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ABSTRACT

In this paper we propose a theory of optimal property rights in a financial contracting setting. Following recent contributions in the property law literature, we emphasize the distinction between contractual rights, that are only enforceable against the parties themselves, and property rights, that are also enforeceable against third parties outside the contract. Our analysis starts with the following question: which contractual agreements should the law allow parties to enforce as property rights? Our proposed answer to this question is shaped by the overall objective of minimizing due diligence (reading) costs and investment distortions that follow from the inability of third-party lenders to costlessly observe pre-existing rights in a borrower's property. Borrowers cannot reduce these costs without the law's help, due to an inability to commit to protecting third-parties from redistribution. We find that the law should take a more restrictive approach to enforcing rights against third-parties when these rights are i) more costly for third-parties to discover, ii) more likely to redistribute value from third-parties, and iii) less likely to increase efficiency. We find that these qualitative principles are often reflected in observed legal rules, including the enforceability of negative covenants; fraudulent conveyance; corporate veil-piercing; and limits on assignability.

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1 Introduction

The economics of contracting literature and legal scholarship conceive of property rights in very different ways. Economists, starting with the seminal contribution of Coase (1960), emphasize the role of property rights as a starting point for contracting. While the traditional statement of the "Coase theorem" stresses the irrelevance of the allocation of property rights for economic efficiency, later contributions by Alchian and Demsetz (1972) and Jensen and Meckling (1976) on the one hand argue that property rights can affect incentives, due to the status of the property owner as a residual claimant, and Williamson (1979) and Klein, Crawford and Alchian (1978) on the other argue that property rights provide protection against ex-post opportunism. Subsequently, Grossman and Hart (1986) and Hart and Moore (1990) have defined property rights instead as residual rights of control, and have shown that allocations of property rights can be valuable in alleviating holdup problems when contracts are incomplete. These formal analyses of property rights have been used to explain firm boundaries, capital structure, and authority relationships within organizations.

Although there may be differences in their conceptions of property rights, economists usually start from the perspective that property rights are optimal allocations of rights *within a contracting coalition*. This perspective, and its implication for the role of the legal system, is important. When all affected parties start around a common bargaining table, as is often assumed in economic models, there is no role for a legal system beyond enforcing the contractual agreements reached by the parties. Left to their own devices, rational parties will be expected to allocate all relevant rights contractually, in a way that maximizes total social surplus.[1] As a result, the economist's framework to date has little to offer in the way of a positive analysis that explains features of property and contract law, nor does this framework offer normative prescriptions for the design of these laws, other than the recommendation that voluntary agreements should always be strictly enforced.

The economist's conception of property rights stands in sharp contrast to the concept

[1] Economists' viewpoint often presupposes that the law is also necessary to defend an initial allocation of ownership rights to assets (however they may be determined), but this is not entirely obvious. Even if the law is completely silent on this issue and all assets are in the "public domain" at the outset, if all parties are available to bargain over the uses of assets going forward, efficiency is achievable. This implies that legal intervention in the realm of property rights (over and above enforcing contracts) is necessary only when third-parties outside the initial contracting coalition are affected.

of property as defined in recent legal scholarship (Merrill and Smith 2000, 2001a, 2001b, Hansmann and Kraakman 2002). This literature distinguishes property rights from ordinary contractual rights by defining property rights as rights *in rem* (rights to assets that are good against third-parties), while contractual rights are rights *in personam* (good only against the contracting parties themselves). In other words, property rights are unique because they bind not only the parties to a contract, but also bind third-parties *who lie outside a contracting coalition*. In this paper, we create the first formal model to explore the consequences of this definition of a property right. Specifically, our definition of a property right follows the one used by Hansmann and Kraakman (2002):

> "Property rights differ from contract rights in that a property right in an asset, unlike a contract right, can be enforced against subsequent transferees of other rights in the asset."

The importance of this definition of property rights is that the law can play a more active role in increasing the efficiency of contractual agreements when third-parties outside a contracting coalition become relevant.[2] When information about pre-existing rights is costly to acquire, these third-parties may be unknowingly affected by the rights of others. As a result, the law, as these authors argue, might optimally standardize the property rights that can be created to limit externalities to unrelated parties (Merrill and Smith 2000), and it may also set limits on the notice required to make property rights enforceable (Hansmann and Kraakman 2002).

With this *in rem* feature of property in mind, we formally analyze the design of property laws in a financial contracting setting. We start with a firm run by an agent (call the agent A) that requires funding from two lenders, who each provide valuable capital to an investment project, but each lender contracts with the firm at a different point in time. As a result, the lenders may have competing claims to the firm's cash flows, and knowledge of the rights of pre-existing loan contracts may be imperfect.[3] The financial contracting context

[2] We should note that there are alternative definitions of what constitutes a "property right" in legal scholarship. For example, some define a property right as a right that is enforced through a "property rule" such as specific performance, while a contractual right is a right that is enforced through monetary damages. (Calabresi and Melamed 1972; Ayres and Talley 1995; Kaplow and Shavell 1995) This definition gives rise to different legal design problems than the one we consider here, however.

[3] Our model assumes a sharp difference regarding the information about the contracts of other parties,

is a particularly important environment in which to consider these issues, because of the possibility that insolvency can result in incomplete satisfaction of a lender's claim. Thus, a mere *in personam* right to sue a bankrupt debtor can be substantially less valuable than an *in rem* right (such as priority rights to seize and sell collateral) that also binds past and/or future creditors. When the law allows for the borrower to give an early lender (call this lender $P1$) stronger property-like protections, it can alleviate credit constraints by protecting $P1$ against borrower moral hazard and the claims of a later lender (call this lender $P2$). On the other hand, $P2$ might act more conservatively in extending funds when he is uncertain about the pre-existing rights of $P1$. He might insist on being compensated for due diligence expenses to verify these pre-existing rights, and if he can not be sufficiently reassured, might forgo lending entirely.

Our model generates several findings. First, in a world without reading costs, there can be affirmative reasons for the law to allow A to grant $P1$ not only seniority over $P2$ (say, through a first-priority security interest in the final cash flow), but also an additional property right, known in law as a *restraint on alienability.* This right prevents A from legally transferring some of his remaining cash flow rights to a new lender. This right is valuable in a world in which monitoring A's behavior is costly for $P1$, and A has the incentive to over-borrow from $P2$ to continue his project inefficiently at $P1$'s expense. Intuitively, to ensure that his claim is repaid, $P1$ may require not only seniority, but also that A retain sufficient cash flow rights so that his incentives to make the project succeed are preserved.

Given this affirmative justification for restraints on alienability (protecting earlier lenders from *dilutive contracts* by subsequent lenders), one might wonder why the law often limits the enforceability of these rights in practice. Our model suggests an answer when $P2$ must expend reading costs to observe and fully understand the pre-existing rights of $P1$. If $P1$ and A anticipate that $P2$ will not conduct any costly due diligence to discover $P1$'s rights, this would open the door for $P1$ to write a *redistributive contract* with A that diverts as much value from $P2$ as the law will enforce. With this possibility in mind, $P2$ will insist that A reimburses him for sufficient due diligence costs, enough so that $P1$ and A will not be tempted to redistribute. In equilibrium, inefficient deadweight reading costs are incurred,

which is costly to acquire, and the observability of one's own contract, which is assumed to be costlessly understood by the parties themselves. Thus, our model leaves room for legal intervention into property rights, but not into contractual rights. Nevertheless, the assumption of limited observability has been made in the contractual context; see Katz (1990).

and when these costs are sufficiently large, credit rationing to A may occur.

Importantly, all of these deadweight reading costs are borne by A in equilibrium, but A cannot eliminate them, because he cannot (in a costless, observable way) credibly demonstrate to $P2$ that he has not written a redistributive contract with $P1$. This logic differs from Merrill and Smith (2000), who argue that legal restrictions on property rights are valuable because they limit externalities *across firms* (i.e. an A-$P1$-$P2$ coalition increase due diligence costs for other A-$P1$-$P2$ coalitions by creating a novel property right).[4] In our model, restrictions can be valuable because they reduce externalities *within* a firm (i.e. A and $P1$ impose due diligence costs on $P2$, which A pays for in equilibrium, but can not reduce without the credible commitment provided by the law).

Our model results in three qualitative principles that govern optimal enforcement of property rights. We find that the law should take a more restrictive approach to enforcing a right (given by A to $P1$) against a third party ($P2$) when the right (i) is more costly for $P2$ to discover; (ii) is more *redistributive* from an uninformed third-party, and (iii) is less likely to increase the efficiency of contractual relationships. We analyze a series of examples in financial contracting settings, and find that these principles are often reflected in existing law. The principles echo central themes in Hansmann and Kraakman (2002), who argue that an optimally designed law balances the value of a right to its users against the incremental verification costs borne by non-users. Our model shows that when redistributive rights are enforceable, these verification costs are most severe. Hence, an optimal law restricts the enforceability of these rights in particular.[5]

The rest of the paper will proceed as follows. Section 2 will introduce the general model

[4] Merrill and Smith use the phrase "zone of privity" to include all parties that are relevant to a particular transaction, which would include $P1$, $P2$ and A in our setup. Unlike Merrill and Smith, who argue that all costs inside the zone of privity are internalized, we find that because of reading costs and the threat of opportunism, $P1$ and A can not internalize the costs to $P2$, giving rise to a role for the law even if externalities outside the zone of privity are not important.

[5] Our analysis is also related to the large literature on optimal priority and the efficiency of secured credit. Bebchuk and Fried (1996, 1997) argue for mandatory limits on the priority of secured creditors in bankruptcy; unlike our model, their argument relies heavily on the existence of involuntary creditors or small creditors who find it costly to adjust interest rates. Schwartz (1991) argues that current law regarding creditor priorities should be replaced by a pure first-in-time rule, which is similar to the Coasean legal environment we consider here. Schwartz's model allows for costs of revealing information to creditors, but does not consider the role the law might play in reducing them.

and Section 3 solves for optimal contracts in a world where all information about pre-existing contracts is costlessly observable by third-parties. Section 4 solves the model in the presence of reading costs by third-parties, which leads to our key results regarding the optimal legal design of property rights and generates comparative statics that can be applied to existing features of the law. Section 5 discusses some of these features and how they relate to the principles in our model, and Section 6 concludes.

2 Model

We consider a simple model of a firm with a single project that requires two rounds of financing from two different lenders. At date 1, a wealthless agent (A) is endowed with a valuable idea, and must raise an amount of i_1 from a principal ($P1$) to start the project. To continue the project at date 2, the agent requires an additional cash input of i_2 from a second principal ($P2$). To focus on the interface between principal $P1$'s and $P2$'s claims, we shall make the restrictive assumption that $P2$ can contribute no more than the required investment outlay i_2 and that $P1$ can not contribute the entire amount $i_1 + i_2$[6]. Also, both principals operate in competitive lending markets, all parties are assumed to be risk-neutral, and there is no discounting.

2.1 Technological assumptions

If the project receives two rounds of financing (i.e. it is continued at date 2 rather than liquidated) it produces a random cash flow at date 3. If the project does not receive the required funding at date 2, it is liquidated for a known value $L > 0$. The final cash flow outcome depends on the realization of the state of nature at date 2, which becomes observable to $P2$ and A at date 2 before the continuation decision is made. We allow for two states of

[6]There may be several reasons why each principal is only willing to invest a limited amount. For one, the lenders may be wealth constrained, or they may prefer to have a limited exposure in a firm for risk-diversification reasons. Finally, principal $P1$ may be reluctant to invest more than i_1 for fear that the agent A simply wastes the surplus funds. It is possible to extend our model to allow for an endogenous determination of each principal's investment and to show that under some quite intuitive conditions each principal would not want to invest more than the required amount i_j. However, for the sake of simplicity and brevity we omit the discussion of this more general model.

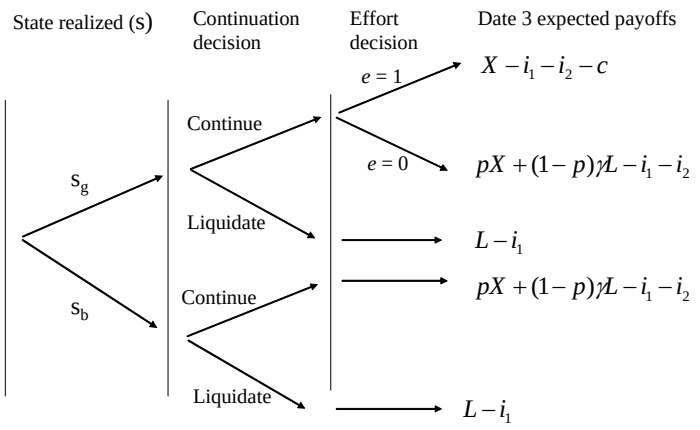

Figure 1:

nature, $\hat{s} \in \{s_g, s_b\}$. The good state of nature, s_g, occurs with probability π and the bad state, s_b, with probability $1 - \pi$.

In the bad state of nature the project yields a cash-flow of X at date 3 with probability p and with probability $(1 - p)$ the project yields no cash flow but a liquidation value γL, where $\gamma < 1$. In the good state of nature the cash-flow outcome of the project depends on the agent's effort choice $e \in \{0, 1\}$ at date 2. If the agent chooses $e = 1$ then the project yields a final cash flow X with certainty. If the agent chooses $e = 0$, the project yields the same cash-flow as in the bad state of nature. The agent's private cost of choosing high effort $(e = 1)$ is $c > 0$, and the cost of $e = 0$ is normalized to zero.

We summarize the date 2 timeline and the project's expected payoffs in Figure 1.

2.2 Contracting assumptions

The agent A and principal $P1$ can write a bilateral long-term debt contract at date 1. Similarly, the agent and principal $P2$ can write a bilateral debt contract at date 2. Each bilateral contract specifies the amount the principal agrees to lend i_j and a repayment F_j at date 3. The contract between $P1$ and A can also specify a maximum amount Φ_1 of date 3 cash flows A is allowed to pledge to $P2$, and whether the claim F_1 is senior, on par, or junior to F_2.

Importantly, our assumptions rule out the possibility that contract terms may be contingent on the state of nature s_l, $l = g, b$. We justify this restriction on the usual grounds that the state of nature s_l, while observable to A and $P2$ at date 2, is not verifiable in court.[7] We also rule out the possibility for now that $P1$ is available to monitor the firm, or to renegotiate his contract with A at date 2 after the realization of the state of nature s_l. Thus, $P1$ is a passive lender who can only lend at date 1 and collect at the final date. This assumption is admittedly strong, but is made to demonstrate in the simplest possible fashion the potential conflicts between $P1$ and $P2$ when they lend at different points in time.[8]

The four key economic issues in our contracting problem are as follows. First, the agent's repayment obligations F_j must be low enough that the agent has an incentive to put in high effort ($e = 1$) in state s_g. Second, F_1 must be sufficiently low to make room for continuation financing by $P2$ at date 2, whenever continuation is efficient. Third, $P1$ also faces a threat of dilution of the value of his claim F_1 at date 2, when the agent issues a new claim F_2 to $P2$. It is, of course, possible for $P1$ to limit this dilution risk by issuing a senior claim F_1. However, as we show below, issuing a senior claim is not a sufficient protection against dilution in our setup. To obtain full protection $P1$ must also specify a limit Φ_1 on date 3 cash flows the agent is allowed to pledge to $P2$. Fourth, and most importantly for our analysis, the very protections against the risk of dilution that $P1$ specifies in his contract may, in turn, create a risk of loss for $P2$. This latter risk arises from the fact that $P1$'s contract with A may contain covenants that limit $P2$'s claims on the firm's cash flows, and the *due diligence* that $P2$ must expend to discover these covenants in the fine print of $P1$'s contract is costly and imperfect. We discuss the formal representation of the due diligence technology in Section 4.

[7] The non-verifiability of the state is not at all crucial to the results, but it simplifies the set of contracts that can be written.

[8] The assumption that $P1$ is not available at all at date two implies among other things that $P1$ cannot accelerate his loan in response to an attempt by $P2$ to collude with A against $P1$. While repayment accelerations do sometimes occur in practice, they require that $P1$ monitor A carefully, which is costly. Moreover a surprise acceleration of a loan might also hurt $P2$.

3 Optimal Contracting in a world with no information costs

Economic models of contracting with multiple principals, similar to the one outlined above, are cast in a world where, i) there are no information costs; ii) there is freedom of contracting; iii) property rights are exogenously given; and, iv) contracts are perfectly enforced by courts[9]. What precise form property rights take in these models is typically not spelled out explicitly. It is helpful, therefore, to begin our discussion in this section by teasing out explicitly the underlying assumption on property rights in these models. We then proceed with an analysis of optimal contracts when there are no information costs.

3.1 Legal rules: The Coasean environment

In this section we attempt to spell out the benchmark legal environment that has become standard in the economics literature. We refer to this environment as the *Coasean legal environment.* It has, in our view, the following three main components:

a) **Well-defined, fully-alienable, and fully-divisible property rights**

In our *common agency* setup, A's initial endowment is his idea (and his human capital), and the principals $P1$ and $P2$ are endowed with their cash stocks. The assumption on property rights is that these individuals begin at date one with *full ownership rights* to these assets and that these will be perfectly enforced by a court. Full ownership rights are defined as a bundle of *property rights* similar to the notions of *usus*, *fructus*, and *abusus* under Roman law:

Thus, the *full owner* of an asset has all of the following property rights:

a) the exclusive right to use the asset (*usus*),

b) the exclusive right to receive income from the asset (*fructus*),

c) the exclusive right to modify or transform the asset (*abusus*).

Furthermore, we also single out among *abusus* rights,

d) the exclusive right to transfer any subset of these rights by contract (*alienability*).

Thus, in the Coasean legal environment, full ownership is a starting point, and the bundle of property rights that comprise ownership can be freely divided.

[9] See Bernheim and Whinston (1985, 1986), Segal (1999) and Bolton and Dewatripont (2005)

b) **Freedom of Contracting:** Courts will enforce all contracts regarding transfers of property rights (based on information they can verify), with no restriction on the space of allowable contracts, other than that the property right being transferred must be under the initial ownership of one of the contracting parties. Note that this definition allows for parties to write enforceable contracts that place restraints on alienability. In the present context, for example, if A has the right to the cash flows from an asset X, she may retain the right to spend the cash, but she could also transfer to $P1$ the right to sell these cash flows to a third-party or to pledge them as collateral for a debt contract.

c) **First-in-time (FT) rule:** in the Coasean legal environment, when any inconsistency arises between contracts, the first contract written will have priority.

We should emphasize the extreme nature of the FT rule in the Coasean legal environment, which differs from most real-world laws of property and contract. To give a concrete example that will be relevant to our model, suppose A writes the following sequence of contracts with $P1$ and $P2$:

$C_1 : P1$ will lend 45 dollars to A and is entitled to the first 50 dollars of the firm's final cash flow. Any subsequent claim on the firm's cash flow by any third-party is null and void.

$C_2 : P2$ will lend 25 dollars to A and is entitled to 30 dollars of the firm's final cash flow.

Now suppose that the final cash flow is 100. In the Coasean legal environment, $P1$ would receive 50, A would receive 50, and $P2$ would receive zero. In contract C_1, A transferred away his right to pledge future cash flows to subsequent lenders. Thus, the FT rule would require that $P2$'s claim be voided; he would have no right to recover anything from A, even though A had knowledge of his inability to pledge cash flow to $P2$, and he receives a payout that would allow him to pay $P2$ in full.

3.2 Optimal Contracting with no reading costs

We shall restrict ourselves to a subset of parameter values for which the optimal contract for $P1$ and A, and for $P2$ and A, is such that continuation with high effort is optimal in the good state and liquidation at date 2 is optimal in the bad state.

For ease of exposition, we will use the notation R_g to denote the maximum pledgeable income to $P1$ in the good state, conditional on continuation with effort:

$$R_g \equiv X - \frac{c}{1-p} - i_2 \tag{1}$$

To see that this is the maximum pledgeable income to $P1$, note that in order to encourage A to choose high effort, A requires a sufficient stake w_g in the output when the project succeeds. An optimal contract will pay the agent w_g when the cash flow is X and 0 if output is 0. Thus, in order to elicit effort from A, the following incentive compatibility constraint must be satisfied:

$$w_g - c \geq p w_g$$

which reduces to

$$w_g \geq \frac{c}{1-p}.$$

Therefore, the maximum pledgeable income to all lenders is $X - \frac{c}{1-p}$. Since $P2$ will not participate unless he receives an expected payment equal to his monetary contribution, $P2$ must be repaid i_2. Thus the maximum pledgeable income to $P1$ is as in (1).

With this notation, the parameter restrictions we maintain throughout the paper are:

Assumptions:

A1)

$$X - c - i_2 > L$$

The first assumption tells us that in the good state, continuation with high effort is economically efficient relative to liquidation.

A2)

$$pX + (1-p)\gamma L - i_2 < L$$

Assumption A2 says that continuation with low effort is inefficient relative to liquidation; hence liquidating the project will be optimal in the bad state at date 2. Assumptions A1 and A2 together imply also that high effort is efficient relative to low effort in the good state.

A3)

$$\pi R_g + (1-\pi)L \geq i_1$$

Assumption A3 implies that the first-best action plan, which involves continuation in the good state with effort and liquidation in the bad state, can generate enough cash flow to repay $P1$ for his loan. Since we assume that $L < i_1$, A3 also implies that $R_g > L$; i.e.

continuation with effort produces more pledgeable income to $P1$ than liquidation in the good state.

Finally, we shall also assume that:

A4)

$$X - R_g \geq \frac{i_2}{p}.$$

As we will show in the next section, assumption **A4** implies that $P1$ may be at risk of *dilution* of his claim in the bad state if he writes a debt contract with A where $\Phi_1 = X$. This assumption is central to our analysis, since it implies that $P1$ will not be fully protected against the risk of dilution by seniority alone.

3.2.1 First-best outcome

Suppose a benevolent, social welfare-maximizing planner could observe the state of the world and make all investment and effort decisions. Under the assumptions above (**A1**-**A4**), the social planner would choose to fund the project, to continue the project in the good state at date 2 while at the same time choosing high effort ($e = 1$), and to liquidate the project at date 2 in the bad state. This first-best action plan would maximize social welfare, which is given by

$$\pi(X - c - i_2) + (1 - \pi)L - i_1$$

3.2.2 Implementation: state-contingent contracts

If the contracting parties can write (bilateral) state-contingent contracts, then this first-best action plan can be implemented as a subgame perfect equilibrium (SPE) of the following contracting game.

At date 1, the agent makes the following take-it-or-leave-it offer of a state-contingent debt contract to $P1$. Agent A borrows i_1 from $P1$ and in exchange agrees to:

1. liquidate the project and to pay the entire liquidation proceeds L to $P1$ at date 2 in the bad state, and

2. to repay $P1$ a face value of debt

$$F_1 = \frac{i_1 - (1 - \pi)L}{\pi}$$

at date 3 in the good state, and finally

3. to make F_1 senior to any subsequent claims on the firm.

Given that this contract covers $P1$'s investment i_1 in expected terms, $P1$'s (weak) best response is to accept this contract.

It is easy to see that the best response to this contract for A in the good state at date 2 is to offer $P2$ the following contract: A borrows i_2 dollars from $P2$ in exchange for a junior debt claim with face value $F_2 = i_2$. Again, as this contract covers $P2$'s investment i_2, $P2$'s (weak) best response is to accept this contract.

Finally, to see that A's contract offer at date 1 is a best response to the respective equilibrium moves of $P1$ at date 1, and A and $P2$ at date 2, observe that under this contract A gets the first-best expected payoff $\pi(X-c-i_2)+(1-\pi)L-i_1$ which is equal to total social welfare under the first-best action plan. This is the highest expected payoff A could achieve in any equilibrium, since any deviation from the first-best action plan at date 2, induced by another contract offer, would be anticipated by $P1$ and priced into the loan contract through a higher F_1 (i.e. a higher interest rate). In other words, A's private objective is perfectly aligned with social welfare in a Coasean legal environment, and therefore A's choice of contract implements the first-best social outcome.

3.2.3 Incomplete contracts: the insufficiency of seniority

While a first-best outcome is straightforward to implement under complete contracting, it is less obvious under incomplete contracting (when courts cannot observe the state of the world). At first glance, one might expect that a simple senior debt contract alone would be sufficient to generate the socially efficient outcome even with non-contingent debt contracts.[10]

Indeed, if $P1$ has a senior debt claim one might expect that this would generate the right social incentives for $P2$ to refuse to lend in the bad state, since he bears more of the cost of failure than $P1$[11]. Even so, under assumption **A4**, this is not the case. Since under assumption **A4** we have $X > R_g + \frac{i_2}{p}$, it is still in the joint interest of $P2$ and A to continue the firm inefficiently at the expense of $P1$, and thus to *dilute* the value of $P1$'s debt claim.

[10] The idea that junior debt can be used to dilute senior claims in the presence of moral hazard was originally formalized in Bizer and DeMarzo (1992).

[11] Since $P1$'s loan is senior, he will recover the entire cash flow in the low state if the project fails, γL while $P2$ will receive nothing. Thus, the consequences of failure are more severe for $P2$ than for $P1$.

Indeed, $P2$ is then willing to lend i_2 and take a junior debt claim with face value $F_2 = \frac{i_2}{p}$ and A would then receive an expected payoff from continuation of

$$p(X - F_1 - F_2) > p(X - R_g - \frac{i_2}{p}) > 0,$$

which is strictly higher than what A gets in liquidation.[12]

Thus, under the parameter assumptions in the model, seniority alone is not sufficient to protect $P1$. Though social welfare is destroyed by the inefficient continuation, the value transferred from $P1$ to the $P2/A$ coalition outweighs this loss when **A4** holds. Thus, the incentives of $P2$ and A are not aligned with social welfare when a simple senior debt contract is written. Since A bears this efficiency loss in equilibrium, A would prefer to give $P1$ stronger rights than seniority alone in order to achieve efficiency and maximize his private payoff. Giving an additional property right to $P1$ to specify a limit Φ_1 of date 3 cash flows A is allowed to pledge to $P2$ achieves this goal.

3.2.4 The value of restraints on alienability

In the good state $P2$ is willing to lend i_2 in exchange for debt with face value $F_2 = i_2$, since the project will succeed with certainty.[13] In the bad state, however, the project fails with

[12]It is possible to correct this inefficiency by giving A a payment in the event of liquidation, of say ϕL, sufficient to offset the positive gain A would get under continuation. Deviations from absolute priority in bankruptcy could, thus, be rationalized in our model as a way of forestalling inefficient continuation.

In a somewhat richer model, however, one might be concerned that by structuring the agent's incentives in this way one might undermine her incentives to perform at date 1. For example, if efficiency requires that A raise the probability of reaching the good state from λ to $\pi > \lambda$ at date 1, by taking action $a = 1$ with private effort-cost ψ, rather than the free action $a = 0$, then rewarding the agent in the event of liquidation might be counterproductive.

Indeed, the agent's incentive constraint at date 1 :

$$\pi(X - F_1 - F_2) - \psi \geq \lambda(X - F_1 - F_2)$$

without any payment in liquidation might be satisfied, while the constraint with a payment ϕL in liquidation :

$$\pi(X - F_1 - F_2) + (1 - \pi)\phi L - \psi \geq \lambda(X - F_1 - F_2) + (1 - \lambda)\phi L$$

might not.

[13]By definition of R_g, as long as $P1$ is promised no more than this amount, $P2$ can be promised i_2 if the good state occurs, and A will prefer high effort. Therefore, the probability of success will be 1 and $P2$ will

probability $1-p$ if it is continued. As we have pointed out above, $P2$ will then require a face value of debt higher than i_2 (F_2 must be at least $\frac{i_2}{p}$) in order to be compensated for this added default risk. Thus, the following contract will result in a first-best outcome:

Proposition 1 *Under assumptions **A1** to **A4**, an optimal contract between $P1$ and A is such that A takes a loan i_1 in return for a date 3 senior (collateralized) debt repayment of*

$$F_1 = \frac{i_1 - (1-\pi)L}{\pi},$$

and a commitment not to pledge more than $\Phi_1 = i_2$ to $P2$ at date 3.

The best response for $P2$ and A at date 2, then is to sign a new loan contract only in the good state specifying a loan of i_2 in return for a (riskless) junior claim of i_2 at date 3.

Proof. see appendix ■

In order to implement the first-best, $P1$ requires not only seniority, but also that A make a credible commitment not to pledge new cash-flow in excess of i_2. This commitment can be achieved by transferring to $P1$ (or abandoning altogether) the right to pledge the project's cash flows to future lenders over and above i_2. Thus, Φ_1 is a form of *negative covenant*, which would apply to all future debts in excess of i_2, whether these are secured or unsecured. Since $P2$ understands that A can legally pledge no more than i_2, he is not willing to lend in the bad state, and the first-best is achievable.[14] We will refer to the optimal contract between $P1$ and A in Proposition 1 as the *efficient contract*, and denote this contract C_1^{fb}.

It is important to note the efficiency gains that come from granting a *property right* in $A's$ assets to $P1$ that binds $P2$, instead of a mere *contractual right* that binds only A. To see this, suppose that if A breaches its contract with $P1$ (by promising $P2$ junior debt with face value greater than i_2), $P1$ has only a *contractual right* to sue A for breach of its contract, but can not invalidate $P2$'s debt. In this environment, the first-best outcome would not obtain.[15] This would follow because, at date 2, A would convey to $P2$ a property right in

be repaid with certainty.

[14] If $P2$ can take a claim on A's personal assets (his dividend from the firm at the end of date three) then he would be equally happy to lend into an inefficient continuation in the bad state. Thus $P1$'s right to restrict alienability must extend beyond the corporate form and also to A's assets more generally in order to effectively shut down $P2$'s loan.

[15] A similar point is made by Schwartz (1996), arguing for property-like protections for unsecured creditors with negative covenants because contractual remedies may be insufficient.

the project's cash flows that binds $P1$. When $P1$ wins his breach of contract suit against A, the property available to satisfy the judgment would be only the property A has left to transfer, which would be the cash flows from the firm after paying $P2$.[16] Anticipating this outcome, $P2$ will be willing to lend in the bad state, and the inefficient continuation will not be prevented.[17]

4 Equilibrium Contracting with Reading Costs

We have shown that in our model there are efficiency gains to be had by allowing firms to create restraints on their ability to alienate cash flow rights. Moreover, in a world with no transactions costs and perfectly observable contracts, there are only benefits and no costs to these restraints. The limits on alienability merely allow the firm to commit to protecting early lenders against the ex-post risk of dilution at the hands of subsequent lenders. Thus, in a perfect world with fully observable contracts there are affirmative reasons to allow for such divisions of property rights to be enforceable. In this section, we introduce contract reading costs and show that limits on alienability also create costs for third parties. When alienability of assets can be restricted in any way contracting parties desire, it becomes more difficult and costly for third parties to determine which assets are alienable and under what contingencies. The reading costs third parties face are a form of negative externality that the contracting parties impose on others. What is more, the contracting parties are not well placed, as we shall show, to internalize these externalities.

4.1 The contracting game with reading costs

We begin this subsection with a description of the contracting game between A, $P1$, and $P2$. Before negotiations between $P2$ and A start, $P2$ is unable to observe the contract C_1

[16] This argument assumes that $P1$ would have no rights to sue $P2$ as well (say, for tortious interference with contract). If this were possible, the first-best could be achieved by this means. According to our definition, $P1$'s right to prevent additional debt would be considered a property right, since $P1$ has a right that binds a third-party rather than a right which is only good against A.

[17] Of course, $P1$ could take $A's$ remaining cash flow right, making him indifferent between continuation and liquidation. Adding a small private benefit to continuation for A would make the property right strictly more valuable than the contractual right only.

between $P1$ and A without incurring reading costs. Thus, when negotiations begin, $P2$ can only form a prior belief over what type of contract $P1$ and A have signed at date 1. As in standard signaling games, $P2$ can, however, rationally revise his beliefs about the initial contract between $P1$ and A when he sees A's contract offer C_2 and conducts due diligence.

We assume that the contracting game at date 2 then proceeds as follows:

1. Agent A begins by making a loan contract offer $C_2 = \{i_2, F_2, \rho\}$ to $P2$, which contains the terms of the second loan, F_2 (as well as its priority status in repayment at date 3) and also a commitment by agent A to reimburse ρ dollars of $P2$'s due diligence costs.[18]

2. $P2$ proceeds with the due diligence specified in A's contract offer[19]. Due diligence results in an observed contract $\Omega(C_1)$.

3. Nature decides whether $P2$'s due diligence is *effective*, which occurs with probability $P(\rho) = \frac{\rho}{\rho+\kappa}$, or *ineffective*, which occurs with the complementary probability $(1 - \frac{\rho}{\rho+\kappa})$. If effective, $P2$ will observe (and understand) the true contract $P1$ and A have written. $(\Omega(C_1) = C_1)$. If ineffective, $P2$ observes the efficient contract $(\Omega(C_1) = C_1^{fb})$, regardless of the contract $P1$ and A have actually written. The second lender $P2$ knows $P(\rho)$ but not nature's decision.

4. Finally, after completing the due diligence $P2$ decides whether or not to lend given his updated beliefs about C_1.

This simple setup is intended to capture the possibility that $P1$ and A may have written terms into their contract that have the effect of redistributing date 3 cash-flows to them rather than $P2$. The second lender's uncertainty can come from two possible sources. First, he may be unsure that he observes the entirety of the pre-existing loan contracts that A has written. For example, he may be wary that A did not disclose a hidden obligation, such as a loan guarantee to a parent company, that would reduce the assets available to $P2$ in the event of default. Second, even if $P2$ is confident that he possesses all relevant pre-existing contracts, some of the covenants in these contracts may be overlooked, or have implications

[18] For simplicity, we assume that due diligence costs can be paid in-kind; that is, A can commit to $P1$ that these costs will be spent on due diligence (as opposed to being divertable by $P2$).

[19] We assume that when indifferent $P2$ always conducts the due diligence. Thus, $P2$ always conducts a level of due diligence that A fully reimburses.

for $P2$'s rights that are misleading. The parameter $\kappa > 0$ then represents the difficulty of discovering the meaning or implications of a clause: as κ approaches zero, even low levels of due diligence will discover hidden terms with probability approaching one; as κ grows toward infinity, a given due diligence expenditure discovers hidden terms with probability approaching zero.

Although $P2$ may not always discover a hidden term, he understands that when $P1$'s contract appears normal to him, he still "may have missed something", and makes his lending decision given this risk. Lender $P2$ is aware, however, that the more due diligence that $P1$ and A willingly reimburse, the less likely is the possibility that $P1$ and A may have included a redistributive clause in C_1, since discovery of the clause by $P2$ would preclude further lending and result in an inefficient liquidation. Thus, due diligence gives $P2$ confidence to lend, even if it never results in complete certainty about $P1$'s contract.

4.2 Equilibrium Contracting and Due Diligence

We begin our analysis by pointing out that there does not exist a Bayes-Nash equilibrium of the game with reading costs, which implements the first-best outcome without any due diligence by $P2$. To see this point, suppose that $P2$ simply follows the same lending policy as before without reading the details of the contract between $P1$ and A and hoping that $P1$ and A would have written the efficient contract. Could the efficient contract between $P1$ and A still be an equilibrium move in a world with reading costs? If so, then the presence of reading costs for third parties would not be a serious concern for welfare, as agents would simply continue to draft contracts as if they were in a transactions-cost free world and they would not have to worry about imposing negative externalities on others.

However, as intuition suggests and as the next lemma establishes, when $P1$ and A expect $P2$ not to do any due diligence and to follow the efficient lending policy irrespective of what form their own contract takes, then their best response is to write a contract that involves maximal redistribution from $P2$ to themselves (call this contract C_1^x). Adding some additional notation, let V_x denote the joint continuation payoff to $P1$ and A in the event that they write this maximally redistributive contract and $P2$ lends[20]. Then we have

[20]The maximally redistributive contract C_1 would set $\Phi_1 = 0$, so that $P1$ and A would be able to claim the entire cash-flow net of effort costs: $(X - c)$.

In principle, the law could even allow for negative Φ_1, implying that $P1$ could seize $P2$'s property (over

the following lemma:

Lemma 2 *Suppose that $P2$ always accepts the contract $C_2 = \{i_2, i_2, 0\}$ in the good state without incurring any due diligence costs. Then the best response for $P1$ and A is to write a maximally redistributive contract C_1^x that takes the following form:*

Principal $P1$ agrees to lend i_1 dollars to A in exchange for a senior debt claim with face value $F_1 = \frac{i_1-(1-\pi)L}{\pi}$ and a covenant that fully restricts alienability of future cash-flows ($\Phi_1 = 0$). In the Coasean legal environment, $P1$ and A would receive the maximum possible joint continuation payoff $V_x = X - c$.

This lemma implies that in a Coasean legal environment in which third parties incur contract reading costs, it will be impossible to avoid these costs completely, because this would increase the likelihood of opportunism by $P1$ and A.

We now proceed to describe what we will term the *least-cost separating equilibrium* of the contracting game. This will be the equilibrium with the lowest feasible (deadweight) due diligence costs that supports lending by $P1$ and $P2$ in equilibrium. As is well known, the set of possible Bayes-Nash equilibrium outcomes in a signaling game is typically large and our game is no exception. This multiplicity is driven by the general form the conditional belief function can take and the weak restrictions imposed by the equilibrium consistency-of-beliefs requirement in a Bayes-Nash equilibrium. However, in our game as in other signaling games a particular belief function appears to be particularly reasonable intuitively.

We assume that the belief function is such that $P2$ will attach positive probability weight to at most two contracts: the efficient contract C_1^{fb}, and the maximally redistributive contract C_1^x. Let $\nu(C_1) \in [0,1]$ denote $P2$'s belief that C_1^{fb} was written. As in standard signaling games, $P2$ can rationally revise his beliefs about C_1 to $\nu_2(C_1 \mid C_2, \Omega(C_1))$ when he sees A's contract offer C_2 and the observed contract $\Omega(C_1)$ that results from his investigation. We assume this belief function takes the general form that any contract offer $C_2 = \{i_2, i_2, \rho\}$ – where ρ is below a cutoff value ρ^*– is interpreted by $P2$ as signaling the redistributive contract C_1^x. In that case $P2$'s updated beliefs are $\nu_2(C_1 \mid C_2, \Omega(C_1)) = 0$ and $P2$'s best response is to reject such a contract. On the other hand, all contract offers $C_2 = \{i_2, i_2, \rho\}$, with $\rho \geq \rho^*$ provide sufficient reassurance to $P2$ that he is willing to investigate, and he will lend as long as $\Omega(C_1) = C_1^{fb}$.

and above i_2) if $P2$ makes a loan. In a world with no reading costs, there would be no loss in enforcing these extremely redistributive contracts, because $P2$ would never sign them.

We now characterize the cutoff ρ^* that implements the least-cost separating equilibrium. Consider some $\rho \geq \rho^*$, so that $P2$ will lend after observing C_1^{fb}. Intuitively, $P1$ and A will find one of two possible strategies optimal given $P2$'s beliefs.

One strategy is to write contract C_1^{fb}, which is optimal for $P1$ and A given a fully-informed $P2$. If $P1$ and A were to agree on this contract, followed by the same contract offer $C_2 = \{i_2, i_2, \rho\}$, their joint continuation payoff in the good state would be

$$X - i_2 - c$$

The other strategy is to write the *maximally redistributive contract* C_1^x, hoping that $P2$ will not discover it. This contract would return the highest possible joint payoff $V_x = X - c$ to the parties if the investigation is ineffective, but will result in liquidation if $P2$'s due diligence is effective. The expected joint continuation payoff of $P1$ and A in the good state from writing C_1^x is

$$\left(\frac{\rho}{\rho + \kappa}\right) L + \left(1 - \frac{\rho}{\rho + \kappa}\right) V_x$$

With these expressions in hand, the following inequality tells us for what level of due diligence costs $P1$ and A will prefer to write the efficient contract, given $P2$'s beliefs:

$$X - i_2 - c \geq \left(\frac{\rho}{\rho + \kappa}\right) L + \left(1 - \frac{\rho}{\rho + \kappa}\right) V_x \tag{2}$$

Since equilibrium requires that $P2$'s beliefs must be consistent with the behavior of $P1$ and A along the equilibrium path, the lowest feasible cut-off ρ^* is given by the solution ρ for which (2) holds as an equality:

$$\rho^* = \frac{\kappa\{V_x - (X - i_2 - c)\}}{X - i_2 - c - L} \tag{3}$$

In the Coasean legal environment (in which the law allows fully-flexible design of property rights), this expression reduces to:

$$\rho^* = \frac{\kappa i_2}{X - i_2 - c - L} \tag{4}$$

In the least-cost separating equilibrium, $P1$ and A must set aside ρ^* up-front to compensate $P2$ for his due diligence: if they offer less, $P2$ will rationally believe that the contract is redistributive and refuse to lend.

The final step in implementing this equilibrium is to verify that, inclusive of these due diligence costs, $P1$ and A prefer to implement an equilibrium that involves $P1$ lending at date 1, and continuing with effort in the good state by borrowing from $P2$. This requires a slightly modified assumption to reflect the presence of positive reading costs:

A3b: $\pi(R_g - \rho^*) + (1-\pi)L \geq i_1$

Under this assumption the project can feasibly repay $P1$ inclusive of $P2$'s due diligence costs, which are paid only in the good state.

With these assumptions in hand, we summarize this subsection by describing fully the least-cost separating equilibrium in the following proposition:

Proposition 3 *Under the assumptions above (A1, A2, A3b, A4), the least cost separating Bayes-Nash equilibrium of the lending game with reading costs is as follows. At date* 1, $P1$ *and* A *agree on contract* C_1^{fb} *taking the following form:*

1. $P1$ *lends* $i_1 + \rho^*$ *to* A. *In turn,* A *invests* i_1 *in the project and holds* ρ^* *until date* 2*;*
2. $P1$ *obtains a senior debt claim of* $F_1 = \frac{i_1+\rho^*-(1-\pi)(L+\rho^*)}{\pi}$, *and a commitment not to pledge more than* $\Phi_1 = i_2$ *to* $P2$.

At date 2, *in the good state:*

1. A *offers contract* $C_2 = \{i_2, i_2, \rho^*\}$ *to* $P2$,
2. $P2$ *conducts due diligence, accepts the contract after observing* $\Omega(C_1) = C_1^{fb}$, *and invests* i_2 *in the firm;*
3. A *chooses high effort* ($e = 1$) *and the project yields* X *at date* 3.

At date 2 *in the bad state:* $P2$ *refuses to lend and the project is liquidated, paying* $L + \rho^*$ *to* $P1$.

Proof. See the appendix. ■

In this equilibrium, since we have assumed (by assumption A3b) that ρ^* is not too large, the only inefficiency caused by the presence of reading costs for $P2$ are the deadweight costs of due-diligence ρ^*.

It is important to note, however, that the direct costs of due diligence are not the only economically relevant costs to imperfect observability. When assumption A3b is relaxed, so that

$$\pi(R_g - \rho^*) + (1-\pi)L < i_1 \leq \pi R_g + (1-\pi)L,$$

then $P1$ does not expect to be repaid his initial contribution, and refuses to lend. As a result, due diligence costs cause credit-rationing: firms that would otherwise receive funding under costless observability can not obtain an initial loan from $P1$.

Whether the deadweight costs are the reading costs actually expended, or the indirect costs of underinvestment in valuable projects, it is clear that these losses will be higher when ρ^* is higher. A casual examination of (3), then, gives the following comparative statics:

Corollary 4 *Relative to the first-best world with no reading costs, the social welfare loss in a world with positive reading costs is greater when:*

1. *Due diligence expenditures are less effective (higher κ);*
2. *The net gains from redistribution to $P1$ and A ($V_x - (X - i_2 - c)$) are larger;*
3. *The net present value of $P2$'s loan ($X - i_2 - c - L$) is smaller.*

Proof. These follow immediately from the definition of ρ^*. ■

These comparative statics are intuitive. The less effective is due diligence in finding a hidden term, the more cost must be expended to eliminate the redistribution threat. When the net gains from redistribution ($V_x - (X - i_2 - c)$) are large relative to the cost of being caught ($X - i_2 - c - L$), $P2$ must be able to catch a redistributive covenant with greater probability for $P1$ and A to prefer to write an efficient contract rather than a maximally redistributive one.

4.2.1 Optimal Property Rights with Omniscient Courts

Up to this point, we have assumed a legal environment (which we termed the Coasean legal environment), in which the law allows contracting parties maximum flexibility in designing property rights that the law will enforce. In the setting with costless observability, the first-best action plan is possible in the Coasean environment, implying that no alternative legal rule can be preferred.

In a world with reading costs, however, the Coasean legal environment is not a welfare-maximizing legal rule. To see this, suppose a social planner can observe and condition legal rules on the same set of variables that the parties can contract upon. Then an optimal legal rule would limit the rights that A could grant to $P1$, to eliminate the risk of expropriation. With this risk eliminated, $P2$ will be free to lend without requiring due diligence.

Lemma 5 *In a world with perfect, omniscient courts, an optimal legal rule modifies the Coasean legal environment by adding the following limitations on the space of enforceable rights:*

1. *A limit on A's indebtedness: A can promise P1 a face value of no more than*

$$F_1 = \frac{i_1 - (1-\pi)L}{\pi}.$$

2. *A rule against excessive restraints on alienability: A and P1 can set Φ no less than i_2.*

In this modified legal environment, the first-best action plan can be implemented by the sequence of contracts in Proposition 1 with no reading costs expended by P2.

Proof. Omitted. ■

The lemma demonstrates, at least in principle, that legal rules limiting the set of enforceable property rights can increase social welfare. Nevertheless, the obvious critique of the above intervention is that it would require an unrealistic level of knowledge by courts to implement successfully in practice. Given that firms vary along many dimensions that are unobservable, the optimal cap on F_1 and Φ will be firm-specific and difficult to identify precisely on a case-by-case basis. As a result, legal rules that limit the space of enforceable property rights in practice will be subject to a trade-off: stricter restrictions may reduce due diligence and credit rationing costs, but due to their imperfect design, tighter restrictions will impose costs on parties who would write these contracts even in a world of perfect observability.

4.2.2 Optimal Property Rights under Imperfect Legal Enforcement

To see this trade-off in our formal model, consider the following imperfect legal rule: at date 2, A may promise $P2$ up to i_2 dollars that is senior to $P1$. If A writes this contract with $P2$, it will be enforced notwithstanding the terms of the contract between A and $P1$.

This modified legal environment is similar in spirit to some legal rules that give later lenders non-waivable priority over earlier lenders, such as the priority given to debtor-in-possession lenders in bankruptcy.[21]

To compare welfare (which is also A's expected payoff) under these two legal environments, note that total expected welfare in the least-cost separating equilibrium in the Coasean legal environment (assuming that $P1$'s participation constraint is satisfied) is given by

$$\pi(X - c - \rho^*) + (1 - \pi)L - i_1 - i_2 \tag{5}$$

While investment efficiency is guaranteed in the Coasean legal environment (continuation with effort in the good state, and liquidation in the bad state), the deadweight due diligence costs ρ^* are incurred in equilibrium. Social welfare under the modified legal environment that "rules in" the new loan is the following:

$$\pi(X - c) + (1 - \pi)(pX + (1 - p)\gamma L) - i_1 - i_2 \tag{6}$$

If $P2$ knows for sure that he will recover at least the value of his loan, he would be willing to lend at fair terms to A at date 2 without the need for any due diligence. But as we have seen, the cost of providing $P2$ with a certain return is that $P2$ and A have the incentive to invest and continue in the bad state of the world. Comparing social welfare in (5) and (6), we observe that as long as

$$\pi\rho^* > (1 - \pi)(L - pX - (1 - p)\gamma L)$$

the "rule-in" legal environment will be social welfare-improving relative to the Coasean environment.

The comparative statics underlying the inequality are intuitive. When ρ^* increases (which will be higher when κ and V_x are higher all else equal), the more restrictive legal environment improves welfare relative to the Coasean environment. On the other hand, $L - pX - (1-p)\gamma L$ represents the forgone efficiency gains when the bad state occurs. As these efficiency gains rise, the Coasean environment is more likely to be preferred. Finally, the probability $(1 - \pi)$ can be thought of as a measure of the likelihood that the potentially unenforceable right

[21] See Bisin and Rampini (2006), who argue that a reorienting of creditor priorities in bankruptcy can be valuable for moral hazard reasons in a world where exclusivity is not enforceable. See Triantis (1993) for a discussion of debtor-in-possession financing in bankruptcy.

would be used in equilibrium. When the states of the world in which the right is valuable are sufficiently unlikely, the more restrictive environment is more likely to be preferred.

It is worth emphasizing that this result is driven by the inability–in a world that allows complete contractual freedom–of $P1$ and A to commit to protecting $P2$. If the inequality above holds, $P1$ and A would like to commit to offering $P2$ a senior claim, because of the due diligence cost savings, even though this would result in an inefficient continuation in the bad state. But although they prefer this outcome, they can not achieve it in the Coasean environment. Any attempt to offer this "guaranteed seniority" to $P2$ would not be credible unless accompanied by an offer to reimburse ρ^* in due diligence costs. Lender $P2$ is aware that, due to the first-in-time rule in the Coasean world, $P1$'s contract could contain a term setting $\Phi = 0$, which would essentially nullify $P2$'s contract. Thus, $P2$ will react with suspicion to any proposal that does not include reimbursement of due diligence, and refuse to participate.

In a world where legal design and courts are imperfect, there is a difficult trade-off to resolve in the design of property laws in a financial contracting setting. While we can not resolve these trade-offs quantitatively, the analysis in this section suggests three general principles that are relevant for resolving this trade-off:

Principle 1 The law should be less likely to enforce a right if it is *more costly for third-parties to discover* (higher κ)

Principle 2 The law should be less likely to enforce a right if it is more *redistributive* from third parties (V_x)

Principle 3 The law should be more likely to enforce a right if the *expected efficiency gains* are larger ($(1-\pi)(L - pX - (1-p)\gamma L)$)

These principles are summarized graphically in Figure 2:

5 Legal Rules and Optimal Property Rights

With these principles in mind, we now discuss some examples of legal rules regarding property rights. Our goal is to demonstrate that in a variety of situations, the general principles in our model regarding optimal legal design are often reflected in the way property rights are enforced in practice.

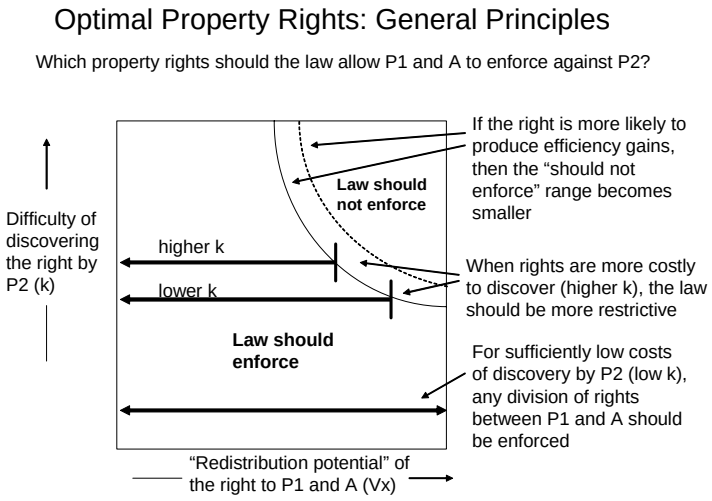

Figure 2:

5.0.3 Principle 1: Discovery costs

Perfected and unperfected security interests Our model predicts that the law will employ a more restrictive approach to enforcing rights against third-parties, all else equal, when these rights are more costly for a third party to discover. U.S. law regarding secured credit provides an illustration of this principle. Under Article 9 of the Uniform Commercial Code (UCC), a secured creditor can acquire important rights that bind third-parties if the claim is *perfected*.[22] For example, a perfected security interest will follow the collateral if the debtor sells it to a third-party. Also, if the debtor pledges the same collateral to a subsequent lender, the first creditor will have priority over the second.

Under the UCC, obtaining *perfection* requires that the creditor give the world notice of the security interest, usually by recording it in a filing system that third-parties can check.[23]

[22]Note here that our definition of a property right is different from the definition that is sometimes used in this context. For example, a lender whose security interest has attached but not perfected is often said to have a property right, though the secured creditor has rights only against the debtor, not against third-parties.

[23]There are some exceptions to this general rule. In some cases, a security interest can be perfected by acquiring possession of the collateral, which also serves a notice function to third-parties. There are also some cases in which neither notice filing nor possession is required. Under revised Article 9, sales of "payment intangibles" are automatically perfected and thus do not require notice filing. Schwarcz (2006)

If the secured creditor fails to record, the security interest is said to have *attached but not perfected*. In this scenario, the law allows the secured lender to enforce contractual rights that are good against the borrower, such as the ability to declare default and accelerate the loan, but the law will not enforce property rights that bind third-party buyers or lenders against the asset.

The notice-filing system guarantees that a security interest (or the absence thereof) can be verified easily, which reduces the required investigation costs of third-parties.[24] Without such a system, the later lender ($P2$) must rely on the cooperation of the debtor (A) to make knowledge of the early lender's ($P1$) prior interests available at low cost. For the reasons we have discussed in the model, the debtor may have the incentive to make this information costly to discover. Hence, the law applies a restrictive approach to enforcing property rights when the interest is not recorded.

Perfected security interests and negative pledge covenants The legal restriction on the property rights of an unperfected secured creditor also applies to unsecured creditors with negative covenants in their contracts. For example, many bond indentures contain "negative pledge" clauses that are intended to prevent the borrower from granting security to a future lender. Other negative covenants limit the amount of total debt that a borrower can incur in the future.

Our model demonstrates that enforcement of these covenants as property rights can be valuable in preventing overinvestment, but the law may refuse to enforce them. In practice, courts usually deny property-like remedies to unsecured creditors with negative pledge clauses when these clauses are violated.[25][26] The exceptions to this general rule have occurred when the court verifies that the subsequent lender had *actual knowledge* of the negative covenant and violated it willingly. In such situations, courts have created remedies for the negative

argues that this poses a problem for securitization of such assets, as potential buyers of these intangibles can not be certain about their priority status with respect to potential competing interests.

[24] In addition to mere recording, the standardization of the security interest also likely reduces investigation costs. We discuss standardization in an earlier version of this paper (Ayotte and Bolton 2007)

[25] The oldest known case on this subject is Knott v. Shepherdstown Manufacturing, 5 S.E. 266 (W. Va. 1888) in which the court denied an equitable lien to an unsecured creditor with a negative pledge clause, arguing that the breach of the negative covenant gave rise only to a claim for damages.

[26] Similarly, an unsecured creditor can not subordinate future unsecured creditors unless they explicitly agree to the subordination (Schwartz 1989)

pledge holders that bind the subsequent lender.[27]

The usual rationale given for the difference between the perfected security interest and the negative pledge is the absence of a registration system for negative pledges that reduce verification costs (Bjerre 1999). Like an unrecorded security interest, discovery of a negative pledge requires the cooperation of the borrower, which is less reliable than a recording system.

Enforcing the negative pledge against $P2$ when he has actual knowledge is also consistent with our model. If the court can verify that $P2$ was aware and understood the negative covenant, then there is no cost to enforcing $P1$'s rights exactly as he intends. Importantly, however, the law generally does not place the burden on $P2$ to discover negative covenants, which helps limit $P2$'s required verification costs.[28]

5.0.4 Principle 2: Redistributive rights

Fraudulent conveyance Our model suggests that the law adds value by refusing to enforce a division of rights that is particularly *redistributive* from third-parties. The law of fraudulent conveyance is intended to invalidate exactly these redistributive transfers of rights. Under the Uniform Fraudulent Transfers Act (UFTA), an unsecured creditor can avoid (invalidate) a transaction if it satisfies the conditions for *actual fraud* or *constructive fraud*. Actual fraud requires demonstrating fraudulent intent on the part of the parties to the transaction (in this context, A and $P1$) to redistribute from $P2$. The tests for constructive fraud require the creditor to demonstrate that the transaction left the firm in poor financial condition, so that it is insufficiently capitalized, or unlikely to be able to pay future debts when they come due.[29] It is exactly these transactions that are likely to be redistributive

[27] In the case First Wyoming Bank v. Mudge (748 P.2d 713 Wyo. 1988) the court found that a secured lender who knowingly violated a negative pledge clause was held liable for tortious interference with contract (the negative pledge holder was able to obtain damages from the later secured lender).

[28] This does not fully resolve the issue from a normative standpoint, of course. Bjerre (1999) argues that Article 9 should be expanded to allow registration of negative pledge clauses (prohibitions on future secured debt), thus allowing them to bind third-parties. Pursuing this logic further, the law could allow *any* negative covenant to be publicized, including stronger covenants (such as the ones we model here through the Φ parameter) that void any subsequent debt, secured or otherwise. In a prior version of this paper (Ayotte and Bolton 2007) we discuss this issue in more detail.

[29] Constructive fraud can be established if the creditor can show that the debtor firm a) received less than reasonably equivalent value for the transfer, and b) that the debtor was in a precarious financial situation

from $P2$.

Fraudulent conveyance attacks often arise in leveraged buyouts that subsequently fail. To make the example concrete, suppose $P1$ and A engage in a leveraged recapitalization, whereby $P1$ lends money to a corporation controlled by A in exchange for a large debt claim secured by A's assets. The corporation pays A the proceeds from the debt issue as a dividend, leaving A's firm highly levered. If the corporation later borrows from $P2$, and then files for bankruptcy, $P2$ may be able to attack the recapitalization as a fraudulent conveyance, and avoid the transfer of property rights (the security interest) given to $P1$.

Notably, consistent with Principle 1, some courts have refused to apply fraudulent conveyance law to protect future creditors in situations where the cost of becoming informed about past transactions is sufficiently low. In the case *Kupetz v. Wolf*, the court refused to protect creditors who invested after a well-publicized leveraged buyout:

> "Because fraudulent conveyance statutes were designed to protect creditors from secret transactions by debtors, the same rules should not apply when the transaction is made public. *Future creditors may not complain when they knew or could easily have found out about the transaction.* This certainly appears to be the case in this particular LBO. The transaction was well-publicized and the Trustee has not claimed or presented evidence that any of the future creditors were not aware of Wolf & Vine's financial dealings." (emphasis added)[30]

The proper role for fraudulent conveyance law is a topic that has received substantial attention in existing legal scholarship. Baird and Jackson (1985) argue that creditors can use protective covenants to prevent fraudulent conveyances (such as a leveraged buyout that dilutes earlier unsecured creditors) voluntarily if they so choose, but under current law, firms can not "contract out" of fraudulent conveyance protection if courts apply it erroneously or over-broadly. We agree with this point in principle, depending on how the opt-out is achieved. Our model does not justify any mandatory restrictions on $P1$'s ability to limit *his own* rights that are good against $P2$ (or vice versa).[31]

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at the time of the transfer (Blum, 2004).

[30] 845 F.2d 842 (9th Cir. 1988)

[31] Moreover, in such a context, A would have every incentive to reveal this contractual term to $P2$, as it would result in more generous lending terms from $P2$. This is not true in the opposite case (where A and $P1$ restrict $P2$'s rights), as A has the incentive to disguise this information.

This suggests that an optimal fraudulent conveyance law could be a default rule that allows creditors to opt-out of the protection in their own loan contract.[32] However, our model can be used to explain why the law might refuse to enforce a contract between A and $P1$ that prevents $P2$'s right to seek the fraudulent conveyance remedy, as this would require $P2$'s investigation to discover a right that may be harmful to him. In this context, our model implies that there is a valid trade-off between the benefits of reducing due diligence expenditures and credit-rationing, and the costs of ineffective or incorrect enforcement of this standard by courts.

Piercing the corporate veil Though we have focused on seniority of claims *within a firm* as a means of protecting $P1$'s claims against dilution by $P2$, another means of protecting $P1$ is through the creation of separate legal entities. For example, A might create a parent company and a wholly-owned subsidiary, and allow $P1$ to lend at the parent level, while $P2$ lends at the subsidiary level. This would imply that $P2$ would be senior to $P1$ with respect to assets held at the subsidiary level, but $P2$ would have no ability to reach the assets at the parent level if the subsidiary's assets are not sufficient to repay $P2$.

When such multi-tiered organizational structures exist, $P2$'s information about which entity owns which assets, and the nature of the relationship between the two entities, is obviously important. As we have seen, A might have an incentive, for example, to disguise the fact that $P2$ is lending to an under-capitalized subsidiary rather than a well-capitalized parent company. When such misrepresentation is possible due to vague boundaries between entities, creditors can attempt to pierce the veil of the subsidiary and pursue the parent's assets to satisfy their claim.[33] While the application of veil-piercing by courts is difficult to generalize, Thompson (1991) finds that the most common reasoning includes undercapitalization of the subsidiary and the misrepresentation of entity boundaries by the firm. The first rationale is consistent with Principle 2: the more thinly-capitalized the subsidiary, the

[32] This is true, of course, subject to the risk that a creditor may fail to observe or understand a term in his own contract, as in Katz (1990).

[33] Veil-piercing is an equitable doctrine that is determined on a case-by-case basis, but most commentators summarize that it is a remedy to be applied only in cases of fraud or approaching fraud: "the separate personality of the corporation will be disregarded or the corporate veil pierced whenever the separateness of the corporate form is employed to evade an existing obligation, circumvent a statute, perpetuate a fraud or crime or generally commit an injustice or gain an unfair advantage."

lower the recovery for the later lender if veil-piercing is not allowed.[34] The second rationale is consistent with Principle 1, that in misrepresenting the boundary of the entity, the firm made discovery costs prohibitively large.

5.0.5 Principle 3: Efficiency

Limitations on anti-assignment clauses Our model suggests a trade-off in legal design between limiting verification costs, and allowing for divisions of rights that enhance efficiency. One example of balancing these competing forces can be found in the treatment of contractual anti-assignment clauses. For instance, a firm operating as a franchisee (A) may desire to grant a security interest in his franchisee rights to a lender ($P2$) as a means of obtaining cheaper credit, but the franchisor ($P1$) may value the right to restrict who can become a franchisee. In a different context, a bank (A) might wish to sell its rights to payment on a loan to an investor ($P2$), but the borrower ($P1$) may be concerned about who his creditors are in the future.

These applications are a slight departure from the model in that the principals are not both lenders, but the underlying trade-off is similar. If the law allows complete contractual freedom between $P1$ and A to limit A's ability to assign his rights to $P2$, this could result in redistribution from an uninformed $P2$ who attempts to acquire A's rights, and later finds himself empty-handed. The possibility of this outcome would increase the required due diligence of potential $P2$'s before agreeing with A, and potentially limit the liquidity of these financial contracts in secondary markets if $P2$ attempts to resell them.[35] On the other hand, limiting the scope of $P1$ and A to create such restraints might hinder efficient contracting. For example, after making a loan to a borrower, a relationship bank might be tempted to assign a loan to a lender who would be unwilling to forgive minor covenant violations, simply because this "tough" lender is willing to buy the loan at a high price.[36]

[34] Easterbrook and Fischel (1985) argues, in the same spirit as our model, that allowing for veil-piercing in these contexts can be understood as a means of providing incentives for firms to disclose their undercapitalization to creditors when a full investigation of the firm's finances is prohibitively costly.

[35] Some anecdotal evidence from Canada supports this feature of our model. In Quebec and Ontario, anti-assignment provisions are not part of the commercial code. As a result, Fingerhut (2006), in an article targeted at practicing lawyers, warns that "additional due diligence is called for when the collateral includes Quebec or Ontario receivables."

[36] Consistent with this logic, Guner (2007) finds that borrowers extract concessions from banks that are

Allowing these restraints on assignment to be enforceable helps the bank commit to the relationship with the borrower.

Revised Article 9 resolves this tension in a way that balances the key trade-offs of efficiency gains against verification costs. In contracts that fall under §9-408 the UCC invalidates agreements between A and $P1$ that attempt to restrict assignability to $P2$.[37] This restriction allows potential third-parties to lend against or purchase these assets without taking the steps to verify that these anti-assignment clauses are not present. To protect $P1$, however, the law allows a contractual anti-assignment provision to limit $P2$'s rights to *enforce* the security interest against $P1$. Thus, a borrower in a commercial lending context can ensure that he will not be subject to the aggressive collection tactics of an unknown loan buyer if he contracts for this protection, yet the loan buyer can be certain that in purchasing rights to payment, his potential losses from failing to discover an anti-assignment clause are limited.[38]

6 Conclusion

In this paper, we adopt a definition of property rights that departs from most of the economics literature on the subject and follows a definition of property rights in recent legal scholarship. Because this definition emphasizes that property rights are rights that bind third-parties, a key concern is that third-parties may be imperfectly informed about the pre-existing rights that affect them. In a financial contracting context, these concepts are particularly important because borrowers may become insolvent. As a result, lenders are particularly worried about the presence of rights that bind other lenders with competing claims.

We develop a formal theoretical model in which lenders and borrowers are rational, in that

likely to sell loans through lower interest rates.

[37] Paragraph §9-408 includes, among other things, "general intangibles" such as franchise and licensing agreements, and sales of "payment intangibles" such as commercial loans. For a thorough discussion of these issues, see Morse (2001), Plank (2001) and Schwarcz (1999).

[38] The reader might wonder what the value of a security interest in the intangible to $P2$ would be in the presence of an anti-assignment clause if $P2$ can not enforce his rights against $P1$. If $P2$ were a secured lender to A against the intangible, the protection $P2$ would obtain in this case is, among other things, the right to adequate protection payments if A files for bankruptcy. For an example, see Plank (2001), p. 331.

they anticipate the strategic behavior of other players, and can write sophisticated contracts that attempt to mitigate inefficient, opportunistic behavior. The model demonstrates that, in a world with costless and complete information, a legal environment that allows parties maximum flexibility to create and enforce any allocation of divided property rights is optimal. When observability is costly, however, there can be a role for the legal system to limit the space of property rights that are enforceable.

In a world with full enforceability, third-parties will not participate without conducting sufficient due diligence to reassure themselves that redistribution at their expense has not occurred. In equilibrium, these deadweight costs of due diligence are borne by the borrowing firms. Importantly, though, this does not rule out a role for optimal design of property laws. In our model, there is no way for firms to reduce these costs, due to an inability to commit to protecting third-parties from redistribution. The law can add value by providing firms with a credible mechanism to make this commitment. If the cost of discovering a right is large enough, and the right is potentially redistributive, then the law will optimally refuse to enforce such a right. The law in our model can be seen as mandatory, in that the law will mandate a relationship between the enforceability of a right and the cost of discovering that right by third-parties which can not be adjusted by contract. On the other hand, if contracting parties can demonstrate to a court that they made third-parties aware of their pre-existing rights, then our model suggests the rights should be enforced.

In our investigation into existing law, we find several examples that broadly confirm the qualitative trade-offs in the model. Laws that govern financial contracting in which third-parties are affected often limit the ability of early lenders to create enforceable property rights that can be redistributive. The law is less likely to enforce a property right when it is unlikely that the right has an efficiency rationale, and is more likely to enforce the right when knowledge about the right is relatively inexpensive for a third-party to acquire.

While our formal model is intended to add an additional element of realism to the study of legal design in a financial contracting setting, there are other important factors our analysis does not address that are important. For instance, many of the mandatory standards in the law that are intended to protect third-parties also entail substantial ex-post litigation costs. In a world with costly courts that make judgment errors, later lenders could threaten to use the legal protections we document above in an opportunistic way as a means of extracting value from earlier lenders. This could lead to deadweight costs and inefficient allocations

as a result, tipping the scales toward a more permissive legal environment. On the other hand, the ability of the early lender to protect himself by monitoring the firm's contracting with the later lender is not present in the current model. Adding the possibility of costly monitoring would imply that $P1$ has other means of protecting himself from dilution by $P2$, reducing the cost of less-permissive legal rules.

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7 Appendix

Proof of Proposition 1:

Proof. Note first that under the contract written between $P1$ and A, $P2$ is not willing to lend to A at date 2 in the bad state. By lending i_2 principal $P2$ gets an expected repayment which is less than the loan i_2. Indeed, the most $P2$ can hope to get is

$$pi_2 + (1-p)\max\{0, \gamma L - F_1\} = pi_2$$

since

$$\gamma L - F_1 = \gamma L - \frac{i_1 - (1-\pi)L}{\pi} =$$
$$\frac{\pi\gamma L + (1-\pi)L - i_1}{\pi} < \frac{L - i_1}{\pi} < 0.$$

Next, $P2$ is willing to lend to A at date 2 in the good state under the contract written between $P1$ and A, since $X - (i_2 + F_1) > \frac{c}{1-p}$, or

$$\pi(X - \frac{c}{1-p} - i_2) - (1-\pi)L \geq i_1$$

by assumption **A3.** And when $X - (i_2 + F_1) > \frac{c}{1-p}$, A's best response is to choose high effort ($e = 1$), since then:

$$X - (i_2 + F_1) - c > p(X - (i_2 + F_1)) \tag{7}$$

as

$$F_1 \leq R_g \equiv X - \frac{c}{1-p} - i_2$$

by assumption **A3**, and by definition of R_g,

$$X - R_g \geq \frac{c}{1-p}.$$

The RHS of (7) is A's expected payoff under the low effort choice ($e = 0$), since when the project fails and only yields a liquidation value γL the firm's total liabilities $(i_2 + F_1)$ exceed its assets γL, so that A gets zero.

Proof. When A chooses high effort the firm gets a cash flow of X for sure at date 3. The firm's debt is therefore safe, so that $P1$ is willing to lend i_1 in return for a debt repayment of the same amount at date 3. ■ ■

7.0.6 The Bayes-Nash Equilibrium and Proposition 3

An equilibrium of our game is taken to be a *Bayes-Nash equilibrium*, where:

1. All agents play a best response given their beliefs, and

2. All players' updated beliefs are consistent with all agents' best responses.

More concretely,

a $P1$ and A choose C_1 at date 1 given $P2$'s expected equilibrium best response,

b A chooses the contract offer C_2 optimally at date 2 given the past choice of C_1 at date 1 and given $P2$'s beliefs $\nu_2(C_1 \mid C_2, \Omega(C_1))$,

c $P2$ best responds by deciding whether or not to lend when $\Omega(C_1)$ is observed. (We assume that $P2$ conducts any due diligence that is reimbursed by A irrespective of his beliefs).

d $P2$'s beliefs $\nu_2(C_1 \mid C_2, \Omega(C_1))$ are consistent with the equilibrium choices, C_1 and C_2.

Under these assumptions, and under the belief-function $\nu_2(C_1^{fb} \mid C_2 = \{i_2, i_2, \rho\}, \Omega(C_1) = C_1^{fb}) = 1$ for $\rho \geq \rho^*$ and $\nu_2(C_1^{fb} \mid C_2, \Omega(C_1)) = 0$ otherwise, the *least-cost separating* Bayes-Nash equilibrium of the full contracting game is stated in Proposition 3. The proof of Proposition 3 is as follows:

Proof. Given that under due diligence ρ^* we have

$$X - i_2 - c = \left(\frac{\rho^*}{\rho^* + \kappa}\right) L + \left(1 - \frac{\rho^*}{\rho^* + \kappa}\right)(X - c), \tag{8}$$

it is a (weak) best response for $P1$ and A to agree to contract C_1^{fb}. Given the choice of C_1^{fb}, $P2's$ investigation will produce $\Omega(C_1) = C_1^{fb}$. Thus, $P2$'s equilibrium beliefs $\nu_2(C_1^{fb} \mid C_2 = \{i_2, i_2, \rho^*\}, \Omega(C_1) = C_1^{fb}) = 1$ are consistent with $P1$ and A's equilibrium play. It is a (weak) best response for A to offer contract $C_2 = \{i_2, i_2, \rho^*\}$ at date 2, and a (weak) best response for $P2$ to accept C_2 in the good state, but to reject it in the bad state. In particular, A cannot obtain a higher payoff by offering any other contract $C_2 = \{i_2, i_2, \rho\}$, with $\rho \neq \rho^*$ at date 2. Indeed, any contract with $\rho > \rho^*$ would involve unnecessarily high due diligence expenditures, and any contract such that $\rho < \rho^*$ would be rejected by $P2$ given his updated beliefs, yielding a payoff of $L + \rho^*$ to $P1$ and A. To show this is less than $X - i_2 - c$, note that by A3b, $\pi(R_g - \rho^*) + (1 - \pi)L \geq i_1$. Combining this assumption with $L < i_1$, and the definition of R_g, it follows that $X - i_2 - c > R_g > L + \rho^*$. ■