Creditor rights, lender competition and firm value*

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Abstract

We show that the real effects of creditor rights critically depend on the degree of lender competition. To do this, we introduce both lender market power and limited pledgeability of cash flows in an otherwise standard moral hazard problem. The degree of competition does not affect entry at the extensive margin, or the optimality of issuing debt. However, the extent of competition affects the intensive margin. Specifically, with competing lenders, creditor rights relax a firm's financing constraint, inducing higher firm value. In sharp contrast, with market power, creditor rights can *reduce* both effort and firm value, while increasing lender profit. This lender-competition channel can reconcile the limited, or even negative, effects of creditor rights reforms in developing economies.

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1 Introduction

How much of a firm's assets and cash flows can be pledged to outsiders varies greatly across economies, and is positively related to the development and size of capital markets (LaPorta et al. (1997)). This observation has motivated many countries to implement reforms seeking to strengthen creditor rights, and to pursue titling and formalization programs (e.g., reflecting ideas from De Soto (1989, 2000)). Evidence from developed countries suggests positive effects from increasing creditor rights (Mann (2018), Aretz et al. (2020), Ersahin (2020), Favara et al. (2021) and Lewis (2023)), supporting conclusions that "creditor protection can improve contracting efficiency and enhance access to credit" (Degryse et al. (2020)). More broadly, however, the effects are less clear cut. Specifically, evidence from developing economies and risky small business lending suggests a possible dark side of creditor protection. In the US, Cerqueiro et al. (2019) and Ersahin et al. (2021) find that greater creditor rights are associated with lower startup entry and business dynamism, while Vig (2013) and Alok et al. (2022) find negative and heterogenous consequences of creditor rights on firms in India. Overall, surveys of the literature by Woodruff (2001) and Ulyssea (2020) suggest modest or mildly negative net effects from property rights and other formalization reforms in developing economies.

We develop a novel theory showing that the heterogenous impacts of creditor rights reforms may be due to heterogeneity in the extent of competition in the relevant lending markets. First, we observe that both developing economies and small business lending tend to feature less competitive lending markets. Then, we show theoretically that, with limited lender competition, increasing creditor rights can *decrease* firm value and reduce firm growth, in the absence of any liquidation bias. Indeed, with an increase in creditor rights, interest rates can fall and *yet* firm value declines due to the effect creditor rights have on the recovery rate upon default. Even though we find that the real effects of creditor rights hinge crucially on the extent of lender competition, the literature has barely considered it in the debate (see, e.g., Ulyssea (2020) and Benmelech (2024)).

Our baseline model revisits a classic effort problem à la Innes (1990), where a firm's owner/manager seeks external financing of a project whose profitability depends on the manager's unobservable and costly actions. We then introduce an ex-post diversion problem as in Hart and Moore (1998), and suppose that creditor rights are a means to limit the diversion problem, as in DeMarzo and Fishman (2007) or Gennaioli and Rossi (2013). Unlike Besley et al. (2012), we consider limited pledgeability of cash flows. Finally, we contrast equilibrium outcomes with competitive and monopolistic lenders.

In this setting, the optimal monotonic security used by firms to raise external financing is debt, regardless of the degree of creditor rights and lender competition. Moreover, the extensive margin of whether a firm receives financing or not in equilibrium is unaffected by the extent of lender competition. However, the effect of creditor rights on firm value and effort at the intensive margin—i.e., conditional on receiving financing—hinges critically on the extent of lender competition.

Competitive lenders are at their participation constraint, so increases in creditor rights lead to reductions in the required face value of debt. Consistent with the canonical view, this increases firm value. In sharp contrast, from the perspective of a lender with market power, creditor rights and effort can either be complements or substitutes in maximizing profits. On the one hand, higher creditor rights reduce the lender's losses given default, which increases expected profits. On the other hand, for any fixed face value of debt, this increment in the recovery rate induces a reduction in managerial effort. Moreover, reducing the face value to the point where managerial effort remains constant can be suboptimal for a monopolist, as it reduces lender profits relative to an alternative high-face-value and low-effort outcome that is feasible to implement. Thus, when lenders have market power, our model delivers conditions under which firm value falls as creditor rights increase.

We show how the degree of lender competition affects the relation between creditor rights and the cost of credit, i.e., the face value of debt required for a given investment. In competitive capital markets, higher creditor rights always reduce the cost of credit. This observation motivates using the face value of debt—or, more broadly, debt yields—to proxy for the positive effects of creditor rights (Benmelech (2024)). Our analysis of a monopolist lender reveals issues with this identification assumption. Specifically, stronger creditor rights may cause a monopolist lender to reduce the face value; but nonetheless, firm value can still fall and the firm's owner may have to make a larger transfer of cash-flow rights to the lender. That is, even though the face value drops, the monopolist anticipates that the increment in the losses-given-default due to higher creditor rights will more than compensate for the lower effort *and* the reduced face value in good states. Our analysis also delivers a testable implication: if the cost of credit rises in the aftermath of a reform that increases creditor rights, then the lending market must not be competitive.

Our analysis has important empirical implications. If firms have discretion over the fraction of cash flows pledged to outsiders, as is common in practice, then firms that operate in competitive lending markets want to make their cash flows as pledgeable as possible. In contrast, with limited lender competition, firms prefer to keep the largest possible fraction of cash flows *not* pledgeable, subject to satisfying the participation constraint of lenders. In turn, this induces the *highest possible* managerial effort and firm value. Thus, our analysis provides micro-foundations for strict benefits in keeping firm cash flows not pledgeable when lender competition is limited, consistent with the modest real effects estimated from formalization reforms (see Woodruff (2001) or Ulyssea (2020)).

The costs of creditor rights that emerge from our analysis cast doubts on the so-called 'credit market channel' of formalization reforms (Straub (2005)), which motivates enhancing enforcement of debt contracts. While enforcement efforts tend to have positive effects on the rate of firms' participation (see, e.g., De Giorgi et al. (2018) and De Andrade et al. (2016)), it is unclear if this ultimately benefits firm growth and development. Indeed, when capital markets are not competitive, policies that enhance enforcement of formalization and titling reforms can backfire. That is, while they might successfully increase the rate of formality, they can also hamper effort incentives and firm growth. As a result, any regulatory effort that seeks to change the balance of power between creditors and debtors must take into account whether the relevant credit market is sufficiently competitive to pass through enough of the benefits of the reform to the borrowers.

In a related paper, Besley, Burchardi and Ghatak (2012) also highlight potential negative effects of creditor rights, in a moral hazard setting. However, in their model higher creditor rights *never* reduce firm value, like in our setting, but only have distributional consequences, inducing a larger transfer of resources from borrowers to lenders. These heterogeneous results can be traced down to the following two modeling differences between our framework and theirs: (i) we allow for an arbitrary number of cash-flow states, whereas they only consider two states; (ii) we consider limited pledgeability of cash flows, in a context in which firms do not have any collateralizable assets in place. In contrast, Besley et al. (2012) assume that a firm's cash flows are fully pledgeable, and the firm also has access to additional collateral which can only be partially pledged. Our assumption that firms do not have assets in place is realistic, especially in developing economies.

2 Baseline Model

Our baseline model is designed to achieve two purposes. First, it makes comparisons between our results and classic results in Innes (1990) transparent. Second, it highlights the common key forces at play in more general environments.

There are two risk-neutral agents: a firm Manager (M) and a Principal investor (P). M runs a firm that requires an investment of \$1 today ($t = 0$) to generate a stochastic cash flow $\tilde{x} \in \{l < 1, m > 1, h > m\}$ tomorrow ($t = 1$). The firm has no cash, while P has \$1 that it can either lend to M, or invest at zero net return. M and P share a common prior that $\Pr.[x = h] = \delta e$ and $\Pr.[x = m] = (1 - \delta)e$, where e is the (unobservable) effort that M exerts in the project and $\delta \geq 0$.[1] M's private cost of effort is given by $\frac{ce^2}{2}$, where $c > 0$.

[1]The parameter δ only matters for our results on the cost of credit. For other purposes, the same qualitative results obtain for $\delta = 1$ or $\delta = 0$.

Assumption 1. $\left(\frac{\delta(h-m)+m-l}{2}\right)^2 \geq c \geq \delta(h-m)$

Here, $c \geq \delta(h-m)$ ensures that the second-best effort level is interior, and $c \leq \left(\frac{\delta(h-m)+m-l}{2}\right)^2$ ensures that, regardless of the degree of pledgeability ϕ, the face value of debt under competition is well defined. Thus far, this model is a special case of the classic setting studied by Innes (1990), for a three-point support and a specific effort cost function. We refer to *firm value* as the present value of the firm's cash flows net of investment and effort costs. That is, when effort e' is exerted, firm value is $e(\delta h + (1-\delta)m) + (1-e)l - 1 - \frac{ce^2}{2}$.

Our **first innovation** is to introduce an ex-post moral hazard problem—allowing M to divert a fraction $(1-\phi) \in [0,1]$ of the realized cash-flow x at no cost. That is, we allow for limited *creditor rights* to a firm's cash flow, where creditor rights increase with ϕ: if a debt contract has face value D and cash flows are x, a creditor receives $min\{\phi x, D\}$.

2.1 Competition

To begin, suppose P is a competitive lender who offers to fund M with a security $s(\cdot)$. Save for the limited-creditor rights constraints—i.e., $s(x) \leq \phi x$ for all x—the model mirrors Innes (1990). Limited liability requires $s(x) \in [0, x]$, but this does not bind due to the stricter limited-creditor rights constraint $s(x) \in [0, \phi x]$. Under competition, the optimal contract maximizes M's utility subject to its own IC constraint and P's participation constraint. Formally, the optimal contract solves the following problem:

$$\max_s \; e[\delta h + (1-\delta)m - l - (\delta s(h) + (1-\delta)s(m) - s(l))] + l - s(l) - \frac{ce^2}{2} \text{ subject to:}$$

$$\text{IC}: e \in \arg\max_{e'} \; e'[\delta h + (1-\delta)m - l - (\delta s(h) + (1-\delta)s(m) - s(l))] + l - s(l) - \frac{ce'^2}{2}$$

$$\text{PC}: e(\delta s(h) + (1-\delta)s(m) - s(l)) + s(l) \geq 1$$

$$\text{LP}: 0 \leq s(x) \leq \phi x, \; \forall x.$$

Inspection reveals that the IC constraint is unchanged by creditor rights, save for the indirect effect that creditor rights have on the optimal security s. As a result, solving the first-order condition with respect to effort yields

$$e = \frac{\delta h + (1-\delta)m - l - (\delta s(h) + (1-\delta)s(m) - s(l))}{c},$$

which is increasing in $s(l)$. It follows that M optimally minimizes the difference between

$\delta s(h)+(1-\delta)s(m)$ and $s(l)$, setting $s^*(l)=\phi l$. The optimal contract can be implemented by issuing debt $s=\min\{\phi x, D\}$ for some $D \leq \phi h$. The next proposition characterizes the competitive outcome, establishing the expected result that in a competitive lending market, increasing creditor rights ϕ increases both managerial effort and firm value.

Proposition 1. *Suppose there is a competitive lending market. Then*

- *There exists a $\underline{\phi} > 0$ such that financing takes place if and only if $\phi \geq \underline{\phi}$. The optimal contract takes the form of debt: $s^* = \min\{\phi x, D\}$, for some $D \leq \phi h$.*
- *Managerial effort increases with creditor rights ϕ, which increases firm value and reduces the face value of debt D, with increases in firm value accruing to the manager.*

Proof: See the Appendix for proofs. The proof gives the solutions for $\underline{\phi}$ and D. □

2.2 Monopolistic lender

Our **second innovation** is to suppose that, rather than the manager, the Principal investor (P) has all of the bargaining power. That is, P can make the manager a take-it-or-leave-it offer. We show that giving the lender all bargaining power profoundly afters both the split of the firm's value between M and P, and the role played by creditor rights.

Ignoring for now P's participation constraint, the optimal security solves:

$$\max_s \pi(s) := e(\delta s(h) + (1-\delta)s(m) - s(l)) + s(l) - 1 \text{ subject to:}$$

$$\text{IC} : e \in \arg\max_{e'} \; e'[\delta h + (1-\delta)m - l - (\delta s(h) + (1-\delta)s(m) - s(l))] + l - s(l) - \frac{ce'^2}{2}$$

$$\text{LP} : 0 \leq s(x) \leq \phi x, \; \forall x.$$

Creditor rights ϕ only affect the objective function and IC constraint via the endogenous security s. It follows that M's effort reaction function to a change in s does not depend on the extent of competition. This means that it is optimal for P to maximize downside protection in the low state of the world, i.e., $s(l)^* = \phi l$. The lower bound on creditor rights $\underline{\phi}$ is unaffected by the extent of lender competition, as, in this instance, only the contract that gives P all pledgeable cash flows satisfies P's participation constraint. We have:

Proposition 2. *Suppose there is a monopolist lender. Then*

- *Financing occurs if and only if* $\phi \geq \underline{\phi}$. *The optimal contract takes the form of debt:* $s^* = \min\{\phi x, D_M\}$.[2]

- *Effort and firm value decrease in* ϕ *for* $\phi \in [\underline{\phi}, \frac{1}{2})$, *and are minimized by any* $\phi \geq \frac{1}{2}$.

- *For* $\phi \geq \underline{\phi}$, *increasing creditor rights always results in a larger transfer of firm value from M to P. Increasing creditor rights raises the face value of debt when either* $\phi \notin \left[\underline{\phi}, \frac{D_M}{m}\right]$, *or* $\phi \in \left[\underline{\phi}, \frac{D_M}{m}\right]$ *and* $l > (1-\delta)m$. *Otherwise, higher creditor rights reduce the face value of debt, even though they do not increase effort and firm value.*

The intuition is simple. When creditor rights are increased, a monopolistic lender can seize more of the product from a firm manager's efforts. When creditor rights are low, here $\phi \in [\underline{\phi}, \frac{1}{2})$, they sufficiently constrain the lender's rent extraction to ϕx in each state x. In essence, the contract reduces to an equity contract in which the lender receives a share ϕ of the firm's cash flow. In turn, increases in ϕ induce the manager to reduce effort so firm value falls. Once creditor rights are high enough—in this baseline case, $\phi \geq \frac{1}{2}$ is required—the lender can induce his most-preferred incentive compatible effort level from the manager, trading off optimally between rent extraction and inducing effort, so that managerial effort ceases to vary with ϕ. As a result, increases in creditor rights past $\phi = \frac{1}{2}$ just transfer firm value from the manager to the lender.

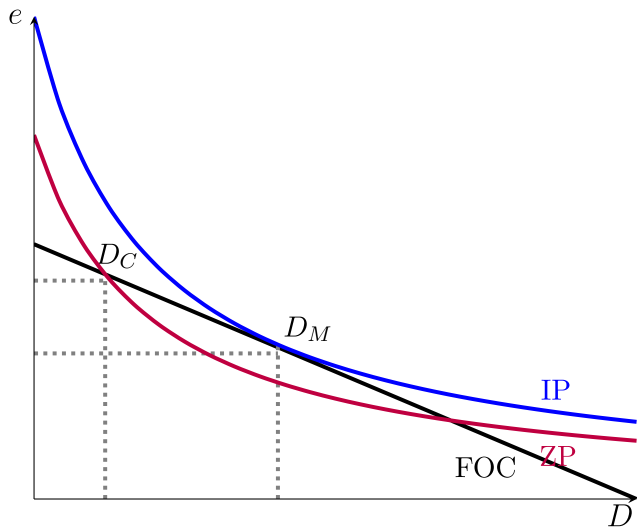
As for the analysis of the face value of debt (or, equivalently, the firm's cost of credit), recall that in a competitive lending setting, higher creditor rights result in a lower face value of debt. In contrast, with a monopolistic lender, whether increased creditor rights increase or reduce the equilibrium face value of debt depends on parameters. This finding points to issues with studies that argue lower interest rates *must* benefit firms and growth. Under monopoly, when financing occurs, increased creditor rights can cause interest rates to fall—here it does when both $l < (1-\delta)m$ and $\phi \in \left[\underline{\phi}, \frac{D_M}{m}\right]$—but firm value *never* grows. Intuitively, to keep (optimal) effort unchanged when creditor rights increase, $e = e^{FB} - \frac{\delta D_M + (1-\delta)\phi m - \phi l}{c}$ must not change, implying that $\frac{dD_M}{d\phi} = \frac{l-(1-\delta)m}{\delta} < 0$ for $l < (1-\delta)m$. Posed differently, when state m is likely, the increased rent extraction in state m from increases in ϕ must be offset by a reduction in the face value D_M paid in state h to incentivize M to maintain his effort choice.

Figure 1 contrasts competitive and monopolistic equilibrium outcomes. The figure shows that managerial effort is a decreasing function of the face value of debt. The competitive face value of debt is given by the intersection of the Zero-Profit curve for the

[2] $D_M = \phi h$ for $\phi \in \left[\underline{\phi}, \frac{1}{2}\right]$. D_M solves $ce^{FB} = 2\left[\delta D_M + (1-\delta)\min\{\phi m, D_M\} - \phi l\right]$ for $\phi \in \left[\frac{1}{2}, 1\right]$.

competitive lender (ZP) with the First-Order Condition with respect to effort (FOC), which gives the reaction function of managerial effort to a change in the face value of debt. The monopolist optimizes over D taking the manager's effort response as given, so that the optimum is given by the tangency of the monopolist's isoprofit curve and FOC. Relative to a competitive lending market, the face value of debt is higher and managerial effort is lower, reflecting that the monopolist lender cares about expected profits, not firm value. That is, while the higher face value D_M reduces effort incentives and hence firm value, it gives the lender a bigger share of the proceeds in good states of the world.

Figure 1: Equilibrium under competition and monopoly.



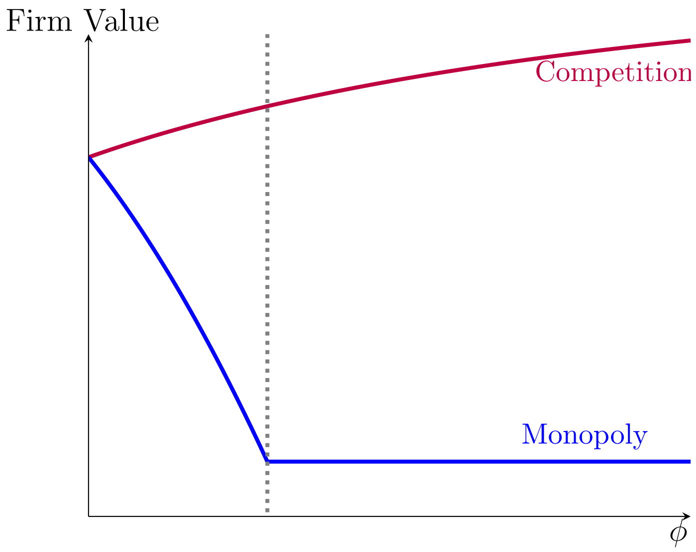
Parameter values: $h = 5.5$, $l = 0.5$, $\delta = 1$, $c = 6$.

2.3 Contrasting competitive and monopoly lending outcomes

Contrasting competitive and monopoly outcomes underscores that discussions of creditor rights and firm formalization should explicitly account for the degree of lender competition. In competitive lending markets, greater creditor rights benefit firms by reducing their cost of external financing and, as a result, alleviate moral hazard problems. This corresponds to the canonical view that dates to De Soto (1989, 2000). Our analysis of monopolistic credit markets reveals a very different relationship: at the intensive margin, increasing creditor rights reduces value, as it induces lower effort. In this context, formalization reforms, even if costless, would fail precisely because the lack of formalization shields some of a borrower's assets from being captured by lenders, motivating borrowers to work more and increase the value of their assets. Even though the extent of lender competition crucially drives the real effects of creditor rights, the literature has barely considered it (see, e.g., surveys by Ulyssea (2020) and Benmelech (2024)).

Figure 2 plots firm value under monopoly and competition, as a function of the degree of creditor rights ϕ for $\phi \geq \underline{\phi}$, so that financing takes place. For $\phi \leq 0.5$, we are to the left of the dotted vertical line and the sign of the impact of increasing creditor rights on firm value *hinges on the nature of lender competition*: it is positive under competition, but negative under monopoly. As one increases creditor rights so that $\phi \geq 0.5$, firm value under competition continues to rise, and it is maximized by $\phi = 1$. In contrast, firm value under monopoly remains at its minimum level for all $\phi \geq 0.5$.

Figure 2: Creditor rights and firm value

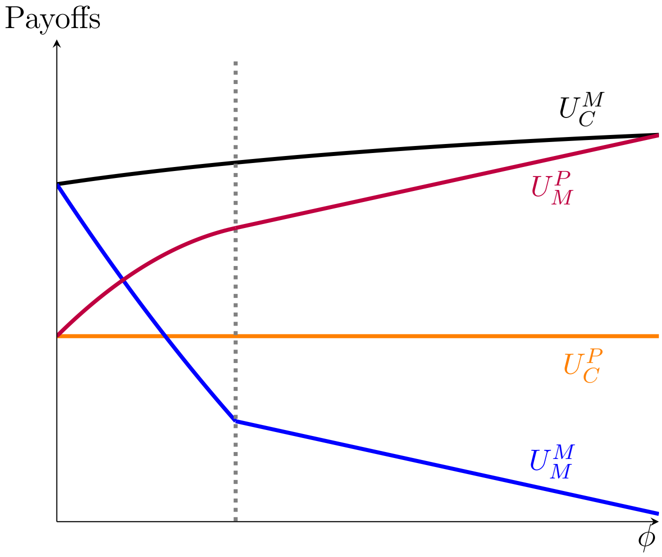


Parameter values: $h = 5.5$, $l = 0.5$, $\delta = 1$, $c = 6$.

Figure 3 plots how creditor rights affect manager and lender payoffs for $\phi \geq \underline{\phi}$. The manager's payoff under competition, U_C^M, increases monotonically with ϕ for two reasons. First, as Figure 2 shows, firm value increases with ϕ under competition. Second, the payoff of investors under competition, U_C^P, is constant and equal to one. Thus, in competitive credit markets, all gains from increasing creditors' rights accrue to the borrowers.

In contrast, with a monopolistic lender, the curve U_M^P shows that the lender's payoff rises monotonically with increases in ϕ, while U_M^M falls monotonically. As higher levels of ϕ reduce firm value, it follows that there is a redistribution of value from borrowers to lenders that more than offsets the reduction in firm value. Of note, even once ϕ exceeds 0.5, so firm value becomes constant, higher creditor rights continue to transfer resources from borrowers to lenders, increasing the gap in their payoffs.

Figure 3: Creditor rights and payoffs



Parameter values: $h = 5.5$, $l = 0.5$, $\delta = 1$, $c = 6$.

We have established that the degree of lender competition is a key determinant of both the real and distributional effects of creditor rights reforms. However, while some of the features of our findings are general in nature, others reflect the particular parametric structure. In our baseline model, under monopoly, (i) firm value falls only if limited cash-flow pledgeability binds in all states, and (ii) firm value never rises with creditor rights. These features are special and reflect the assumed linear relationship between effort and the probability of medium or high cash flows. In the Appendix, we provide two examples where those relationships are non-linear. In the first example, firm value strictly falls under monopoly even when not all pledgeable cash flows are promised to the lender. The second example shows that firm value can increase with creditor rights under monopoly.

3 Generalizing the Model

We now consider a model with general cash flow distributions and general cost functions, imposing only an MLRP relationship between higher effort and higher cash flow realizations, as in Innes (1990). We derive a necessary and sufficient condition for firm value to increase with creditor rights, and show that with a monopolist lender this requires the face value of debt to drop more steeply than a strictly negative lower bound.

Suppose that M's project generates a stochastic cash flow $\tilde{x} \in [0, \bar{x}]$. Let $G(x|e) \in \mathbb{C}^1$

be the cdf over $\tilde{x}$ generated when M exerts effort e, and let $g(x|e)$ be the associated pdf. Increasing effort induces a strict Monotone Likelihood-Ratio-Property (MLRP) on returns: $\frac{\frac{\partial}{\partial e}g(x|e)}{g(x|e)}$ is increasing in x for every e. We allow for any increasing and convex effort cost function that satisfies $c(0) = c'(0) = 0$, $c'(e > 0) > 0$ and $c'' > 0$. As in the literature that follows Innes, we focus on monotonic contracts with $s(x) \geq s(x')$ for any $x > x'$.

Consider the optimization problem of a monopolistic lender P that faces a given ϕ.[3] When P's participation constraint does not bind, P chooses a security $s(\cdot)$ that solves:

$$\begin{aligned}
&\max_{s(\cdot)} \mathbb{E}[s(x)|e] - 1 \text{ subject to:} \\
&\text{IC: } e \in \text{argmax}_{e'} \mathbb{E}[x - s(x)|e'] - c(e') \\
&\text{LP: } 0 \leq s(x) \leq \phi x, \ \forall x.
\end{aligned}$$

Because the IC constraint is unchanged, the monopolist's optimal security remains debt. The results below show that the result that increased creditor rights can reduce effort and firm value is general in nature:

Proposition 3 (Monopoly)**.** *The optimal contract is debt: $s^* = \min\{\phi x, D^*\}$, for $D^* \leq \phi\bar{x}$. There exists a $\bar{\phi} > \underline{\phi}$ such that $D^* = \phi\bar{x}$ is optimal for all $\phi \in [\underline{\phi}, \bar{\phi}]$. For $\phi > \bar{\phi}$, $D^* = \phi\hat{x}^*$, where $\hat{x}^*$ solves $\frac{\partial}{\partial \hat{x}}\left\{ \int_0^{\hat{x}^*} x dG(x|e^*) + (1 - G(\hat{x}^*|e^*))\hat{x}^* \right\} = 0$ and e^* solves:*

$$\int_0^{\hat{x}^*} (1 - \phi)x \frac{\frac{\partial}{\partial e}g(x|e^*)}{g(x|e^*)} dG(x|e^*) + \int_{\hat{x}^*}^{\bar{x}} (x - \phi\hat{x}^*) \frac{\frac{\partial}{\partial e}g(x|e^*)}{g(x|e^*)} dG(x|e^*) = c'(e^*).$$

Increases in creditor rights ϕ increase effort and firm value if and only if:

$$\frac{\partial \hat{x}}{\partial \phi} < -\frac{\frac{\partial \mathbb{E}[\min\{x,\hat{x}\}|e]}{\partial e}\Big|_{e=e^*}}{\phi \int_{\hat{x}^*}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx}, \tag{1}$$

where $\frac{d\hat{x}}{d\phi} = -\frac{\frac{\partial^2 e^*}{\partial \hat{x} \partial \phi} \frac{\partial \mathbb{E}[\min\{x,\hat{x}\}|e]}{\partial e}\Big|_{e=e^*}}{\frac{\partial^2 e^*}{\partial^2 \hat{x}} \frac{\partial \mathbb{E}[\min\{x,\hat{x}\}|e]}{\partial e}\Big|_{e=e^*} + \int_{\hat{x}}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx - g(\hat{x}|e^*)}$. There exists a $\phi^* > \bar{\phi}$ such that increases in creditor rights reduce effort and firm value for all $\phi \in [\underline{\phi}, \phi^*]$.

The condition in (1) reveals the forces that play a role in determining the effect of creditor rights on firm value in this general setting. The left-hand side is the policy function of the monopolist lender, which maps increments in creditor rights to changes in the

[3]We omit characterization of the competitive lending equilibrium as it has the same qualitative features as the baseline model.

face value of debt. The numerator on the right-hand side is the derivative with respect to effort of the conditional expectation of the value of a debt contract with face value $\hat{x}$ with full pledgeability; by MLRP, the numerator is strictly positive. The denominator is also positive. Thus, (1) shows that firm value falls with creditor rights *unless* $\frac{\partial \hat{x}}{\partial \phi}$ is sufficiently negative that it is less than the right-hand-side threshold. In particular, for ϕ slightly greater than $\bar{\phi}$, $\hat{x}^*$ is arbitrarily close to $\bar{x}$, so the integral in the denominator on the right-hand side of (1) is arbitrarily close to zero, implying the expression tends to negative infinity. Thus, inequality (1) cannot hold, i.e., *increases in creditor rights necessarily reduce effort and hence firm value.*

4 Conclusions

Our paper shows that the qualitative impact of increasing creditor rights on firm value cannot be discerned in isolation without consideration of the extent of lender competition. We study the real effects of reforming creditor rights in a setting where a firm seeks external financing under two frictions—ex-ante effort moral hazard and ex-post cash-flow diversion—where increased creditor rights comprise a way to reduce ex-post diversion.

We find that the real effects critically hinge upon the extent of lender competition. In competitive lending markets, higher creditor rights always relax a firm's financing constraint, inducing higher managerial effort and increasing firm value. In contrast, with a monopolist lender, higher creditor rights can strictly decrease both effort and firm value. These observations have implications for policy design and for interpreting the empirical evidence of the limited effects from creditor rights expansions, especially in developing economies and in sectors where capital markets are not very deep.

In practice, creditor rights reforms are frequently strongly supported by the lenders themselves. Through the lens of our model, one can understand why lenders would care about such reforms in settings where they have market power, as they can profit from greater creditor rights and cash-flow pledgeability. In such settings, creditor rights reform may not succeed in unlocking the growth potential of developing economies absent a political consensus to jointly tackle the problem of capital markets competitiveness.

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5 Appendix

Proof of Proposition 1. At the optimal contract, it is immediate that the lender's participation constraint (PC) binds. Suppose first that there exists a $D^* \leq \phi m$ that solves

$$\frac{\delta h + (1-\delta)m - l - (D^* - \phi l)}{c}(D^* - \phi l) + \phi l = 1.$$

The relevant root of this quadratic equation is the negative root, given by

$$D_C = \frac{1}{2}\left[\delta h + (1-\delta)m - l + 2\phi l - \sqrt{(\delta h + (1-\delta)m - l)^2 - 4c(1-\phi l)}\right].$$

For $\phi \in [0,1]$, the argument of the square root is minimized by $\phi = 0$, and in this case the argument is positive if and only if $c < \left(\frac{\delta(h-m)+m-l}{2}\right)^2$, which holds by Assumption 1.

Otherwise, we must have $D \geq \phi m$. In this case, imposing the binding pledgeability constraint $s(m) = \phi m$ yields

$$e = \frac{\delta h + (1-\delta)m - l - (\delta D^* + (1-\delta)\phi m - \phi l)}{c}.$$

Plugging e into the lender's zero-profit condition yields:

$$\frac{\delta h + (1-\delta)m - l - (\delta D^* + \phi((1-\delta)m - l)}{c}(\delta D^* + \phi((1-\delta)m - l)) + \phi l = 1,$$

Solving for the relevant negative root yields the face value of debt for $\phi < \frac{D_C}{m}$:

$$D = \frac{1}{\delta}\left[D_C - 2\phi(1-\delta)m\right].$$

Note that the face value is continuous in ϕ. The two face values are equal if and only if:

$$D_C = \frac{1}{\delta}\left[D_C - 2\phi(1-\delta)m\right] \iff \phi m = D_C.$$

Limited pledgeability mandates $D \leq \phi h$, which yields the lower bound on ϕ for funding:

$$\phi \geq \underline{\phi} := \frac{\left[D_C(\underline{\phi}) - 2\underline{\phi}(1-\delta)m\right]}{\delta h}. \tag{2}$$

To establish the comparative statics, first consider $\phi > \frac{D_C}{m}$. The FOC for effort yields: $e = e^{FB} - (D_C - \phi l)/c$, where D_C depends on ϕ. Differentiating with respect to ϕ yields:

$$\frac{cl}{\sqrt{(\delta h + (1-\delta)m - l)^2 - 4c(1-\phi l)}} > 0.$$

Thus, both firm value and M's share of it strictly increase with ϕ. Now consider $\phi < \frac{D_C}{m}$. From the FOC for effort, (after simplifications) we again get $e = e^{FB} - (D_C - \phi l)/c$, which takes the same form as that for $\phi > \frac{D_C}{m}$ and is increasing linearly in ϕ. Continuity of D at $\phi = \frac{D_C}{m}$ takes care of the point at which the face value is not differentiable.

Turning to the impact of creditor rights for the face value of debt, we have:

$$\begin{aligned}\frac{\partial D_C}{\partial \phi} &\propto \sqrt{(\delta h + (1-\delta)m - l)^2 - 4c(1-\phi l)} - c \\ &< \sqrt{c^2 - 4c(1-\phi l)} - c < 0\end{aligned}$$

where the first inequality is obtained by substituting $\delta h + (1-\delta)m - l = c$, and by Assumption 1, $\delta h + (1-\delta)m - l < c$, and the second inequality follows since $4c(1-\phi l) > 0$. Thus, $\frac{\partial D_C}{\partial \phi} < 0$. When, instead, $\phi \leq \frac{D_C}{m}$,

$$\frac{\partial D}{\partial \phi} = m - \frac{m}{\delta} + \frac{1}{\delta}\frac{\partial D_C}{\partial \phi} < 0,$$

where the inequality follows from $0 < \delta < 1$ and $\frac{\partial D_C}{\partial \phi} < 0$. □

Proof of Proposition 2. From the first-order approach, we can replace the IC constraint with the solution for the first-order condition with respect to effort:

$$e = e^{FB} - \frac{\delta s(h) + (1-\delta)s(m) - s(l)}{c}. \tag{3}$$

Plugging (3) into P's objective function yields:

$$\pi(s) = \left[e^{FB} - \frac{\delta s(h) + (1-\delta)s(m) - s(l)}{c}\right](\delta s(h) + (1-\delta)s(m) - s(l)) + s(l) - 1.$$

Differentiating P's payoffs with respect to $s(l)$ yields:

$$\frac{\partial \pi(s)}{\partial s(l)} \propto c(1 - e^{FB}) + 2(\delta s(h) + (1-\delta)s(m) - s(l)) > 0.$$

The inequality follows from (i) the interiority of first-best effort, which follows from $c > \delta h + (1-\delta)m - l$; and (ii) the participation constraint of investors, coupled with limited liability and $l < 1 < h$, which jointly imply that $\delta s(h) + (1-\delta)s(m) - s(l) > 0$ whenever financing takes place. As a consequence, due to limited creditor rights, it must be that the optimal contract has $s^*(l) = \phi l$.

Plugging $s^*(l) = \phi l$ into the derivatives with respect to $s(h)$ and $s(m)$ yields

$$\frac{\partial \pi(s)}{\partial s(h)} \propto ce^{FB} - 2(\delta s(h) + (1-\delta)s(m) - \phi l), \text{ and}$$

$$\frac{\partial \pi(s)}{\partial s(m)} \propto ce^{FB} - 2(\delta s(h) + (1-\delta)s(m) - \phi l).$$

Note that if $(s(h), s(m))$ set $\frac{\partial \pi(s)}{\partial s(h)}$ equal to zero then they also set $\frac{\partial \pi(s)}{\partial s(m)}$ to zero. Thus, we have two cases. First, if there exists a pair that satisfies limited pledgeability ($s(h) \leq \phi h, s(m) \leq \phi m$), such that the unconstrained (by pledgeability) solution to the common first-order conditions above holds, i.e., $ce^{FB} = 2(\delta s(h) + (1-\delta)s(m) - \phi l)$, then this implements the optimal allocation that maximizes P's profits. Substituting for this solution to the optimal effort into equation (3) yields that the same level of effort is chosen, $e = \frac{(2c-1)e^{FB}}{2c}$ for all ϕ sufficiently large that the pledgeability constraints do not bind. By limited creditor rights, from (3) this occurs whenever:

$$ce^{FB} \leq 2\phi ce^{FB} \iff \phi \geq \frac{1}{2}.$$

For $\phi < \frac{1}{2}$, both first-order conditions are strictly positive, which implies that $s(x) = \phi x$ for every x, i.e., pledgeability binds on P.

Turning to the comparative statics, suppose that $\phi \in [\underline{\phi}, \frac{1}{2})$. Then, M's effort, $e^* = \frac{(1-\phi)(\delta h + (1-\delta)m - l)}{c}$, decreases in ϕ. It follows immediately that firm value also decreases in ϕ. For all $\phi > 0.5$, managerial effort and firm value are constant in ϕ.

As for the face value of debt, when $\phi \in \left[\underline{\phi}, \frac{1}{2}\right]$ we have $D = \phi h$ and so it increases with ϕ. When $\phi > \frac{1}{2}$, we have two sub-cases. First, when $D > \phi m$, $\partial D/\partial \phi \propto l - (1-\delta)m$, which cannot be signed a priori. It follows that $\partial D/\partial \phi > 0 \iff l - (1-\delta)m > 0$. Second, when $D \leq \phi m$, $\partial D/\partial \phi = l > 0$. □

Proof of Proposition 3. Ignoring limited pledgeability, the Lagrangian reads:

$$\mathcal{L} = \int_0^{\bar{x}} s(x)dG(x|e) + \lambda \left[\int_0^{\bar{x}} (x - s(x)) \frac{\frac{\partial}{\partial e} g(x|e)}{g(x|e)} dG(x|e) - c'(e) \right].$$

Differentiating with respect to s yields: $\dfrac{\partial \mathcal{L}}{\partial s} = 1 - \lambda \dfrac{\frac{\partial}{\partial e} g(x|e)}{g(x|e)}$, which does not depend on s, because of linearity. This implies that, by limited liability, $s(x) = \phi x$ whenever $1 \geq \lambda \frac{\frac{\partial}{\partial e} g(x|e)}{g(x|e)}$. From MLRP this holds for all $x \leq \hat{x}$ for some $\hat{x}$, while $s(x) = \phi \hat{x} =: D^*$ for all $x > \hat{x}$, due to monotonicity. The fact that at $\hat{x}$ the derivative of the objective function with respect to $\hat{x}$ must be zero follows immediately from the envelope theorem.

Consider now the comparative statics. Totally differentiating the FOC with respect to e^* and ϕ yields:

$$\frac{de^*}{d\phi} = \frac{\int_0^{\hat{x}} x \frac{\partial g(x|e^*)}{\partial e^*} dG(x|e^*) + \int_{\hat{x}}^{\bar{x}} \hat{x} \frac{\partial g(x|e^*)}{\partial e^*} dG(x|e^*) + \phi \frac{\partial \hat{x}}{\partial \phi} \int_{\hat{x}^*}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx}{\int_0^{\hat{x}} (1-\phi) x \frac{\partial^2 g(x|e^*)}{\partial e^2} dx + \int_{\hat{x}}^{\bar{x}} (x - \phi \hat{x}) \frac{\partial^2 g(x|e^*)}{\partial e^2} dx - c''(e^*)}.$$

Tthe denominator of $\frac{de^*}{d\phi}$ must be strictly negative, as it is the second derivative of the manager's payoffs with respect to effort, and the value function must be locally concave. Thus, the sign of $\frac{de^*}{d\phi}$ depends on the sign of its numerator, and using $\int_0^{\hat{x}} x \frac{\partial g(x|e^*)}{\partial e^*} dx + \int_{\hat{x}}^{\bar{x}} \hat{x} \frac{\partial g(x|e^*)}{\partial e^*} dx = \frac{\partial \mathbb{E}[\min\{x, \hat{x}\}|e]}{\partial e}\Big|_{e=e^*}$ we have

$$\frac{de^*}{d\phi} > 0 \iff \frac{\partial \mathbb{E}[\min\{x, \hat{x}\}|e]}{\partial e}\Big|_{e=e^*} + \phi \frac{\partial \hat{x}}{\partial \phi} \int_{\hat{x}^*}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx < 0,$$

or $\frac{\partial \hat{x}}{\partial \phi} < -\frac{\frac{\partial \mathbb{E}[\min\{x,\hat{x}\}|e]}{\partial e}\Big|_{e=e^*}}{\phi \int_{\hat{x}^*}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx}$.

To calculate $\frac{\partial \hat{x}}{\partial \phi}$, recall that the Envelope condition reads:

$$\begin{aligned} 0 &= \frac{\partial}{\partial \hat{x}} \left\{ \int_0^{\hat{x}} x dG(x|e^*) + (1 - G(\hat{x}|e^*)) \hat{x} \right\} \\ &= (1 - G(\hat{x}|e^*)) + \frac{\partial e^*}{\partial \hat{x}} \left[\int_0^{\hat{x}} x \frac{\partial g(x|e^*)}{\partial e^*} dx + \int_{\hat{x}}^{\bar{x}} \hat{x} \frac{\partial g(x|e^*)}{\partial e^*} dx \right]. \end{aligned}$$

Totally differentiating with respect to $\hat{x}$ and ϕ yields:

$$\frac{d\hat{x}}{d\phi} = -\frac{\frac{\partial^2 e^*}{\partial \hat{x} \partial \phi} \frac{\partial \mathbb{E}[\min\{x,\hat{x}\}|e]}{\partial e}\Big|_{e=e^*}}{\frac{\partial^2 e^*}{\partial^2 \hat{x}} \frac{\partial \mathbb{E}[\min\{x,\hat{x}\}|e]}{\partial e}\Big|_{e=e^*} + \int_{\hat{x}}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx - g(\hat{x}|e^*)}.$$

Observing that $\frac{d\hat{x}}{d\phi}$ is bounded, the inequality $\frac{\partial \hat{x}}{\partial \phi} < -\frac{\frac{\partial \mathbb{E}[\min\{x,\hat{x}\}|e]}{\partial e}\Big|_{e=e^*}}{\phi \int_{\hat{x}^*}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx}$ cannot hold for $\hat{x}^*$ sufficiently close to $\bar{x}$ as $\int_{\hat{x}^*}^{\bar{x}} \frac{\partial g(x|e^*)}{\partial e^*} dx \to 0$ when $\hat{x}^* \to \bar{x}$. $\square$

Examples

(1) Stronger negative effects of creditor rights with a monopolist lender

We extend the baseline model by introducing non-linear effort benefits in the medium state of the world to show that increasing creditor rights can strictly reduce strictly firm value for all ϕ large enough that financing takes place. We modify the probability distribution across states so that: $\Pr.[x = h] = e$; $\Pr.[x = m] = e^2+\gamma$; $\Pr.[x = l] = 1-e-e^2-\gamma$, for some $\gamma > 0$. To simplify exposition, we normalize parameters so that, at the first-best effort level, $e^{FB} + \left(e^{FB}\right)^2 + \gamma = 1$, or

$$e^{FB} = \frac{1}{2}\left(\sqrt{1+4(1-\gamma)} - 1\right). \tag{4}$$

MLRP requires $\gamma \geq \frac{1}{4}$. For simplicity, we set $\gamma = \frac{1}{4}$, so that $e^{FB} = \frac{1}{2}$, and focus on parameters such that the monopolist's participation constraint is violated if effort is zero, which requires that $3l + m < 4$.

Proposition 4. *With a monopolist lender, the optimal monotonic contract is debt. The optimal design varies with the degree of creditor rights ϕ as follows:*

1. *If $1 \geq \phi \geq \phi_H$, then the face value of debt is $D^* = \phi m$;*
2. *If $\phi_H > \phi \geq \phi_L$, then $D^* = \phi l + \frac{(h-l)^2}{2(h-l)+\phi(m-l)} \in (\phi m, \phi h]$;*
3. *If $\phi_L > \phi \geq \underline{\phi}$, then $D^* = \phi h$;*
4. *If $\phi < \underline{\phi}$, then there is no financing.*

If there is financing, then increasing creditor rights reduces both effort and firm value.

Proof. The first-best effort maximizes $eh + (e^2+\gamma)m + (1-e-e^2-\gamma)l - ce^2/2$. Solving the first-order condition with respect to effort yields $e^{FB} := \frac{h-l}{c-2(m-l)}$. Combining this solution with (4) yields $c = \frac{2(h-m+\sqrt{1+4(1-\gamma)}(m-l))}{\sqrt{1+4(1-\gamma)}-1}$. Notice that, despite the convexity in effort benefits, the problem is concave as the second derivative with respect to effort is

$$-c+2(m-l) = -\left(\frac{2(h-m+\sqrt{1+4(1-\gamma)}(m-l))}{\sqrt{1+4(1-\gamma)}-1}\right)+2(m-l) = -\frac{2(h-l)}{\sqrt{1+4(1-\gamma)}-1} < 0.$$

One can similarly solve for the second-best effort level, $e^{SB} := \frac{h-l-(s(h)-s(l))}{2(h-l+s(m)-s(l))}$.

The monopolist's profit function is

$$\pi(s) := e^{SB} * (s(h) - s(l)) + \left(\left(e^{SB}\right)^2 + \frac{1}{4}\right)(s(m) - s(l)) + s(l) - 1.$$

Taking the derivative with respect to $s(l)$ and setting it to zero gives three solutions, none of which are viable. The first solution requires $2s(l) = s(m) + s(h)$. By monotonicity, this implies that $s(l) = s(m) = s(h)$, which violates the participation constraint of the monopolist, as $s(l) < 1$. The other two solutions involve the expression: $\sqrt{-((14h - 14l + s(h) - s(m))(2h - 2l - s(h) + s(m)))}$. The square root has a real solution if and only if

$$((14h - 14l + s(h) - s(m))(2h - 2l - s(h) + s(m))) < 0.$$

Monotonicity implies that $14h - 14l + s(h) - s(m)) > 0$, so a real solution requires $h - l < \frac{s(h)-s(m)}{2}$. However, $h - l > s(h) - s(l)$ implies that a necessary condition for the square root to be well defined is $\frac{s(h)-s(m)}{2} < s(h) - s(l)$, which never holds due to monotonicity. Thus, the derivative with respect to $s(l)$ is always strictly positive on the feasible range of values $[0, \phi l]$. It follows that—at the optimal contract—$s^*(l) = \phi l$.

Now consider the derivative of the profit function with respect to $s(m)$, after substituting $s^*(l) = \phi l$. There are two cases, depending on whether $s(m) = s(h)$, or not. First, suppose $s(m) = s(h)$. In this case, setting the derivative of the profit function with respect to $s(m)$ to zero yields $s(m) = h - l + \phi l$. However, this solution cannot satisfy the participation constraint of the monopolist, as it implies that $s(m) = h - l + s(l)$, which means that effort is zero, violating the monopolist's participation constraint, due to the assumption that $3l + m < 4$. Thus, we conclude that, if setting $s(m) = s(h)$ is ever optimal, it would be also optimal to set $s(m) = \phi m$ in this case.

Alternatively, the monopolist can choose $s(m) \neq s(h)$. In this event, one can show that $\partial\pi(s)/\partial s(m) > 0$, whenever $s(m) \in [\phi l, s(h)]$. Plugging $s^*(m) = \phi m$ into the profit function, yields the following FOC with respect to $s(h)$:

$$s(h) = \phi l + \frac{(h-l)^2}{2(h-l) + \phi(m-l)}.$$

Limited creditor rights require that $s(h) \in [\phi m, \phi h]$, which can be re-written as

$$\phi_L := \frac{\sqrt{(h-l)^2 + (m-l)(h-l))}}{(m-l)} - \frac{h-l}{m-l} \leq \phi < \min\left[1, \frac{(h-l)}{(m-l)}(\sqrt{2}-1)\right] =: \phi_H.$$

Thus, we conclude that: (i) when $1 \geq \phi \geq \phi_H$, we have $s^*(h) = s^*(m) = \phi m$; (ii) when $\phi_H > \phi \geq \phi_L$, we have $s^*(m) = \phi m$ and $s^*(h) = \phi l + \frac{(h-l)^2}{2(h-l)+\phi(m-l)}$; (iii) when $\phi_L > \phi$, we have two possibilities. Either there is financing and $s(h) = \phi h$, or there is no financing. Which of the outcomes arises depends on whether $\phi \geq \underline{\phi}$, in which case there is financing, or not. Given that in this case $e^{SB} = \frac{(1-\underline{\phi})(h-l))}{h-l+2\underline{\phi}(m-l)}$, the threshold $\underline{\phi}$ solves:

$$e^{SB} * (h-l) + \left(\left(e^{SB}\right)^2 + \frac{1}{4} \right)(m-l) + l = \frac{1}{\underline{\phi}}.$$

Finally, we prove that as ϕ rises, firm value falls for all $\phi \geq \underline{\phi}$. The derivative of effort with respect to ϕ reads (i) $\frac{(h-l)(l-m)}{(h-(1+\phi)l+\phi m)^2} < 0$ when $1 \geq \phi \geq \phi_H$; (ii) $\frac{(h-l)(l-m)}{2(2h-(2+\phi)l+\phi m)^2} < 0$ when $\phi_H > \phi \geq \phi_L$; (iii) $\frac{(l-h)(h-2l+m)}{2(h-(1+f)l+fm)^2} < 0$ when $\phi_L > \phi \geq \underline{\phi}$. $\square$

The optimal contract remains a debt contract; but non-linearities in the marginal benefits of effort can mean that increased creditor rights reduce firm value even when the lender does not capture all pledgeable cash flows. Indeed, in parameter ranges (2-3), the monopolist could implement higher effort when ϕ rises. However, this requires a sufficiently large reduction in the face value of debt that it is suboptimal for the monopolist to do so: it costs more than the increment in the profits it generates. Posed differently, with increases in ϕ, a monopolistic lender *substitutes* creditor rights for effort incentives, and implements lower effort and firm value.

This example also has the feature that firm value never increases with creditor rights, conditional on financing taking place. This is special. In the next example, firm value increases with ϕ over a range of the parameter space where financing occurs.

(2) Firm value as a non-monotonic function of creditor rights

In this three state setting, the probability distribution across states is as follows: Pr.$[x = h] = e^2$; Pr.$[x = m] = e + \frac{1}{4}$; Pr.$[x = l] = 1 - e - e^2 - \frac{1}{4}$. It is easy to verify that MLRP holds. To simplify exposition, we normalize parameters so that, at the first-best effort level, $e^{FB} + \left(e^{FB}\right)^2 + \frac{1}{4} = 1$, or $e^{FB} = \frac{1}{2}$. Solving the first order condition with respect to effort yields $e^{FB} := \frac{h-l}{c-2(m-l)}$. Combining with (4) yields $c = 2(h - l + m - l)$.[4]

Proposition 5. *With a monopolist lender, the optimal monotonic contract is debt.*

[4]Notice that, despite the convexity in effort benefits, the problem is concave: the second derivative with respect to effort is $-c + 2(m-l) = -(2(h-l+m-l)) + 2(h-l) < 0$.

1. *If* $1 \geq \phi \geq \phi_H$, *the face value of debt is* $D^* = \phi m$;
2. *If* $\phi_H > \phi \geq \phi_L$, *then* $D^* = \frac{(\phi(4+\phi)-1)l+m(1-3\phi)}{1+\phi}$;
3. *If* $\phi_L > \phi \geq \underline{\phi}$, *then* $D^* = \phi h$:
4. *If* $\phi < \underline{\phi}$, *there is no financing.*

In parameter ranges (1) and (3), increasing creditor rights ϕ *reduces both effort and firm value. In parameter range (2), increasing creditor rights* ϕ *raises effort and firm value.*

Proof. The second-best effort level reads $e^{SB} := \frac{m-l-(s(m)-s(l))}{2(m-l+s(h)-s(l))}$, and it is greater than zero if and only if $s(m) - s(l) < m - l$, which must hold for the monopolist's participation constraint to hold. Tedious algebra yields that the derivatives of the profit function with respect to both $s(l)$ and $s(m)$ are always strictly positive, which implies that—due to limited creditor rights—it is optimal to set $s^*(i) = \phi i$, for $i \in \{l, m\}$. Taking the derivative with respect to $s(h)$ and setting it to zero yields

$$s(h) = \frac{(\phi(4+\phi)-1)l + m(1-3\phi)}{1+\phi},$$

which satisfies the limited-pledgeability constraints if and only if

$$\phi_L := \frac{1}{2}\sqrt{\frac{h^2 - 12hl + 20l^2 + 10hm - 28lm + 9m^2}{(h-l)^2}} - \frac{h+3m-4l}{2(h-l)} \leq \phi \leq \sqrt{5} - 2 =: \phi_H.$$

If $\phi > \phi_H$, then $s^*(h) = s^*(m) = \phi m$. Otherwise, when $\phi < \phi_L$, we either have no financing, or $s^*(x) = \phi x$ for all x. Given $e^{SB} = \frac{(1-\underline{\phi})m-l}{2(m-l+\underline{\phi}(h-l))}$, the financing threshold $\underline{\phi}$ solves:

$$\left(e^{SB}\right)^2 (h-l) + \left(e^{SB} + \frac{1}{4}\right)(m-l) + l = \frac{1}{\underline{\phi}}.$$

As for the relation between creditor rights and firm value, we have: (i) when $1 \geq \phi > \phi_H$, the derivative of effort with respect to ϕ is $-1/(1+\phi)^2 < 0$; (ii) when $\phi_H \geq \phi \geq \phi_L$, the derivative of effort with respect to ϕ is $1/4 > 0$; (iii) when $\phi_L > \phi \geq \underline{\phi}$, the derivative of effort with respect to ϕ is $\frac{(l-m)(h+m-2l)}{2(\phi(h-l)+m-l)^2} < 0$. □

In this example, increased creditor rights reduce firm value and effort in parameter regions (1) and (3), but not in region (2). For the intermediate levels of ϕ in region (2), the monopolist incentivizes higher effort as ϕ rises, indicating that—depending on the specifics of the distribution of cash flows—increasing creditor rights with a monopolist lender can have either negative or positive real effects.

Competition with general cash-flow distributions

Consider the general setting of Section 3, but with competitive lenders. The equilibrium security solves the following payoff maximization problem for M:

$$\begin{aligned} &\max_{s(\cdot)} \mathbb{E}[x - s(x)|e] - c(e) \text{ subject to:} \\ &\text{IC: } e \in \text{argmax}_{e'} \mathbb{E}[x - s(x)|e'] - c(e') \\ &\text{ZP: } \mathbb{E}[s(x)|e] - 1 \geq 0 \\ &\text{LP: } 0 \leq s(x) \leq \phi x, \ \forall x. \end{aligned}$$

As in the three-state case, the IC constraint depends on creditor rights ϕ only through its indirect effect on s. Therefore, the comparative statics with respect to an increase in creditor rights are identical to those in the three-state setting.

Proposition 6 (Competition)**.** *The optimal monotonic contract is debt:* $s^* = \min\{\phi x, D^*\}$, *for some* $D^* = \phi \hat{x}^* \leq \phi \bar{x}$, *where* $\hat{x}^*$ *solves* $\int_0^{\hat{x}^*} \phi x dG(x|e^*) + (1 - G(\hat{x}^*|e^*)\phi \hat{x}^* = 1$, *and the equilibrium effort* e^* *solves:*

$$\int_0^{\hat{x}^*} (1-\phi)x \frac{\frac{\partial}{\partial e} g(x|e^*)}{g(x|e^*)} dG(x|e^*) + \int_{\hat{x}^*}^{\bar{x}} (x - \phi \hat{x}^*) \frac{\frac{\partial}{\partial e} g(x|e^*)}{g(x|e^*)} dG(x|e^*) = c'(e^*).$$

As creditor rights ϕ *increase, the face value of debt* D^* *falls. It follows that managerial effort rises with* ϕ*, which implies that both firm value and the manager's payoff increase.*

Proof. By the First-Order-Approach, replace the IC constraint with:

$$\int_0^{\bar{x}} (x - s(x)) \frac{\frac{\partial}{\partial e^*} g(x|e^*)}{g(x|e^*)} dG(x|e^*) = c'(e^*).$$

Ignoring for now the restriction on creditor rights ϕ, the Lagrangian of the problem reads:

$$\begin{aligned} \mathcal{L} = &\int_0^{\bar{x}} (x - s(x)) dG(x|e) - c(e) + \lambda_1 \left[\int_0^{\bar{x}} s(x) dG(x|e) - 1 \right] \\ &+ \lambda_2 \left[\int_0^{\bar{x}} (x - s(x)) \frac{\frac{\partial}{\partial e} g(x|e)}{g(x|e)} dG(x|e) - c'(e) \right]. \end{aligned}$$

Linearity in s yields that $\frac{\partial \mathcal{L}}{\partial s} = 1 + \lambda_1 - \lambda_2 \frac{\frac{\partial}{\partial e} g(x|e)}{g(x|e)}$, which does not depend on s. This implies that, as in Innes (1990), the solution takes a bang-bang form. By limited liability, $s(x) = \phi x$ whenever $1 + \lambda_1 \geq \lambda_2 \frac{\frac{\partial}{\partial e} g(x|e)}{g(x|e)}$. From the MLRP assumption, $\frac{\frac{\partial}{\partial e} g(x|e)}{g(x|e)}$ increases in x, so this holds if and only if $x \leq \hat{x}$ for some $\hat{x}$. By monotonicity, $s(x) = \phi \hat{x}$ otherwise. Defining $D^* = \phi \hat{x}^*$, the result follows from the fact that ZP binds at any optimal contract.

Consider now the comparative statics. The zero-profit condition is: $\int_0^{\hat{x}} \phi x dG(x|e^*) + (1 - G(\hat{x}|e^*))\phi \hat{x} = 1$. Were e^* not to change with ϕ, the derivative of the left-hand side with respect to ϕ would be $\int_0^{\hat{x}} \phi x dG(x|e^*) + (1 - G(\hat{x}|e^*))\hat{x} > 0$, while the derivative with respect to $\hat{x}$ would be

$$\phi \hat{x} g(\hat{x}|e^*) + (1 - G(\hat{x}|e^*))\phi - g(\hat{x}|e^*)\phi \hat{x} = (1 - G(\hat{x}|e^*))\phi > 0.$$

Therefore, if e^* did not change, taking the total differential of the zero-profit condition with respect to $\hat{x}$ and ϕ would yield that $\partial \hat{x}/\partial \phi < 0$. Inspection of the IC constraint reveals that $\partial e^*/\partial \hat{x} < 0$. It follows that, as ϕ rises, effort also increases, which further reduces the threshold $\hat{x}$. This implies that both M's payoff and firm value increase. □

This analysis confirms quite generally that with competitive lenders, increased creditor rights always relax a firm's financing constraint, increasing both managerial effort and firm value.