Costly Contract Enforcement and The Effects of Judicial Efficiency on Lending Market

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Abstract

The efficiency of judicial enforcement significantly influences credit market outcomes. We examine a bilateral lending relationship with opportunistic borrowers and inefficient courts, where lenders face a choice between costly legal proceedings and non-judicial foreclosure to enforce debt contracts. We show that improvements in judicial efficiency reduce credit constraints and increase lending. However, lenders' ex-ante preferences for court actions versus collateral recovery depend on the trade-off between judicial efficiency and collateral recoverability. Collateral is particularly relevant as a mechanism for managing default risk in lower-quality investments and serves as an effective repayment incentive only when its value exceeds the outstanding debt.

1 Introduction

Why would a borrower, with a promising project but insufficient liquid wealth to finance it, struggle to secure funding? A borrower may default on a loan either as a consequence of a genuine inability to repay or because they are unwilling to repay if the gain from defaulting outweighs the perceived cost of the sanction. The cost of such a sanction depends not only on the lender's willingness to impose it but also on institutional factors, such as the quality of laws and the legal system supporting the lender's claims. Given the costly nature of loan recovery in cases of default, this raises the question of whether the lender is willing to lend ex-ante, and consequently, the extent to which the borrower faces the risk of being credit-constrained.

At the core of this issue is the security of property rights and the enforcement of contracts. In recent decades, the landscape of civil litigation has shifted, with debt claims increasingly dominating state civil court dockets (Pew Research Center 2020). Although resorting to legal avenues incurs significant transaction costs for creditors, default judgments also place heavy burdens on borrowers. As Acemoglu and Johnson (2005) argued, while the costly nature of weak 'contracting institutions' can be mitigated as both parties can alter contract terms or their activities to safeguard against opportunistic behavior, the failure of 'property rights institutions' can be detrimental. Thus, the certainty of legal enforcement and the ability to assert legal rights are critical in shaping lending behavior.

The key function of courts in lending relationships is to force solvent borrowers to repay when they fail to do so. Institutional factors, such as laws governing foreclosure and the protection of creditor-borrower rights, can create significant asymmetries in legal strength between lenders and borrowers. When these frameworks disproportionately favor one party. They influence the choice of dispute resolution, especially when one party perceives a substantial advantage in court due to these legal imbalances (Schaller and Skaperdas 2020).

This power asymmetry is often determined by judicial efficiency, which influences creditors' willingness to lend and the terms they offer. As Dagher and Sun (2016) demonstrate, borrower-friendly judicial requirements increase costs and risks for lenders, reducing their willingness to extend credit. Judicial efficiency plays a pivotal role in shaping the lender's decision to extend loans and recover debts, as it affects the relative strength of creditor and borrower protections.

In this paper, we examine a bilateral lending relationship to explore the impact of judicial enforcement of debt contracts on ex-ante contracting, default rates, and the choice of dispute resolution methods. We are particularly interested in how the prospects of judicial recovery and non-judicial foreclosure impact the lender-borrower relationship when collateral is involved.

We present a model of opportunistic borrowers and courts with varying degrees of judicial efficiency. The borrower and the lender engage in ex-ante contract negotiation, with the lender determining the terms of the contract. The borrower, while lacking liquidity, holds collateralizable wealth that can be pledged as collateral. Once the loan agreement is made, the project succeeds with a common probability, and the borrower must then decide whether to fulfill their contractual obligations voluntarily. The lender then faces a decision between pursuing legal action in court or opting for non-judicial recovery through collateral repossession. A contest game characterizes the litigation process, while the lender retains the option of repossessing collateral as a cheaper alternative.

Judicial efficiency is measured by how practices of law favor the lender when the lender has the claim at the contract's formation, which in turn influences the lender's probability of winning in court if legal action is pursued. According to the model, relative judicial efficiency determines whether the lender resorts to non-judicial foreclosure mechanisms such as repossession of the collateral. A trade-off exists between judicial efficiency and the collateral recovery rate: when collateral recovery is low, judicial efficiency must be sufficiently high for court actions to remain attractive. Collateral is often used to finance low-quality investments, and improvements in judicial efficiency unambiguously increase the likelihood of lending in such bilateral lending relationships.

2 Related Literature

Debt contracts are fundamental in all economies, with property rights and legal enforcement playing crucial roles in ensuring these contracts function effectively and maintain the contract's core value of 'good faith.' In a lending context, legal institutions have been established to allow lenders to go after a defaulting borrower's income and assets without resorting to violence or the threat of it. Some of the debt enforcement mechanisms, such as certain foreclosure proceedings, operate outside the courts. However, many societies rely on judicial systems to enforce debt contracts, particularly in cases involving firms with multiple creditors, typically through bankruptcy or insolvency procedures.

Securing title to assets involves significant costs in every economy, and debt contracts are particularly costly to enforce in bilateral lending scenarios. The World Bank "Doing Business" database documents that judicial procedures to enforce debt are costly even when lenders have secured claims. In 91 out of 198 countries, the estimated recovery rate on a secured loan is less than one-third of the claim. [1] Failures of debt enforcement discourage lending, and costly debt enforcement negatively impacts credit market development in emerging economies (Djankov et al. 2008). Recovery rates remain low even in high-income countries, and enforcing rights in assets like real estate or intellectual property can be prohibitively expensive in developed economies as well. This inefficiency in debt enforcement is often rooted in the legal system's origins, where more formalistic legal systems tend to yield greater inefficiency and a lower quality of legal systems (Djankov et al. 2003, 2008). Structural aspects of debt enforcement, such as ineffective collateral systems and poorly structured appeals, also contribute to this inefficiency.

Many common features used in bilateral lending alone do not necessarily incentivize repayments or guarantee efficient contract enforcement. Loan collateral, an additional asset forfeited by the borrower in case of default, offers lenders a legal means to recoup losses and increases the punishment for default. In the U.S., more than 80% of loans are backed by collateral (Berger et al. 2010). However, its effectiveness can be compromised when collateral recovery is costly, possibly failing to assure full recovery of the lent value (Carroll and McCann 2017). In other cases, relational lending, as highlighted by Benczúr and Ilut (2016), can effectively promote loan repayment as parties fulfill their obligations to positively shape future interactions. This approach, nevertheless, may not be viable for many consumers and emerging businesses seeking capital growth. Notably, many

[1] The World Bank Doing Business database documents the costs involved in a bank enforcing a secured claim on a non-financial firm which enters bankruptcy procedures. For data see http://www.doingbusiness.org/data/exploretopics/resolving-insolvency

illicit markets use the safety and well-being of the borrower as collateral, further highlighting the importance of effective legal structures.

The role of judicial institutions and their performances is thus important in understanding behavioral variations in debt repayment and credit availability. Significant differences exist between countries in how households respond to adverse shocks to income or health. Duygan-Bump and Grant (2009) used data from the European Community Household Panel to show that households are strategic in their repayment decisions when legal institutions are less effective at punishing default. Many studies have consistently shown that institutional factors influencing the punishment of defaults are critical in explaining credit availability. Higher creditor and property rights, for example, are positively associated with the size and development of financial sectors (Bae and Goyal 2009; Qian and Strahan 2007; Djankov et al. 2008). Haselmann et al. (2010) argued that a major function attributed to law is that it empowers creditors to enforce their contracts. Furthermore, improvements in judicial efficiency reduce credit constraints and increase lending (Jappelli et al. 2005; Moro et al. 2018). Judicial effectiveness can be broadly measured by the judicial protection and enforcement practices of property rights – when property rights are ambiguously defined, and judicial protection is inefficient, parties may engage in costly actions to establish mutually beneficial trades. Empirically, judicial efficiency is often measured through the length of trials and bankruptcy case load (Müller 2022), with longer durations typically resulting in increased resource expenditures and lower recovery rates. In principle, more efficient judicial enforcement systems and higher creditor protection not only reduce the probability of borrowers being partially or totally denied credit but also decrease the likelihood of strategic default.

While the literature often emphasizes creditor rights and the legal enforcement of property rights, the protection of debtor rights is relatively less discussed La Porta et al. (1998) showed that common-law countries generally have stronger legal rules for creditor rights protection than civil-law countries. However, even in common-law countries like the United States, there are strong protections for debtor rights aimed at benefiting less well-off borrowers. For example, many personal assets can be exempted from the bankruptcy process under Chapters 7 or 13 in various states. Many U.S. households might find themselves in situations where filing for bankruptcy could financially benefit them, as the legal system provides incentives for filing bankruptcy rather than repaying debts(Gropp et al. 1997; White 1998). Similarly, corporate borrowers can transfer assets out of companies through tunneling [2](Johnson et al. 2000). Hence, the balance between debtor rights and creditor rights could be an important determinant of credit supply, loan recovery, and debt structures.

In light of this balance between debtor and creditor rights, the structure of debt arrangements plays a crucial role in mitigating the risks associated with lending. In syndicated loan markets, lenders form larger and more diffuse syndicates as a strategy to deter strategic defaults when legal enforcement mechanisms are insufficient to protect their claims (Esty and Megginson 2003). For bilateral loans, although the debt structure can be much simpler, the underlying principle should remain consistent: stronger protection of creditor rights and dependable legal enforcement should incentivize lenders to maintain smaller equity positions. This confidence stems from reduced fears of strategic default and the associated costly disputes.

Yet, one more puzzle remains. Kiser et al. (2008) noted that civil cases that go to trial often result in both plaintiffs and defendants choosing a trial over settlement despite the potential for lower financial gains. Pre-trial settlements may inadvertently affect court decisions in lending and lead to sub-optimal outcomes. Settlement rates vary significantly across the world, with common-law countries generally having the highest settlement rates (Chang and Klerman 2022). Given that the settlement rates in civil law systems are so low, one should not always assume settlement rates are as high as they are in the United States.

To understand why legal disputes ever go to trial, it is important to examine the role of private settlements. Rational agents with complete information should theoretically avoid trials by settling out of court. On this matter, McBride et al. (2018) presented evidence that court decision enhances property rights and deters future costly litigation using a multi-period model. Yang (2020) showed that a neutral party may prefer trial over settlement when faced with an optimistic agent. The issue of trial versus settlement could shed light on the broader implications of judicial enforcement in debt contracts.

[2] Johnson et al. (2000) defines 'tunneling' as a term that describes the transfer of assets and profits out of firms for the benefit of those who control them.

3 Preliminaries

We consider a framework that is partly based on Bester (1994), where a risk-neutral borrower (B) is endowed with a project. This project necessitates an investment, represented by I, and yields a random return X. If the project is successful, $X = X_s$ with probability p, and $X = X_f$ with probability $1 - p$ when the project fails. The setup diverges from Bester (1994) in the sense that the borrower and the lender both observe the return realization at no cost.

The borrower lacks liquid assets to fund the investment and can put down only αI for the project but possesses collateralizable wealth amounting to W. The parameter α represents the borrower's equity stake in the project. It is the portion of the total investment I that the borrower is able to contribute from their own resources. The collateralizable wealth W cannot be directly utilized for investment purposes. Instead, the borrower can secure the loan from the lender (L) by using a fraction of W as collateral C for the loan. Assume the risk (quality, distribution) of the project is known, such that

$$pX_s + (1 - p)X_f > I. \tag{1}$$

For simplicity, we assume $X_f = 0$. The lender values the collateral C differently from the borrower, quantified as βC, with $0 < \beta < 1$. The costs $(1 - \beta)C$ arise because taking possession of and liquidating C involves transaction costs.

The loan contract between the lender and the borrower specifies a repayment amount of R, defined as $R \equiv (1 + \rho)(1 - \alpha)I$, where ρ represents the interest rate stipulated in the contract. If the borrower refuses to pay R, the contract allows the lender to take possession of the collateral C. Should the borrower fail to surrender the collateral voluntarily, they are effectively disputing the lender's claim. In such cases, the lender's right to foreclose on the project assets becomes essential to induce the borrower's incentive of repayment. We further suppose the lender's means of contract enforcement is to contest it in court or to repossess the collateral.

In summary, the obligations specified in the debt contract are $\Gamma = (R, C)$, requiring the borrower to pay the amount R; failure to do so, whether due to a genuine inability to repay or strategic behavior, entitles the lender to enforce the contract through available means.

To analyze lender and borrower behaviors in this scenario, we adopt the stylized game of contest and bargaining to analyze borrower and lender behavior. The lender offers contracts of the form $\Gamma = (R, C)$. Assume an exogenous prevailing interest rate $\bar{r}$. The lender decides to invest if their expected payoffs $V_l \geq \bar{r}I$. Here, a successful project yields the lender a return of R, which can be expressed as $(1+\rho)I$, where $\rho \geq 0$ is the project's profitability. If the lender finds none of the contracts acceptable, the game ends, and both parties receive zero payoffs. Otherwise, the borrower decides whether to accept the contract offer and undertake the investment. Figure 1 summarizes the investment game under complete information. We study the subgame-perfect equilibrium of this game and proceed by backward induction from the final stage.

- In stage zero, the lender extends a loan package to the borrower.
- In stage one of the borrower-lender relationship, the borrower decides whether to accept the lender's offer and invest and fund the project.
- In stage two, X_s is realized with probability p and X_f is realized with probability $1-p$. This is observed by both the lender and the borrower.
- In stage three, the entrepreneur decides whether to fulfill the repayment and pay R. If the repayment occurs and the project is successful, the game concludes with payoffs of $X_s - R - \alpha I$ for the borrower and $R - (1-\alpha)I$ for the lender. If the project fails, the entrepreneur is forced to default.
- In stage four, upon default, the lender either repossesses the collateral and incurs a fixed cost or takes legal action against the borrower.

3.1 Going to Court

In the event of a default, the lender intends to recover the agreed-upon repayment. Our stylized model gives the lender two options in the event of default. In the event of a successful project, if the borrower defaults, the lender may proceed to force a trial to seize the repayment R. If the project fails and the borrower chooses to default, the lender sues for C.

Both parties, the lender and the borrower, can influence their respective probabilities of winning by expending efforts, such as hiring counsel and collecting evidence. These effort choices are

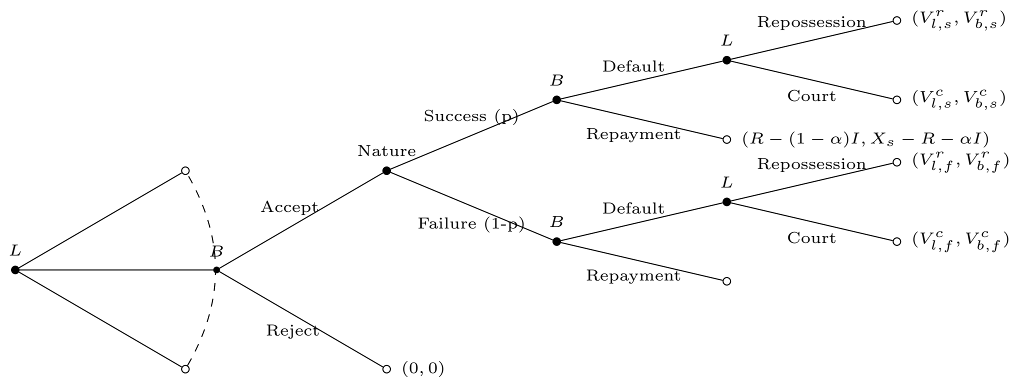


Figure 1: The Investment Game.

strategic and impact the outcomes of the contest. They are represented through a CSF as in Skaperdas and Vaidya (2012). Specifically, let e_l and e_b be the efforts expended by the lender and the borrower, respectively. The winning probability of the lender is given by $q(e_l, e_b)$, expressed as:

$$q(e_l, e_b) = \frac{\varphi e_l}{\varphi e_l + (1-\varphi)e_b}. \tag{2}$$

Here, $\varphi \in (0,1)$ represents the judicial efficiency or the degree of property rights security and describes the pre-trial legal environment. Assuming $\varphi \to 1$ indicates that preexisting legal norms, legislation, or the practices of law completely favor the lender. This scenario aligns closely with Shapiro (1986)'s idealized universal court, where a dispute between two neighbors is resolved by a third party guided by common sense and custom. If the contract clearly outlines an agreement that includes all necessary elements, given that the nature of the contract favors the lender in case of default, the lender should be assigned the legal rights. On the contrary, assuming $\varphi \to 0$ indicates that the legal or factual situation completely favors the borrower, indicating low judicial efficiency. Given a fixed effort level e_b, the lender's winning probability $q(e_l, e_b)$ increases with e_l. The converse is true for the borrower.

When the lender decides to go to court, the risky prospect for the lender in a successful project scenario is represented as $Y^s_L = (R-(1-\alpha)I, -(1-\alpha)I; q, 1-q)$, and in the event of project failure, as $Y^f_L = (\beta C - (1-\alpha)I, -(1-\alpha)I; q, 1-q)$. For the borrower, the prospects in a successful project are denoted as $Y^s_B = (X_s - R - \alpha I, X_s - \alpha I; q, 1-q)$ and in a failed project as $Y^f_B = (-C - \alpha I, -\alpha I; q, 1-q)$, respectively.

Assume both parties have to pay their own legal costs. Let δ be the fraction of the additional cost of actually going to court, then the expected payoffs when the project is a success are:

$$
\begin{aligned}
V'^{c}_{l,s} &= q[R-(1-\alpha)I] + (1-q)[-(1-\alpha)I] - (1+\delta)e_l \\
V'^{c}_{b,s} &= q(X_s - R - \alpha I) + (1-q)(X_s - \alpha I) - (1+\delta)e_b
\end{aligned}
\tag{3}
$$

The first-order conditions (FOC) implies

$$
\begin{aligned}
&\frac{e_b(\varphi(1-\varphi))}{(\varphi e_l + (1-\varphi)e_b)^2}(R) - (1+\delta) = 0, \\
-&\frac{e_l(\varphi(1-\varphi))}{(\varphi e_l + (1-\varphi)e_b)^2}(-R) - (1+\delta) = 0,
\end{aligned}
\tag{4}
$$

and gives the equilibrium condition of efforts

$$
\frac{e_b}{e_l} = 1. \tag{5}
$$

Let e_l^c and e_b^c represent the equilibrium efforts of the lender and the borrower, respectively, when opting for court litigation. The efforts and expected payoffs are as follows:

$$
\begin{aligned}
e_b^c = e_l^c &= \frac{\varphi(1-\varphi)R}{(1+\delta)}; \\
V^{c}_{l,s} &= -(1-\alpha)I + \varphi^2 R, \\
V^{c}_{b,s} &= X_s - \alpha I - \varphi(2-\varphi)R.
\end{aligned}
\tag{6}
$$

In the event of a project failure, the borrower is forced to default on the specified repayment of R. If the borrower voluntarily surrenders the collateral, the lender receives βC. The borrower is left with no assets. If the lender resorts to judicial foreclosure, the expected payoffs in court are:

$$
\begin{aligned}
V^c_{l,f} &= q(\beta C - (1-\alpha)I) + (1-q)(-(1-\alpha)I) - (1+\delta)e_l, \\
V^c_{b,f} &= q(-C - \alpha I) + (1-q)\alpha I - (1+\delta)e_b.
\end{aligned} \tag{7}
$$

Equating the two FOCs for the equilibrium efforts gives the equilibrium condition

$$
\frac{e_b}{e_l} = \frac{C}{\beta C} = \frac{1}{\beta} > 1. \tag{8}
$$

A borrower who chooses to default must exert greater effort than the lender, in an attempt to secure a payoff exceeding their entitled share as outlined in the contract. This is equivalent to a winner-take-all contest with asymmetric valuations. The efforts and expected payoffs are as follows:

$$
\begin{aligned}
e^c_{l,f} &= \frac{\varphi(1-\varphi)C}{[\varphi + (1-\varphi)\frac{1}{\beta}]^2(1+\delta)}, \quad e^c_{b,f} = \frac{\varphi(1-\varphi)\frac{C}{\beta}}{[\varphi + (1-\varphi)\frac{1}{\beta}]^2(1+\delta)}; \\
V^c_{l,f} &= -(1-\alpha)I + \frac{\varphi^2}{[\varphi + (1-\varphi)\frac{1}{\beta}]^2}\beta C, \\
V^c_{b,f} &= -\alpha I - \frac{\varphi^2 + 2\varphi(1-\varphi)\frac{1}{\beta}}{[\varphi + (1-\varphi)\frac{1}{\beta}]^2}C.
\end{aligned} \tag{9}
$$

3.2 The Decision to Repossess

Alternatively, the lender may choose to repossess the collateral if the borrower defaults, incurring a fixed cost f. In the case of repossession, the lender recovers βC minus the fixed cost f.

Creditors could bring suit on the underlying debt, but this remedy is infrequently utilized due to its time-consuming and costly nature. Instead, many creditors prefer non-judicial foreclosure, as it is typically faster and less expensive than judicial foreclosure. In practice, lenders favor repossessing the collateral, either selling it or retaining possession to satisfy the debt.

Consider a scenario where, in the event of a default, the lender repossesses the collateral pledged by the borrower directly, without obtaining a court judgment beforehand.

Assume a fixed cost is incurred in this process. We normalize the fixed cost to zero so that the lender recovers $\underline{C} = \beta C$. The expected payoffs are

$$\begin{aligned} V^r_{l,s} &= V^r_{l,f} = -(1-\alpha)I + \beta C, \\ V^r_{b,s} &= X_s - C - \alpha I, \quad V^r_{b,f} = -C - \alpha I. \end{aligned} \tag{10}$$

In cases where the debtor does not voluntarily surrender the collateral, 'self-help' repossession is usually permissible. This is predicated on the security agreement's provision that allows repossession, provided it can be carried out without breaching the peace.

4 Pure Lender with Zero Equity

First, we want to take a look at the contracting problem when the borrower does not put down their own assets. We thus study the subgame-perfect equilibrium condition of the game described in Section 3 under the exogenous condition $\alpha = 0$. In this scenario, the borrower has no assets other than the collateralizable wealth W. As we shall see, a successful borrower will always default when the lender decides to go to court. When the lender exercises their right to foreclose on the borrower's assets in the event of default, the successful borrower is better off paying the debt as long as $C \geq R$.

4.1 Subgame: Failed Entrepreneur

The project fails with probability $1-p$. In the final stage, the lender must choose between repossession and legal action when facing a defaulting borrower. For the lender to prefer repossession over court action, the following conditions must be satisfied:

$$\frac{\varphi^2}{[\varphi + (1-\varphi)\frac{1}{\beta}]^2}\beta C \leq \beta C$$

It is straightforward to show that $\frac{\varphi^2}{[\varphi+(1-\varphi)\frac{1}{\beta}]^2}\beta C \in (0, \beta C)$ is monotonically increasing and convex in φ. Therefore, the lender repossesses the collateral C when the borrower defaults.

In fact, given any fixed cost of repossession f that is sufficiently small relative to βC, the lender always favors repossession in the event of a default when the project fails. Note that a sufficiently small f can be interpreted as the cost associated with obtaining a court order granting access to the collateral, which occurs when $\varphi \to 1$.

In stage three, regardless of the lender's decision in the final stage, the borrower lacks liquid assets to repay and is thus forced to default.

4.2 Subgame: Successful Entrepreneur

With probability p, the project succeeds, and the borrower's realized project return is X_s. In the event of default, the lender decides to take legal action against the borrower if and only if $V^c_{l,s} > V^r_{l,s}$, which occurs when $\varphi^2 R > \beta C$.

Therefore, the lender repossesses if and only if $\varphi \leq \hat{\varphi} = \sqrt{\frac{\beta C}{R}}$, and goes to court otherwise.

In stage three, knowing that the lender favors court actions, the borrower will always default since $\varphi < 1$ implies $\varphi(2-\varphi) < 1$. Thus, the borrower is better off defaulting given $V^c_{b,s} > X_s + C - R$, the payoff received when fulfilling contractual obligations and repaying.

Given the lender's decision to repossess, the borrower's optimal strategy is to default when $C - R \leq 0$, and to repay otherwise.

To summarize, the optimal strategies for the lender and the borrower, respectively, in the subgame is

$$s = \begin{cases} \{\text{repossess, repay}\} & \varphi^2 R \leq \beta C, C > R \\ \{\text{repossess, default}\} & \varphi^2 R \leq \beta C, C \leq R \\ \{\text{court, default}\} & \varphi^2 R > \beta C \end{cases}$$

4.3 Equilibrium Characterizations

In stage one, the lender invests if and only if the lender's effective return from the project exceeds $\bar{r}I$, where $\bar{r}$ is the prevailing interest rate, or the opportunity cost of investment. The effective return is determined by the lender's expected payoff from the project relative to their initial investment, factoring in both the probability of repayment and the potential for collateral recovery.

There are five possible equilibrium outcomes that depend on the interaction between collateral, judicial efficiency, and project quality. Table 1 provides an overview of the outcomes and the conditions under which they occur.

p	$1-p$	ρ^*	C^*	Conditions
Court	Repossession	$\frac{pX_s-(1-p)W-\bar{u}-I}{p\varphi(2-\varphi)I}$	W	$\varphi^2(1+\rho)I > \beta C$, $\beta > \frac{\varphi}{2-\varphi}$, $W \in [W_{\min}, p(X_s-\bar{u})]$, $V_l^* \geq \bar{r}I$
Court	Repossession (No recovery)	$\frac{pX_s-\bar{u}-I}{p\varphi(2-\varphi)I}$	0	$\varphi^2(1+\rho)I > \beta C$, $\beta < \frac{\varphi}{2-\varphi}$, $V_l^* \geq \bar{r}I$
Repossession	Repossession	$\rho^* > \frac{pX_s-I-\bar{u}}{I}$	$pX_s-\bar{u}$	$\varphi^2(1+\rho)I < \beta C$, $C^* < (1+\rho^*)I$, $V_l^* \geq \bar{r}I$
Repay	Repossession	$\frac{pX_s-I-\bar{u}}{I}$	$pX_s-\bar{u}$	$\varphi^2(1+\rho)I < \beta C$, $C^* > (1+\rho^*)I$, $V_l^* \geq \bar{r}I$
No Lending	No Lending	/	/	$V_l^* < \bar{r}I$

Table 1: Summary of Possible Equilibrium Outcomes

Lending occurs if and only if the lender's expected payoff V_l exceeds the opportunity cost $\bar{r}I$. If lending proceeds, borrowers—aware of the difficulties creditors face in recovering loans easily and cheaply through the courts—may be tempted to default strategically.

To mitigate the risk of default, the lender adjusts the interest rate and collateral requirements based on the collateral recovery rate (β) and judicial efficiency (φ). When judicial efficiency is above the threshold $\hat{\varphi}$, if the collateral recovery rate is low (i.e., β is small), the lender responds by increasing the interest rate, since recovering loans through collateral is less effective. The lender recognizes that a portion of the repayment is dissipated by the judicial process itself. On the other hand, when the collateral recovery rate is high (i.e., β is large), the lender focuses more on requiring collateral and accepts a lower interest rate, relying on the collateral to punish default. In a sense, collateralization also becomes attractive for high-risk entrepreneurs.

If judicial efficiency φ is below the threshold $\hat{\varphi}$, the lender optimally chooses to repossess the collateral in the event of default regardless of the status of the project, and thus, the borrower's repayment behavior depends on the amount of the collateral specified in the contract. The borrower repays their loan only if the value of the collateral exceeds their debt $(1+\rho)I$. Regardless of the borrower's default decision, The lender takes nearly all the surplus from the project $(pX_s - I)$ minus the reservation utility of the borrower $(\bar{u})$: The collateral equals the gross return of the project to the borrower. Of course, this solution works only when W is sufficiently large.

4.3.1 Borrower defaults, lender goes to court when the project is successful

This is the case where $\varphi > \hat{\varphi}$ when the project is successful. The lender's expected payoff is given by

$$V_l = p\varphi^2 R + (1-p)(\beta C) - I. \tag{11}$$

When equality holds, the subgame-perfect equilibrium is achieved when the effective interest rate

$$\iota = \frac{p\varphi^2 R + (1-p)\beta C - I}{I} \geq \bar{r}. \tag{12}$$

The borrower's expected payoff is

$$V_b = p(X_s - \varphi(2-\varphi)R) + (1-p)(-C) \geq \bar{u}. \tag{13}$$

where the parameter $\bar{u}$ denotes the expected utility demanded by the borrower.

Equation 13 will always be binding and hence can be rewritten to express the interest rate specified in the contract

$$\rho = \frac{pX_s - (1-p)C - \bar{u}}{p\varphi(2-\varphi)I} - 1. \tag{14}$$

The interest rate ρ decreases in φ since $\frac{\partial \rho}{\partial \varphi} = -\frac{2-2\varphi}{p\varphi^2(2-\varphi)^2 I}(pX_s - (1-p)C - \bar{u})$ and $pX_s \geq (1-p)C + \bar{u}$ when the borrower accepts the offer as shown in Equation 13. Hence, as the legal or factual situations increasingly favor the lender, the lower the interest rate required by the lender.

Lemma 1. A feasible contract $\Gamma = (R, C)$ always exists when pX_s is sufficiently large.

Proof. We can derive the interest rate ρ as a function of C, given the values of other parameters, from the expected payoffs V_l and V_b, respectively:

$$\rho_L = \frac{(\bar{r}+1)I - (1-p)(\beta C)}{p\varphi^2 I} - 1,$$
$$\rho_B = \frac{pX_s - (1-p)C - \bar{u}}{p\varphi(2-\varphi)I} - 1.$$

For any $\rho(C)$ to be acceptable to both parties, it must satisfy $0 < \rho_L < \rho(C) < \rho_B$. If $\varphi = \frac{2\beta}{\beta+1}$, a feasible contract $\Gamma = (R, C)$ always exists.

When $\varphi < \frac{2\beta}{\beta+1}$, the slope of ρ_L is larger than the slope of ρ_B. Setting $\rho = 0$ yields $C_b(0) = \frac{pX_s - \bar{u} - p\varphi(2-\varphi)I}{1-p}$ and $C_l(0) = \frac{(1+\bar{r}-p\varphi^2)I}{(1-p)\beta}$.

As seen in Figure 2a, the lender prefers any combination of (ρ, C) northeast to the ρ_L curve, and the borrower prefers anything southwest to the ρ_B curve. A feasible set of $\Gamma = (R, C)$ exists if and only if $C_b(0) \geq C_l(0)$, that is,

$$pX_s \geq (\frac{(1+\bar{r}-p\varphi^2)I}{\beta} + \bar{u} + \varphi(2-\varphi)pI.$$

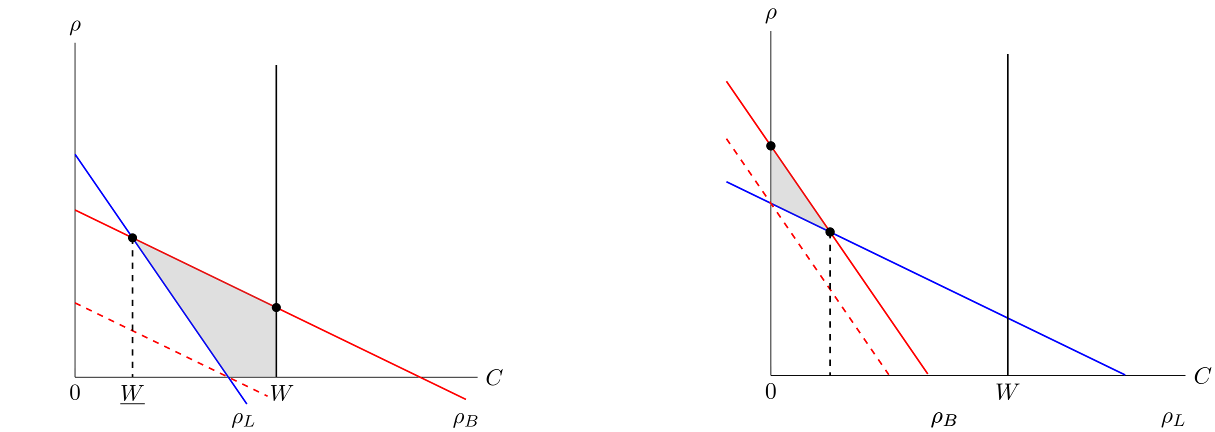
When $\varphi > \frac{2\beta}{\beta+1}$, the slope of ρ_l is smaller than the slope of ρ_b. A feasible set of $\Gamma = (R, C)$ exists if and only if the intercept of ρ_b is larger than that of ρ_l, as shown in Figure 2b. This condition can be rewritten as

$$pX_s \geq \frac{2-\varphi}{\varphi}(\bar{r}+1)I + \bar{u}.$$

□

For the scenario illustrated in Figure 2a to hold, the condition $\hat{\varphi} < \varphi < \frac{2\beta}{\beta+1}$ must be satisfied. This condition can also be expressed as $\frac{\varphi}{2-\varphi} < \beta < \varphi^2(1+\rho)\frac{I}{C}$, which simplifies to $\varphi^2(1+\rho)\frac{I}{C} > \frac{\varphi}{2-\varphi}$. Hence we have $\varphi(2-\varphi)(1+\rho)\frac{I}{C} > 1$. Under this scenario, the interest rate ρ specified in the contract is likely high or the legal system operates with high efficiency. With a relatively high discount factor β, it is reasonable that the lender would rely more heavily on a higher amount of collateral.

For the scenario depicted in Figure 2b, the condition $\varphi > \hat{\varphi}$ and $\varphi > \frac{2\beta}{\beta+1}$. This translates to the condition $\beta < \min\{\frac{\varphi}{2-\varphi}, \varphi^2(1+\rho)\frac{I}{C}\}$. Given that $\varphi \in (0,1)$, unless the legal system is highly efficient and strongly favors the lender, the discount factor β will remain relatively low.



(a) $\varphi < \frac{2\beta}{\beta+1}$ (b) $\varphi > \frac{2\beta}{\beta+1}$

Figure 2: The ρ-C space.

Assuming Equation 12 holds, the following result deals with the optimality of collateralization in this situation.

Proposition 1. *If* $\varphi < \dfrac{2\beta}{\beta+1}$ *and* $W \geq W_{\min} \equiv \dfrac{(\bar{r}+1)I + \frac{\varphi}{2-\varphi}\bar{u} - \frac{\varphi}{2-\varphi}pX_s}{(1-p)(\beta - \frac{\varphi}{2-\varphi})}$, *then in equilibrium a contract* Γ^* *is signed such that* $C^* = W$*. If* $\varphi \geq \dfrac{2\beta}{\beta+1}$, *it is optimal to set* $C^* = 0$*.*

Proof. As a result of competition, Γ^* maximizes the lender's expected payoff, subject to the borrower's break-even constraints. Equation 14 defines the break-even interest rate ρ charged to the borrower. Substituting ρ in Equation 11 yields

$$V_l = \frac{\varphi}{2-\varphi}(pX_s - \bar{u}) + (1-p)(\beta - \frac{\varphi}{2-\varphi})C - I \geq \bar{r}I. \tag{15}$$

As a result, maximizing the lender's payoff with respect to C implies $C^* = W$ given that $\varphi < \dfrac{2\beta}{\beta+1}$ and the corresponding interest rate

$$\rho_W^* = \frac{pX_s - (1-p)W - \bar{u}}{p\varphi(2-\varphi)I} - 1. \tag{16}$$

If instead $\varphi \geq \dfrac{2\beta}{\beta+1}$, then $C^* = 0$ with the corresponding interest rate

$$\rho_0^* = \frac{pX_s - \bar{u}}{p\varphi(2-\varphi)I} - 1. \tag{17}$$

When the lender requires the borrower's entire collateralizable wealth W as collateral, the borrower will be credit-rationed if the collateral is insufficient to fully shield the lender against losses in the event of project failure. As a result, when $\dfrac{\varphi}{2-\varphi} < \beta$ and ρ_W is charged to the borrower, it must hold that $\frac{\varphi}{2-\varphi}(pX_s - \bar{u}) + (1-p)(\beta - \frac{\varphi}{2-\varphi})W - I \geq \bar{r}I$. The inequality implies that

$$W \geq \frac{(\bar{r}+1)I + \frac{\varphi}{2-\varphi}\bar{u} - \frac{\varphi}{2-\varphi}pX_s}{(1-p)(\beta - \frac{\varphi}{2-\varphi})} \equiv W_{\min}. \tag{18}$$

□

The lender's expected payoff in equilibrium when the borrower pledges full collateral $C^* = W$ is given by

$$V_l^* = \frac{\varphi}{2-\varphi}(pX_s - \bar{u}) + (1-p)(\beta - \frac{\varphi}{2-\varphi})W - I,$$

When the discount factor β is relatively high, i.e., $\beta > \frac{\varphi}{2-\varphi}$, the lender demands full collateral coverage and requires the borrower to pledge W. Using ρ_W^* in Equation 16, this scenario happens when $pX_s - p\bar{u} > W$, meaning the actual interest rate $\frac{pX_s - I}{I}$ exceeds $\frac{W + p\bar{u} - I}{I}$. Despite requiring full collateral coverage, this condition can only be met if the borrower's collateralizable wealth W is sufficiently small ($W^{\min} < W < p(X_s - \bar{u})$).

On the other hand, the lender's expected payoff in equilibrium when no collateral is pledged ($C^* = 0$) is

$$V_l^* = \frac{\varphi}{2-\varphi}(pX_s - \bar{u}) - I,$$

In this case, the lender chooses to go to court in response to a default, requiring the borrower to pledge no collateral and charges the interest rate ρ_0^* when $\beta < \frac{\varphi}{2-\varphi}$. Here, the discount factor β is relatively small since $\varphi^2(1 + \rho_0^* \frac{I}{C^*}) > \frac{\varphi}{2-\varphi}$ is always satisfied.

In both scenarios, stronger creditor protection improves the lender's welfare. When judicial efficiency fully favors the lender, i.e., $\varphi \to 1$, the lender captures (nearly) all of the surpluses when lending occurs.

4.3.2 Borrower repays when the project is successful

The borrower repays the loan only if the value of the collateral exceeds the debt when the lender decides to repossess the collateral. In this case, when the incentive constraint $C \geq R$ holds, a successful entrepreneur is better off paying R rather than defaulting. The expected payoff for the lender is

$$V_l = p(1+\rho)I + (1-p)\beta C - I \geq \bar{r}I. \tag{19}$$

The borrower's expected payoff V_b is expressed as

$$V_b = pX_s - p(1+\rho)I + (1-p)(-C) \geq \bar{u}. \tag{20}$$

Suppose the lender maximizes their expected payoff V_l subject to the conditions $C \leq W$ and $C \geq (1+\rho)I$, while also considering the borrower's individual rationality constraint $V_b \geq \bar{u}$. The optimal interest rate ρ^* and collateral C^* that maximize the lender's expected payoff are then given by:

$$\rho^* = \frac{pX_s - \bar{u} - I}{I},$$
$$C^* = pX_s - \bar{u},$$

assuming $pX_s - u > W$. Here, the collateral C is set equal to the net return of the project to the borrower to incentivize repayment when the project succeeds. The lender's expected payoff in equilibrium is therefore

$$V_l^* = (p + (1-p)\beta)(pX_s - \bar{u}) - I. \tag{21}$$

A high collateral requirement and the threat of repossession constitute a strong enforcement mechanism, inducing the borrower to fulfill contractual obligations. The lender's equilibrium return equals the gross return of the borrower, adjusted for the project's risk of failure and the collateral's enforcement, minus the cost of the project.

4.3.3 Borrower defaults, lender repossesses when the project is successful

When the value of the collateral is below R and the lender decides to repossess the collateral in the event of default ($\varphi < \hat{\varphi}$), the borrower responds by defaulting. The lender's expected payoff is thus

$$V_l = \beta C - I \geq \bar{r} I. \tag{22}$$

The borrower's expected payoff is

$$V_b = pX_s - C \geq \bar{u}. \tag{23}$$

The break-even level of collateral for the borrower, which maximizes the lender's expected payoffs, is therefore

$$C^* = pX_s - \bar{u}. \tag{24}$$

The collateral C^* in Equation 24 strictly increases in the expected return from the project pX_s. Substituting C^* into Equation 22 yields

$$V_l^* = \beta(pX_s - \bar{u}) - I \tag{25}$$

Hence, the lender's investment decision depends on the expected return from the project. The lender invests if and only if $pX_s \geq \frac{(1+\bar{r})I}{\beta}$.

Using the equilibrium collateral level C^*, the condition $C^* < (1+\rho)I$ must hold for this scenario to occur. This implies that:

$$pX_s - \bar{u} < (1 + \rho)I,$$

meaning that the interest rate ρ^* in equilibrium satisfies:

$$\rho^* > \frac{pX_s - I}{I} - \frac{\bar{u}}{I}.$$

where $\frac{pX_s - I}{I}$ is the actual interest rate.

4.4 Discussion

Figure 3 offers a graphical representation of the subgame-perfect equilibria discussed earlier, partitioning the (β, φ) space into regions that indicate the potential equilibrium outcomes, conditional on lending taking place.

In doing so, we define the general quality, or the profitability of the project with the ratio $\theta = \frac{pX_s - \bar{u}}{I}$, where $pX_s - \bar{u}$ represents the net return of the project for the entrepreneur. To ensure a meaningful context and economic relevance, we construct three representative levels of project quality, which we denote as low ($\theta = 0.25$), medium ($\theta = 0.75$), and high ($\theta = 1.25$).

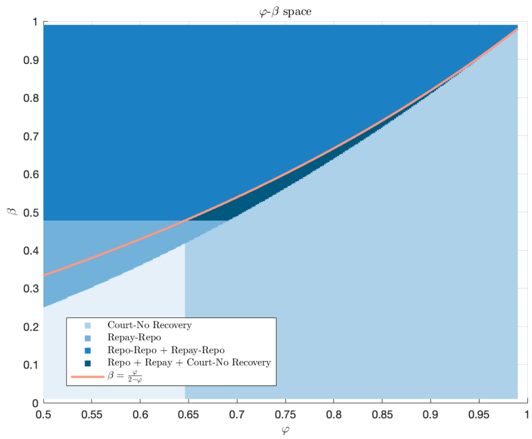
When the collateralizable wealth W is insufficient, i.e., $W < pX_s - \bar{u}$, only court-based equilibria arise, as shown in Figures 3d, 3e , and 3f. In these cases, the criteria $\beta = \frac{\varphi}{2-\varphi}$ determines whether the lender demands full or zero collateral when resorting to legal actions. The lender requires full collateral coverage ($C^* = W$) when the judicial efficiency φ is sufficiently large while the collateral recovery rate β could be moderate. This results in a balance between the expected returns from litigation when the project succeeds and the outcomes of non-judicial foreclosure when the project fails. On the other hand, if the collateral recovery rate is low enough, the lender foregoes any recovery through collateral and instead compensates by charging a higher interest rate.

When W is sufficiently large ($W \geq pX_s - \bar{u}$), multiple equilibrium outcomes—repossession, repayment, and court action—are possible, as depicted in Figures 3a, 3b, and 3c. In this case, the equilibrium involving full collateral coverage is excluded, as W is constrained between $W_{\min}$ and $p(X_s - \bar{u})$ and must remain relatively modest. This outcome is intuitive: if the borrower must pledge too much collateral, they are more likely to repay the loan rather than default. In the case of repossession following a successful project, the minimum collateral recovery rate β increases as judicial efficiency φ rises. When the borrower defaults and disputes the lender's claim, a higher judicial efficiency – and thus a greater winning probability in court for the lender – requires the collateral recovery to be low enough for the option of non-judicial foreclosure to be unattractive. Hence, the relative judicial inefficiency drives the lender's preference for repossession in the case of success. This scenario only happens, of course, when the required amount of the collateral does not exceed the borrower's debt. As long as $C \geq (1 + \rho)I$, the lender's threat of resorting to non-judicial foreclosure effectively induces the successful entrepreneur to pay their debts.

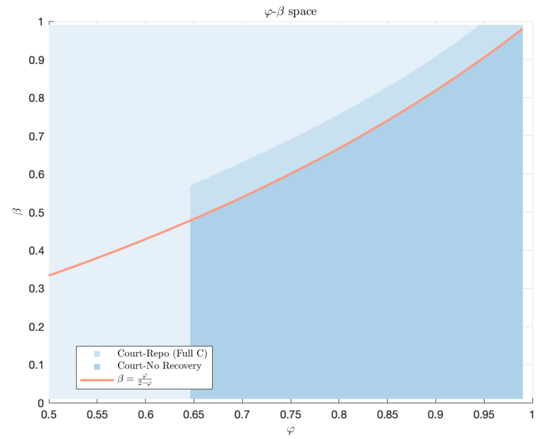
Now, consider the effects of the quality of the project. As project quality θ increases, the regions in which lending does not occur and credit is constrained shrink. For lower-quality projects, improvements in judicial efficiency can convert otherwise loss-making loans into viable ones, given that the lender decides to take legal action against defaulting borrowers. Since the portion of the payment dissipated by the judicial process—due to legal fees, bribes, and other costs—diminishes, the borrower's ability to exploit costly enforcement mechanisms is weakened. Instead, if the lender optimally chooses to repossess the collateral when the successful entrepreneur defaults, a more efficient collateral recovery increases the likelihood of lending.

The only equilibrium outcome unaffected by project quality θ is when the borrower repays the loan following a successful project. Collateralization remains a stable repayment incentive, provided the collateral exceeds the outstanding debt.

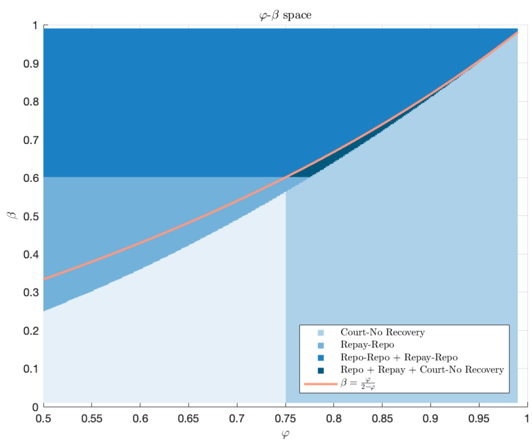
When θ is low, non-judicial foreclosure becomes a more important mechanism for enforcing contracts. As θ decreases, As project quality decreases, it becomes difficult for the lender to rely on judicial recovery to protect their claims, though equilibria involving repossession after a successful project are less affected by the declining quality. In such cases, lenders mitigate risk through collateral, shielding themselves from losses if the borrowers default.



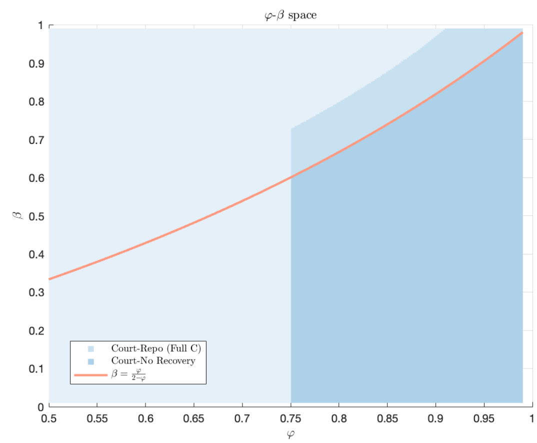
(a) High Quality, Sufficient W



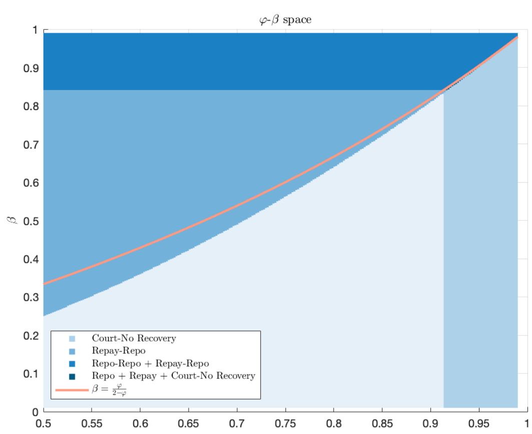
(d) High Quality, Insufficient W



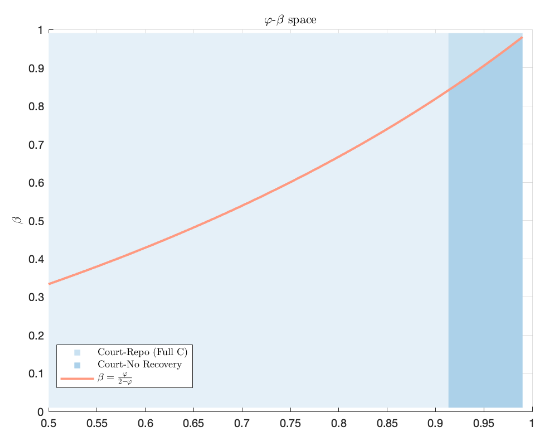
(b) Medium Quality, Sufficient W



(e) Medium Quality, Insufficient W



(c) Low Quality, Sufficient W



(f) Low Quality, Insufficient W

Figure 3: Equilibrium Outcome Regions: φ-β space

Note: The profitability or quality of the project is measured by the ratio $\frac{pX_s - \bar{u}}{I}$. A sufficiently high collateralizable wealth W implies that $W > pX_s - \bar{u}$, ensuring the borrower has enough assets to cover the required collateral in equilibrium.
Source: Authors' calculation.

5 Discussion: The Role of Equity and Out-of-Court Settlements

We have shown how judicial efficiency and collateral recovery rate can shape the choice between judicial recovery and non-judicial foreclosure. The pure lender model highlights that when collateralizable wealth is limited, lenders may prefer court-based recovery, especially if judicial efficiency is high. However, when collateral is sufficient, multiple outcomes are possible, with lenders opting for repossession or legal action based on the balance between the collateral recovery rate and judicial efficiency. The model also shows that as project quality improves, lending becomes more likely, as judicial efficiency and collateral recovery complement each other in mitigating default risks.

The analysis also highlights that environments with pronounced institutional biases may see increased conflict through court actions, while more balanced systems can foster smoother interactions, where legal conflicts are less frequent, and the lender-borrower relationship remains stable even under conditions of default. While rational litigants with complete information would avoid the costs and risks of trial by settling out of court, there are many circumstances where litigation may be preferable (Priest and Klein 1984; Reinganum and Wilde 1986; Kiser et al. 2008; McBride et al. 2018). One significant reason for the breakdown of ex-post bargaining is when one party perceives a substantial advantage in court due to asymmetries in bargaining power or legal strength (Schaller and Skaperdas 2020). In other words, a preference for litigation over settlement or alternative dispute resolution methods can also arise from institutional factors that disproportionately favor creditors or borrowers, particularly through laws governing foreclosure and the protection of creditor-borrower rights.

In the pure lender model, the borrower has no equity in the project, which increases the likelihood of strategic default. Without equity, the borrower's expected payoff, even when considering potential legal proceedings, may exceed the benefit of fulfilling the contract. This lack of personal financial stake makes default a more attractive option. For example, during the housing bubble, borrowers with subprime mortgages and little to no equity were more prone to default. Those who did default often had even less equity. This suggests that equity is a critical factor in default decisions: higher borrower equity generally reduces the likelihood of default.

As we move forward, the next extension will focus on the role of equity positions. Collateral alone is often insufficient to incentivize repayment, especially when borrowers have little personal stake in the project. Exploring how equity impacts the borrower's incentives and the lender's strategies will provide deeper insights into how repayment decisions are made and how lenders can mitigate the risks of default through alternative mechanisms, including ex-post bargaining to settle out of court.

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