors accept the haircut, B's total debt is $1-\bar{h}$.

To start, we assume that there is just one type of debt with recovery rate denoted by $\rho[\,\cdot\,]$, which is a decreasing function of the total amount of debt—the more debt there is, the less each creditor gets.

In the background there is the idea that sometimes a haircut could benefit not only B, but also the creditors C_i; perhaps B's debt is so high that he is unlikely to repay at all unless he gets some breathing room, in which case he could at least pay something. In that case, if everyone takes a haircut, it benefits creditors collectively.

The hold-out problem is that creditors might individually reject such an offer. The reason is that each C_i, being small, takes the average haircut $\bar{h}$ as given and, therefore, fails to internalize the effect of accepting on the recovery rate $\rho[\,1-\bar{h}\,]$. So C_i accepts only if $\rho[\,1-\bar{h}\,](1-h_i) \geq \rho[\,1-\bar{h}\,]$, i.e., if the product of the recovery rate and face value of new debt exceeds that of old debt. That is not satisfied for any $h_i > 0$.

The role of collateral here is to solve the problem by giving creditors something in exchange for their haircuts. Now we assume that there are two types of debt. There is unsecured debt in place that can be exchanged for secured debt. Capturing priority, we assume that the recovery rate on secured debt is greater than that on unsecured $\rho_s > \rho_u$. We assume that ρ_s is constant. That is for simplicity only. What matters is that $\rho_u = \rho_u[\cdot, \cdot]$ is a function both of the total amount of debt and of the amount of secured debt. It is decreasing in both, capturing how more total debt makes default more likely, as above, and now also how more secured debt dilutes unsecured debt.

As in practice, B can do a "distressed exchange," whereby he offers collateral to the creditors that accept. C_i accepts the exchange only if the product of the recovery rate and face value of new secured debt exceeds that of old unsecured debt, taking the others' haircuts $\bar{h}$ and, therefore, the dilution of unsecured debt, as given:

$$\rho_s(1 - h_i) \geq \rho_u[1 - \bar{h}, 1 - \bar{h}], \tag{1}$$

where the first argument of ρ_u is the total amount of debt and the second the total amount of secured debt (they coincide because all debt is secured after the exchange). Plugging in that $h_i \equiv \bar{h}$ in equilibrium and solving with the binding inequality gives the achievable haircut:

$$\bar{h} = 1 - \frac{\rho_u[1 - \bar{h}, 1 - \bar{h}]}{\rho_s}. \tag{2}$$

Since secured debt recovers more than unsecured debt (so $\rho_u[1 - \bar{h}, 1 - \bar{h}] < \rho_s$), the haircut is positive—there is now restructuring in equilibrium.

Collateral relieves the hold-out problem by enticing each creditor to accept a

haircut that benefits them collectively. But it also creates the so-called hold-in problem, trapping each into accepting a restructuring that could hurt them. Because each C_i takes all other creditors' actions as given, the best-response equations and the expression for the equilibrium haircut are the same in both cases.

The distinction between the hold-out and hold-in problems is whether the exchange offer makes the creditors collectivity better off relative to no restructuring whatsoever. In equations, that comparison is between the payoff given the individually—not collectively!—optimal haircuts in equation (2) and those with no haircuts at all: $\rho_s(1-\bar{h}) \lessgtr \rho_u[1,0]$, where the arguments of ρ_u reflect that without the offer there is a unit of unsecured debt and no secured debt. If the decrease in face value (from 1 to $1-\bar{h}$) is more than off set by the increase in recovery rate (from $\rho_u[1,0]$ to ρ_s), collateral does something close to the "good dilution" above. Otherwise, it does something more like "bad dilution" (Section 3.3).[18,19]

That is what happens with unsecured debt in place. With secured debt in place, there is no way to dilute with higher-priority debt and thus no restructuring whatsoever.[20] Thus there is a trade-off between flexibility and rigidity akin to what we saw in Section 3.5. Collateral here is likewise a tool to manage that trade-off. Now it gives the borrower something to bribe creditors with ex post, mitigating the

[18]The analogy with good and bad dilution in Section 3.3 is not an identity. Whereas avoiding the hold-out problem here can make all creditors better off, good dilution there increases the total surplus but does not help creditors.

[19]In the specific set-up here, substituting the equilibrium haircut into the comparison gives $\rho_u[1-\bar{h}, 1-\bar{h}] \lessgtr \rho_u[1,0]$. That equation captures the trade-off between the benefit of decreasing total debt—decreasing the first argument of ρ_u from 1 to $1-\bar{h}$—and the costs of dilution by increasing secured debt—increasing the second from 0 to $1-\bar{h}$. If the benefit outweighs the cost, it is a hold-out problem; if not, a hold-in.

[20]A caveat: Sometimes contractual instruments, such as collective action clauses, exit consents, and consent payments, can also mitigate the problem; see, e.g,. Donaldson, Kremens, and Piacentino (2024) and Kahan and Tuckman (1993). Another: A controversial class of "super priority" instruments can sometimes leapfrog even secured debt; see Bolton and Oehmke (2015) and Antill, Wang, and Jiang (2024).

hold out problem, and something to offer them as protection ex ante, fending off the hold-in problem.[21]

Unlike above, where inefficiencies were generally the result of things like limited commitment and missing markets that a social planner might not be able to do anything about, here there is a classical externality that could justify policy intervention. It is a so-called "anti-commons problem," whereby each creditor, bargaining bilaterally with the debtor, fails to internalize the benefit of accepting a haircut on others.[22] The main policy toolkit to resolve the problem is bankruptcy, which we turn to next.

4.2 Collateral in Bankruptcy

We start with the classical raison d'être of bankruptcy: to stop a distressed borrower's creditors racing to seize assets before it is too late. The race is a commons problem in which creditors overuse shared assets, effectively diluting one another's debt.

In its role as dilution protection, collateral alone can solve that problem. It ensures each creditor has an exclusive claim to specific assets that no other creditor can leapfrog. But, as in the hold-out problem in Section 4.1, that individual creditor has the incentive to exercise exclusion rights too aggressively causing an anti-commons problem of underuse.

Bankruptcy is thus a balancing act. It cannot be only about solving the commons problem. Rather, it must weigh it against the anti-commons problem (Ayotte,

[21]The mechanism also points to why there are, to a crude approximation, two priority classes of debt in reality: secured and unsecured. With more classes you could keep holding creditors in repeatedly.

[22]Bolton and Jeanne (2007, 2009) show why borrowers could choose an ex ante debt structure that is too hard to restructure, even from the second-best perspective.

Donaldson, and Piacentino (2024)).

For illustration, consider a borrower B.[23] On the left-hand side of the balance sheet, B has assets worth L in liquidation and V in continuation. On the right-hand side, B has debts to two creditors, C_1 and C_2, each with face value F. B is in financial distress, in that the debt to each creditor exceeds the asset value: $F > \max\{L, V\}$. We allow either liquidation or continuation to be efficient ($L \lesseqgtr V$) but, to simplify the analysis, we assume L and V not too far apart either: $2\min\{L, V\} > \max\{L, V\}$.

What type of debt creditors have determines their rights to seize and/or to exclude others from seizing. We consider what happens when all debt is unsecured, in that creditors have seizure rights only, and when it is all secured, in that creditors have exclusion rights as well. If either creditor seizes, then B liquidates to meet the claim. Sequential service applies: A seizing creditor is paid in full if sufficient assets remain unencumbered and gets what is left otherwise. But exclusion rights, almost by definition, provide immunity to seizure rights, ensuring claims are preserved (Hohfeld (1913)) to the extent that they can be; they divide collateral equally if their collateral is insufficient to satisfy their claims (here that means that C_1 and C_2 each get $V/2$ if they both block).

With unsecured debt, there is a creditor race (commons problem), in that an individual creditor's best response to the other's seizure is to seize. To see that, suppose that one creditor, say C_{-i} seizes. C_i prefers to seize too, getting $L/2$, than to wait and be left with zero after C_{-i} has seized L (recall $L - F < 0$). So, by symmetry, both creditors seizing is an equilibrium. That causes liquidation even if continuation is efficient (even if $V > L$).

With secured debt, there is a hold-out (anti-commons) problem. To see that,

[23]The analysis here is based on work in progress with Ken Ayotte and Zhe Wang.

suppose that C_{-i} blocks, so C_i is blocked from taking, and can only either block or not. C_i prefers to block too, getting $V/2$, than to be passive and allow C_{-i} to seize freely, leaving C_i with zero ($L - F < 0$). So, by symmetry, both creditors blocking is an equilibrium. That leads to continuation even if liquidation is efficient (even if $V < L$).

The analysis here shows that it is hard to allocate rights to resolve both the commons and anti-commons problems at once. Too much unsecured debt leads to a commons problem; too much secured, to an anti-commons. Bankruptcy exists to balance the problems, granting the borrower and/or trustees the authority to decide what to do. But that comes at a cost, introducing agency rents, as these parties can exploit private information for their own benefit.[24]

Bankruptcy thus faces three problems—commons, anti-commons, and agency—which constitute a trilemma. Any solution can address two of these problems but cannot resolve all three simultaneously. That fundamental tension explains the evolution of bankruptcy law, from the automatic stay to the introduction of Chapter 11 and even current arguments among Supreme Court justices in the Sackler case (see Ayotte, Donaldson, and Piacentino (2024)).

[24]Other allocations of rights are theoretically possible. For instance, granting blocking rights without accompanying taking rights often results in excessive blocking, which creates inefficiency (a fact that might explain why blocking rights are usually paired with taking rights in practice).

You might also ask whether contracting alone could solve these issues. However, the optimal contracting approach is often ill suited to modeling bankruptcy, which arises precisely when contracts come into conflict and cannot be simultaneously satisfied, and it can be impossible to resolve a conflict among contracts by the contracts themselves, as each could assert its own priority over others. Bankruptcy thus requires an external mechanism to adjudicate these such conflicts.

5 Conclusion (Future Research)

To understand collateral it remains to understand what makes property rights special. One way to approach that question is to understand why other contracts cannot satisfactorily convey the right to exclude third parties. That is, ipso facto, a question that the theory of bilateral contracting cannot address. It requires a theory of multiple parties entering into multiple, possibly conflicting contracts and thus research on legal systems for giving notice, like registries of ownership and debts.

Laws and registries must be codified, be it in plain English, legalese, or computer language (e.g., on the blockchain). Another line for future research is to understand why some claims could be hard or impossible to write and understand, and, therefore, to uphold in court. Property-like claims could be easier to express, a possible reason for their priority status. That would jive with the economic value created by standardized, grid-like claims in land, which the standard, "rational" model would deem inefficiently coarse or "incomplete" (see, e.g., Libecap and Lueck (2011)).

Those avenues focus on the property part of property rights. Another should zoom in on the rights part. Our contracts, laws, and morals are codified in terms of rights, duties, powers, and immunities, not in terms of the mechanisms commonly found in economic theory (think: measurable functions mapping states and actions to economic outcomes). That could also be due to the language we deploy, which is better suited to describing lexicographic orderings—one right trumps another—than other preference orderings (Rubinstein (1998)). It could be, as John Stuart Mill suggested, a means of achieving efficiency, i.e. an alternative to the market mechanisms behind the First Welfare Theorem. Other justifications could appeal to psychology and/or bounded computational abilities; e.g., people hold moral convictions in inalienable rights or they struggle to parse other mechanisms.

Human frailty is the likely explanation for another contractual phenomenon, called "landmines." Contracts like corporate bond indentures, which routinely exceed a hundred pages, can be internally inconsistent, with one clause contradicting another. We think these are probably due to noise or decentralization, as studied in the theories of communication and teams (e.g., Marschak and Radner (1972)). Could using property rights to establish priority, even among clauses within a single contract, be a solution to that problem?

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