UNIVERSITÄT BONN

EPoS Collaborative Research Center Transregio 224

UNIVERSITÄT MANNHEIM

Discussion Paper Series – CRC TR 224

Discussion Paper No. 046
Project C 03

Creditor Rights, Information Sharing, and Borrower Behavior: Theory and Evidence

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October 2018

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Funding by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through CRC TR 224 is gratefully acknowledged.

Creditor Rights, Information Sharing, and Borrower Behavior: Theory and Evidence*

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October 10, 2018

Abstract

This paper provides a comprehensive theoretical and empirical analysis of "creditor rights" and "information sharing" throughout over 1.8 million private firms in Europe. We show that many of the outcomes associated with greater levels of creditor rights can be obtained with higher information sharing between banks. Both theory and empirics show that creditor rights and information sharing are associated with greater firm leverage, lower profitability, and greater distance to default. Moreover, theory and empirics find that creditor rights and information sharing are robust substitutes. Our analysis suggests that poor creditor rights can be substituted by improved information sharing.

Keywords: Creditor rights, information sharing.
JEL-Classification: G21, G28, L15.

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*We thank seminar participants at 2017 Financial Intermediation Research Society Meeting (FIRS, Hong Kong), the 2018 China International Conference in Finance (CICF, Tianjin), SFB TR 224 in Offenbach, University of Bonn, University of Regensburg, and University of Konstanz. Additionally, we are thankful for comments on a predecessor paper that were given by seminar participants at DePaul University (Driehaus), Federal Reserve Bank of Boston, Federal Reserve Bank of Richmond, Federal Reserve Board of Governors, Florida State University, Pepperdine University (Graziadio), San Diego State University, University of Georgia (Terry), University of Colorado at Boulder (Leeds), University of Hawaii (Shidler), University of Minnesota (Carlson), University of Wisconsin at Milwaukee (Lubar), and Tulane University (Freeman), as well as Lamont Black, Philip Bond, Rebel Cole, Jean-Edouard Colliard, J. Anthony Cookson, Narly Dwarkasing, Ted Fee, Murray Frank, Jasmin Gider, Lukas Henkel (discussant), Sara Holland, Gerhard Illing (discussant), Abu Jalal, Jonho Kim, David Lesmond, Ross Levine, Silvio Petriconi (discussant), John Pokorny, Yue Qi, Edward D. Van Wesep, Lingling Wang, Julie Wu, Celim Yildizhan, Stefan Zeume (discussant), and Hongda Zhong. Any remaining errors are our own responsibility.

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1 Introduction

Creditor rights have been shown to meaningfully impact the contracts between borrowers and lenders. When creditors believe that they are more likely to be able to recover losses, they are more inclined to extend credit. This makes it easier for borrowers to obtain capital to finance projects, ultimately leading to economic growth. The seminal work on creditor rights is La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998, hereafter LLSV). LLSV show that creditor rights are functions of a country's legal origin, determined when the country was originally colonized. Djankov, McLiesh, and Shleifer (2007, hereafter DMS) expand the analysis to show that creditor rights are remarkably stable over time, contrary to the idea that legal rules are converging to some optimal level. The two papers suggest that creditor rights are representative of the historic laws associated with each country, are relatively stable over time, and do not quickly change based on economic development, financial market development, or technological advances. As described in Acharya, Amihud, and Litov (2011, hereafter AAL), creditor rights are largely "predetermined."

If the literature suggests that enhanced creditor rights are associated with positive outcomes, such as larger propensity for banks to lend and greater economic growth, are countries without creditor rights at a natural disadvantage? If creditor protection laws are sticky and unchanging over time, is there a way for countries with low creditor protection to realize some of the positive outcomes associated with high levels of creditor protection without changing their own creditor rights laws? This paper shows that by increasing information sharing between banks, many of the positive outcomes associated with stronger creditor rights can be realized in low creditor rights environments. The policy implication behind this finding is that greater information sharing has a positive effect on economies and that countries with poor creditor rights should focus on improving information sharing between banks.

In contrast to creditor rights, information sharing has largely been increasing over time.[1] At the country-level, more private registries and public bureaus are being established. Ad-

[1] This trend can be seen by accessing the Depth of Credit Information Index contained in the World Bank's Doing Business database accessible https://data.worldbank.org/indicator/IC.CRD.INFO.XQ

ditionally, private registries and public bureaus have been collecting more comprehensive information about their borrowers, making lenders even more aware of borrower profiles.

Our paper makes two points. First, both creditor rights and information sharing are especially relevant for smaller, private firms. These firms may not have access to wholesale funding markets and may be more credit constrained. As a consequence, we use data that concentrates on private firms. Accordingly, the model assumes that firms can only obtain loan financing through banks. It generates a number of predictions, which are all confirmed by our data and robust to a number of additional tests. Furthermore, we bring together a number of other seemingly paradoxical empirical studies. By examining a comprehensive set of 1.8 million private firms in Europe with heterogeneous characteristics, we are able to provide a more comprehensive understanding of the way creditor rights and information sharing affect borrower behavior outside of bankruptcy states. Specifically, we focus on the group of borrowers that are most likely to be reliant on bank loans and affected by the local creditor rights environment.

Second, we show that both theoretically and empirically, the effects of creditor rights and information sharing meaningfully interact. Information sharing improves the knowledge that banks have on the loan in their portfolio, leads to better lending decisions, and results in fewer bad loans ending up in the banks' portfolios. However, creditor rights are relevant mostly for loans that end up in default. Hence, if highly developed information sharing is already in place, creditor rights matter less. The two are substitutes. Our model predicts that the effects of creditor rights and information sharing go into the same direction, yet one mitigates the other. The intuition is that creditor rights work on the defaulting loans. However, with good information sharing, there are fewer defaulting loans, so the effect of creditor rights is smaller. The data are perfectly in line. The coefficients of creditor rights and information sharing on leverage are both positive, those on profitability are both negative, and those on distance to default are both positive. The interacted effects always have the opposite sign, demonstrating the substitution effect, just as the model predicts.

The model indicates that increased levels of both creditor rights and information sharing affect the intensity at which banks screen, which directly reduces the rate that borrowers are charged. Consequently, borrowers take on larger loans, realize lower profitability, and decrease their distance to default. They are also importantly interactive, and this substitution effect is both economically and statistically significant.

The literature on relationship banking suggests that local firms tend to acquire capital through local banks. We construct a model around a firm with a project who is attempting to obtain a loan from a local bank. In order to test the predictions within our model, we focus on private firms and subsets of firms that are most likely to be borrowing from local banks, placing both the firm and bank in the same creditor rights environment.

1.1 Model Description

We construct a model with two banks, each competing for borrowers in a market with search. There are two types of borrowers. Good borrowers can pay back their loans, while bad borrowers will default. By exerting effort, banks can identify the bad borrowers. Competition is modeled in the style of Broecker (1990), but due to the time structure, we get rid of the mixed strategy pricing equilibria. Entrepreneurs go to one bank to apply for a loan. Depending on the loan rate, they decide what size loan they would like to apply. The bank then decides how thoroughly to screen the firm. If the screening result is positive, the bank offers the loan. If rejected, the firm moves on to the other bank. The second bank does not know whether the firm has been rejected before, so the firm is screened again. Because the bank's screening technology is not perfectly correlated, it is possible that the firm is now granted a loan. Inherently, there is a strategic complementarity between the screening choices of the banks. If one bank screens more, it leaves more lemons for the other bank. As a result, the second bank will also want to screen more, again reinforcing the screening effort of the first bank.

We want to know how the model equilibrium depends on *creditor rights*. We assume that if a loan defaults, the bank can still get a liquidation value, which positively depends on creditor rights. In the model, if creditor rights are stronger, banks lose less money on each loan, leaving them less desire to screen. Consequently, the banks want to attract higher loan volumes, which are more desirable. In order to attract these loans, they can entice borrowers by lowering loan rates. In response to these lower loan rates, firms then take out larger loans, which leads to increases in firm *leverage*. Due to decreasing returns to scale, the larger investment size leads to a reduced *return on assets*.

The effect of increased creditor rights on firm risk is less clear. There are two channels. The loss given default decreases, but the banks also screen less, leading to an ambiguous aggregate effect. First, because banks screen less, firm risk should increase, since more risky firms are being granted loans. In numerical simulations, the direct effect (lower loss given default) dominates, and stronger creditor rights lead to reduced risk.[2] All else equal, banks would choose to lend to less risky firms, reinforcing the result in the numerical simulations. This is also consistent with the empirical results presented in the paper. However, firms may also adjust the risk choices of their projects. As creditor rights increase, the firms will avoid default by reducing risk, which is what leads to the ambiguity in the model regarding the direct effect creditor rights have on firm risk.

Next, we also we model *information sharing*. The only information that is interesting for the other bank is whether a firm has previously been rejected. We model information sharing as the probability with which the fact that a firm has been rejected leaks out or is reported over by a credit registry. The predictions are very similar to those focusing on creditor rights. First, there are fewer lemons in the pool of applicants. Therefore, banks choose to screen less and charge lower loan rates. Firms borrow more, and leverage increases. Second, the average quality of a loan increases. As a result, banks want to increase the loan volume, which they do by lowering the loan rates. Entrepreneurs take larger loans, which leads to higher leverage. Second, because of increasing investment size and decreasing returns to scale, the return on assets decreases. Third, there is an ambiguous effect on risk. Information sharing reduces the risk in the pool of borrowers directly. Indirectly, banks screen less. In our simulations, the direct effect of the loss given default dominates.

Finally, creditor rights and information sharing interact in a natural way. Information sharing reduces the fraction of bad loans in the banks' loan portfolio. Because increased creditor

[2] On the other hand, in our model, borrowers cannot choose risk like in Boyd and De Nicolò (2005).

rights apply only to bad loans, the incremental effect of creditor rights is reduced if information sharing is already strong. In other words, creditor rights and information sharing are substitutes: for leverage, profitability (ROA) and risk.

1.2 Empirical Results Preview

Our empirical analysis examines over 1.8 million private firms in Europe from 2006-2014, utilizing the Amadeus 2015 database by Bureau van Dijk.[3] This database provides the ideal setting to test the predictions within the theoretical model due to the heterogeneity within the sample. We restrict our analysis to private firms within the database, though our results robust to including public firms.[4] As previously discussed, the model focuses on firms approaching banks in order to acquire loans. The relationship banking literature suggests that small firms tend to borrow from local banks, making both firm and bank exposed to the same creditor rights and information sharing environment. Thus, the model is most directly applicable to firms that are small and private, which are the majority of firms contained within Amadeus.

We first examine the effect of creditor rights and information sharing separately on firm leverage. When the variables are examined separately or in conjunction with one another, we find that they have a positive effect on leverage. However, the economic magnitudes of these effects are unrealistically large, suggesting there could be an omitted variable. After accounting for their substitution effect, the impact of creditor rights on firm leverage drops 45%, while the impact of information drops by 80%, though the coefficients are still positive.

In subsequent analysis, we find that creditor rights and information both have a negative effect on firm profit and positive effects on firm distance to default. The interaction effect is always in the opposite direction, and the drop in economic magnitude persists in subsequent analysis. This result is robust to a removing firms that are less likely to be reliant on bank

[3]The Amadeus 2015 dataset starts at the year 2006 and ends with the year 2014. One limitation of the Amadeus database is that only data for specific windows are provided.

[4]Public firms constitute 0.5% only of the total firms within Amadeus. We conduct all tests and robustness with the inclusion of the small set of public firms, and the regression coefficients are nearly unchanged.

loans, alternative measures of both creditor rights and information sharing, controlling for law enforcement, removing country-specific industries, as well as alternative definitions of the outcome variables.

Within the finance literature, both theoretical and empirical papers have primarily focused on either one mechanism or the other, predominantly creating two distinct bodies of literature. Given that information sharing is increasing over time, while creditor rights remain stable at their predestined levels, we examine whether the evolution of information sharing essentially counteracts or complements some of the effects of creditor rights. The natural question to ask is if these two financial markets mechanisms meaningfully interact and how this applies to these two strands of literature.

2 Literature Review

Creditor Rights Literature Review. A large body of theoretical literature examines the supply side of the credit market and provides a framework indicating that lenders are more likely to extend credit when they have the ability to force repayment, seize collateral, or even remove management Townsend (1979); Aghion and Bolton (1992); Hart and Moore (1994, 1998). In order to test these predictions empirically, LLSV constructed the original creditor rights index dataset,[5] were then expanded to a panel covering 129 countries from 1978-2004 by DMS 2007.[6]

Since then, the creditor rights index has been empirically examined by a number of scholars. Within the literature, it has been shown that at the country-level, enhanced creditor rights are associated with a greater ratio of private credit to gross domestic product, indicating that there is more credit in economies with greater creditor protection. Haselmann, Pistor, and Vig (2010) show that foreign banks respond more strongly to changes in the legal

[5]The index components consist of restrictions on reorganization, no automatic stay of assets, secured creditor paid first, and management removal. Higher values of the index as well as the individual components indicate that creditors have more power.

[6]DMS utilize the same four creditor rights index components, though the values differ slightly.

environment and increase lending. Using individual bank-level data, Houston, Lin, Lin, and Ma (2010, hereafter HLLM), show that increased creditor rights lead to greater bank risk-taking. HLLM's results show that bank-level distance to default decreases, as indicated by z-score, though they cannot directly link this finding to the loan portfolio. Syndicated loan-level data has shown that debt is cheaper (Qian and Strahan, 2007; Bae and Goyal, 2009). Heitz and Narayanamoorthy (2017) show that when creditor rights are stronger, bank net interest margin decreases, and the loan portfolio is safer. However, in an attempt to generate profit, banks take more risk in other ventures outside of the loan portfolio, which is an alternative explanation for HLLM's risk finding. AAL and Acharya, Sundaram, and John (2011) show that public firm leverage decreases when creditor rights are higher, suggesting that public firms are actually borrowing less and taking on less risk because they fear being inefficiently liquidated by creditors.

It may seem paradoxical that increased creditor rights are associated with more private credit in an economy, increased bank risk-taking, and cheaper debt, yet have also been associated with decreased borrowing at the firm-level. The natural question to ask is where the additional credit within an economy is going. Our model and empirical findings fill in this missing link by showing that small or private firms, the ones most likely borrowing from local banks, are able to borrow more when creditor rights are stronger, and our empirical findings confirm this prediction.

This paper extends our empirical analysis beyond the firm's decision to borrow and examines subsequent firm risk-taking and profitability, which to our knowledge, have not been analyzed for private firms. Nini, Smith, and Sufi (2009, 2012) show that creditor rights can play an active role in the governance of corporations even outside default. In a sample of public firms, AAL show that increased creditor rights lead to firms engaging in more diversifying acquisitions, causing them to decrease their overall firm-risk. Their paper shows that public firms will even compromise profitability in order to decrease their overall risk out of fear of inefficient liquidation. Consistent with AAL, our model and empirical findings show that increased creditor rights are associated with decreased firm profit and firm risk.

Information Sharing Literature Review. The theoretical literature has shown that information sharing is an important determinant of credit availability by encouraging borrowers to exert more effort into projects (Padilla and Pagano, 1997; Vercammen, 1995) and pay back loans (Klein, 1992). The empirical literature has shown that the organization structure of information sharing as well as the type of information shared is relevant. At the country level, DMS show that greater information sharing is associated with a greater ratio of private credit to GDP. Brown, Jappelli, and Pagano (2009) show that at the firm-level, information sharing leads to greater leverage, while Jappelli and Pagano (2002) show that banks lend more when there is more information sharing and take on more risk, though Brown, Jappelli, and Pagano (2009) show that information sharing is only meaningful in low creditor rights economies. However, HLLM find that information-sharing offsets some of the increased risk-taking banks would take in the event of greater creditor protection. Laeven, Levine, and Michalopoulos (2015) find that information sharing contributes importantly to real economic growth, if information bureaus are privately organized and operated.

3 The Model

Consider an economy with one period and two dates, 0 and 1, and two types of agents: firms, and (two) banks. Entrepreneurs have access to real investment projects but no funds. Banks do not have direct access to projects but have access to funding. They also have access to a screening technology that they can use to evaluate projects.

Entrepreneurs. There is a continuum of firms of mass 2, each endowed with wealth $A > 0$. Each firm has access to an investment project. There are two types of firms, good (fraction γ) and bad (fraction $1-\gamma$). The projects of good firms return some $Y(I)$ *per unit of investment* I. Assume that $Y'(I) < 0$ (decreasing returns to scale) and $Y''(I) < 0$, and additionally $Y'''(I) < 0$ for technical reasons. The projects of bad firms return a fixed $y < 1$ per unit of investment. Entrepreneurs are risk neutral and protected by limited liability. They want to consume only at the later date 2. Furthermore, they bear a (small) non-monetary cost of c to apply for a loan at a bank.

Banks. There are two banks. On the liability side, each bank has access to deposits at rate $r \geq 1$ (including the repayment of the principal).

On the asset side, banks grant loans. If a firm applies for a loan, the bank announces a loan rate, and the applicant chooses a loan volume. Based on this information, the bank can screen the applicant. Spending a screening cost of $C(q)$, a *bad* applicant is screened out with probability q. Assume that $C(q)$ is twice continuously differentiable, with $C'(q) > 0$, $C''(q) > 0$, $C'(0)$ small enough, and $C'(1)$ large enough to guarantee an interior solution. For example, $C'(0) = 0$ and $C'(1) = \infty$. Also, assume that screening costs are proportional to the loan size. The rationale behind this assumption is that larger projects are more complex and thus more difficult and costly to screen.

Screening results are uncorrelated. Good applicants are never screened out. After screening, the bank can offer a loan to the firm at the pre-specified loan rate. Entrepreneurs then choose whether to take the loan. They can also turn down the loan and then subsequently apply for another loan at the competitor bank.

Note that banks can never tell for sure whether a loan in its portfolio is good or bad. Hence, a bank knows that some of its loans are good (they will repay at $t = 1$) and some are bad (they will default). However, from an *ex ante* perspective, the loans are simply risky. The more the bank screens, the less risky they become.

Creditor Rights. The *bad* firms who have not been rejected will invest at date 1. The investment project returns $y\,I$, which is never sufficient to repay the debt, so bad firms default with certainty. The liquidation value is $y\,I$. We assume that bankruptcy law determines how this liquidation value is distributed between the lender-bank and the borrower-firm. Assume that the bank can claim $\lambda\,I \leq y\,I$, indicating that the firm keeps the remaining $(y - \lambda)\,I$, which is non-pledgeable for legal reasons. In the model, λ gives the expected return per unit of investment. Hence, it captures both the collateral regime and the bankruptcy regime (see Haselmann, Pistor, and Vig, 2010). Since the firm can keep a positive amount ($y - \lambda$ or less), it carries out the project with negative NPV in the first place.

Also, since $\lambda \leq y < 1 \leq r$, the net profit $\lambda - r$ per unit of investment will always be negative for the bank. Hence, λ measures the strength of *creditor rights*. The variable λ is exogenous to the model, so we can use it for comparative statics. If it were not, λ could be used by banks for screening or by firms to signal their type. λ should thus be interpreted as a parameter for the legal environment, not for a specific contract.

Information Sharing. Banks share information about rejected firms. Let $s \in [0; 1]$ be the probability that a bank informs its competitor when a firm has been rejected. For $s = 1$, banks fully share information about applicants, such as entering the rejection into a credit registry. For $s = 0$, banks do not let out any information. Also, s is exogenous to the model. Banks must report the correct information (rejection) with probability s, and they do not report anything with probability $1 - s$.[7] We will discuss incentives to share information in the next section.

We model creditor rights and information sharing as two independent technologies. In reality, the two may be complements. For example, the bankruptcy process may be more efficient, if more information is available. However, we will see that the effects of creditor rights and information sharing always have the same sign in the model. Hence, modeling the two as complements would not change this property. In addition, the interaction of the two measures always has the opposite sign of the direct effects. This means that the two measures have complementary effects, even if they are modeled as independent. Modeling them as complements would only strengthen this result. Therefore, we stick to the simplest modeling choice. If we consider welfare to be the sum of firms' and banks' profits, our modeling choice will imply that information sharing increases welfare. If we assume that under default, the part $y - \lambda$ that does not flow to banks is lost or has a high liquidation

[7] Alternatively, one could assume that banks report garbled information, with s measuring the quality of the signal. Another alternative is to interpret s as the probability that negative information just leaks out.

cost, then creditor rights are also welfare-positive. Hence, our modeling choice implies that both policy measures increase welfare.

Time Structure. The time and information structure of the game are illustrated in Figure 1. Importantly, banks do not know whether they are the first or second bank to screen the applicant. Our modeling choice is closely related to Broecker (1990). However, in Broecker's paper, banks first simultaneously choose how much information to gather and then set loan rates. The unique equilibrium exhibits a mixed pricing strategy by banks. In our model, firms successively apply at banks. Our resulting equilibrium is in pure strategies. Furthermore, we assume that banks first set the loan rate and then subsequently, the firm chooses the loan volume. If the time structure were reversed and the firms had to choose the loan volume first, the bank could adjust the loan rate such that the firm's participation constraint binds. That way, the bank would drive the firm's profits down to zero. The loan rate would only be determined by the firm's profit function, not the bank's. *Our* modeling choice entails positive rents for both firms and banks.

Date 0	Creditor rights λ and information sharing s are fixed exogenously. Nature draws the type of firms.
Date 1	Each firm applies for a loan at one of the two banks. That bank announces a loan rate. The firm announces a desired loan size. That bank decides on its screening intensity. Upon a positive screening signal, the bank offers the firm a loan. After a negative signal, the bank rejects the firm and reports this with probability s to the other bank. The firm then applies at the other bank. Entrepreneurs with a loan offer choose the investment volume I of their projects and invest.
Date 2	If the project is good, it returns $Y(I)\,I$, of which the firm passes on $R\,(I-A)$ to the bank. If the project is bad, the project returns $y\,I$, of which the firm passes on $\lambda\,I$ to the bank.

Figure 1: Time and Information Structure

4 Equilibrium

The model is solved by backward induction. For a given loan rate, good firms will choose the loan size that suits them most. Bad firms will have to pick the same loan size in order to not reveal themselves as bad types. A good firm's profit is

$$\Pi_G = I\,Y(I) - R\,(I - A). \tag{1}$$

The first part in the maximum is the revenue net of repayment of principal and interest for an investment size of $I \geq A$. The loan size is then $I - A \geq 0$. The first order condition is

$$\frac{\partial \Pi_G}{\partial I} = Y(I) + I\,Y'(I) - R = 0. \tag{2}$$

This yields the optimal I^*. Some algebra shows that the loan demand is decreasing (of course) and concave in the loan rate.

Lemma 1 *$I'(R) < 0$ and $I''(R) < 0$.*

If a firm gets an offer from a bank, in equilibrium, he does not turn it down. The reason is that in equilibrium, both banks offer the same loan rates. By turning down a loan, a firm would double his application costs without realizing any additional benefit.

Now, let's examine the the bank's behavior. Without loss of generality, we focus on the first of the two banks. In a symmetric equilibrium, half of the firms (with volume 1) apply first at bank 1, and the other half applies first at bank 2. First, focus on bank 2. Bank 2 accepts all good applicants (fraction γ) and those bad applicants (fraction $1 - \gamma$) that it has not screened out (fraction $1 - q_2$). Bank 2 screens out a fraction q_2 and reports those firms to bank 1 with probability s (or a fraction s). Hence, the aggregate number of loan applicants at bank 1 is

$$1 + (1 - \gamma)\,q_2\,(1 - s). \tag{3}$$

If bank 1 screens these applicants with intensity q_1, and $C(q_1)$ is proportional to the loan size $I - A$, $C(q_1) = (I - A)\, c(q_1)$ per loan. The aggregate screening costs are

$$\big(1 + (1-\gamma)\, q_2\, (1-s)\big)\, (I - A)\, c(q_1). \tag{4}$$

The number of firms with bad projects is $(1-\gamma) + (1-\gamma)\, q_2\, (1-s)$. The return of these projects is λ, and the financing cost is r. The number of good firms is γ with a return of R_1. In sum, bank 1's profit function is

$$\begin{aligned} \Pi_1 = {} & \big(\gamma\,(R_1 - r) + (1-q_1)\,[(1-\gamma) + (1-\gamma)\, q_2\, (1-s)]\,(\lambda - r)\big)\,(I - A) \\ & - \big(1 + (1-\gamma)\, q_2\, (1-s)\big)\,(I - A)\, c(q_1). \end{aligned} \tag{5}$$

From this profit function, we can derive the first order conditions for the banks' decision variables. There are four endogenous variables. The screening intensity, q_1, and the loan rate, R_1, corresponding to bank 1 are endogenous, as are q_2 and R_2 symmetrically for bank 2. In a symmetric equilibrium, $q_1 = q_2 = q$ and $R_1 = R_2 = R$. Thus, only two endogenous variables remain, determined by two first order conditions. We will now see that the first order condition with respect to q determines the optimal q^* but does not depend on the equilibrium loan rate R^*. The reason for this is due to the assumption that the screening technology sorts out bad firms. Furthermore, bad firms fail and never pay interest. On the other hand, the choice of the loan rate R^* depends on the screening intensity q^*, as we will see below. Using the first order condition with respect to q_1 and taking into account that the two banks are symmetric($q_1 = q_2 = q$), we arrive at

$$-[(1-\gamma) + (1-\gamma)\, q\, (1-s)]\,(\lambda - r) - \big(1 + (1-\gamma)\, q\, (1-s)\big)\, c'(q) = 0. \tag{6}$$

We obtain the first order condition for q^*,

$$c'(q^*) = \frac{1 + q^*\,(1-s)\,(1-\gamma) - \gamma}{1 + q^*\,(1-s)\,(1-\gamma)}\,(r - \lambda). \tag{7}$$

This condition defines q^* implicitly. In order to solve for q^*, we would have to specify $c(q)$, restricting the generality of the model. Now, turn to the loan rate. Concerning R_1, we obtain a first order condition $\partial \Pi_1 / \partial R_1 = 0$. Again, in a symmetric equilibrium, $q_1 = q_2 = q^*$ and $R_1 = R_2 = R^*$. Some algebra shows that R^* is implicitly defined by

$$\gamma\,(I(R^*) - A) + \gamma\,(R^* - r)\,I'(R^*) - (1 - q^*)\,(1 + q^*\,(1 - s))(1 - \gamma)\,(r - \lambda)\,I'(R^*) \\ - (1 + q^*\,(1 - s)(1 - \gamma))\,c(q^*)\,I'(R^*) = 0. \tag{8}$$

Summing up, the symmetric equilibrium is defined by two implicit equations. Equation (7) does not contain R^*, so it implicitly defines q^*. That solution enters into (8), which then implicitly defines R^*.

Comparative Statics. We first analyze how our main endogenous variables, the screening intensity q^* and the loan rate R^*, depend on the exogenous parameters, prominently creditor rights λ and information sharing s. We then go on and compute comparative statics for measurable statistics such as leverage, return on assets, and aggregate risk. These can be tested in the next section.

Lemma 2 $\dfrac{dq^*}{d\lambda} < 0, \quad \dfrac{dq^*}{ds} < 0,$ *and* $\dfrac{d^2 q^*}{d\lambda\, ds} > 0.$

All three parts are intuitive. Stronger creditor rights cut the potential loss given default for the bank, so it needs to be less reluctant when screening the loans. In addition, there is a multiplicative effect due to the strategic complementarity of banks' screening decisions. If one bank screens more, the other bank gets fewer lemons, further incentivizing the bank to screen less.

Also, the higher the degree of information sharing, the lower the bank's incentive to screen an applicant itself. This is reinforced by the strategic complementarity. If one bank has less of an incentive to screen, this further reduces the other bank's incentives and vice versa.

The cross derivative is positive. Together with the negative direct derivatives, this means that the effects of creditor rights λ and information sharing s on the screening intensity q are substitutes. Concerning the equilibrium loan rate R^*, we can show

Lemma 3 $\dfrac{dR^*}{d\lambda} < 0, \quad \dfrac{dR^*}{ds} < 0,$ *and* $\dfrac{d^2R^*}{d\lambda\, ds} > 0.$

Again, all three parts are intuitive. Stronger creditor rights lead to smaller bank losses from bad borrowers. Because of the competition, banks need to lower their loan rates. This effect is reinforced by the endogenous screening decision of banks. Second, more information sharing leads to fewer bad loans in the banks' loan portfolio. Because of competition, they must lower their loan rates. Third, if there is information sharing, there are fewer bad loans in the banks' portfolio. However, creditor rights apply only to bad loans, so the effect of stronger creditor rights is weaker.

Predictions. We start with analyzing how firms adjust their optimal level of leverage. If creditor rights are stronger, a bank loses less on bad loans, per unit of investment. The bank prefers to attract a larger-size loan, which implies that the loan rate must drop. Hence, we also get $dI/d\lambda > 0$. Furthermore, leverage is defined as debt volume over equity volume, which in the model is simply $(I - A)/A$. Consequently, stronger creditor rights make leverage increase.

If there is more information sharing, fewer loans are contained within the bank's portfolio. Therefore, the bank wants to grant larger loans, which implies it needs to lower the loan rate. With the same argument as above, more information sharing also leads to an increase in leverage. The following proposition, backed numerically by Figure 2, is thus an immediate consequence of Lemma 3.

Proposition 1 *With* $Lev := (I - A)/A$, *we have* $\dfrac{dLev}{d\lambda} > 0, \quad \dfrac{dLev}{ds} > 0,$ *and* $\dfrac{d^2Lev}{d\lambda\, ds} < 0.$

Next, consider the firms' profitability (ROA), simply defined by $Y(I)$, the return per unit of investment. The argumentation is parallel to the one above. If creditor rights improve, the loan rate drops. Consequently, firms demand a higher loan volume. However, a decreasing profitability of the investment project is the counterforce in the firm's decision problem.

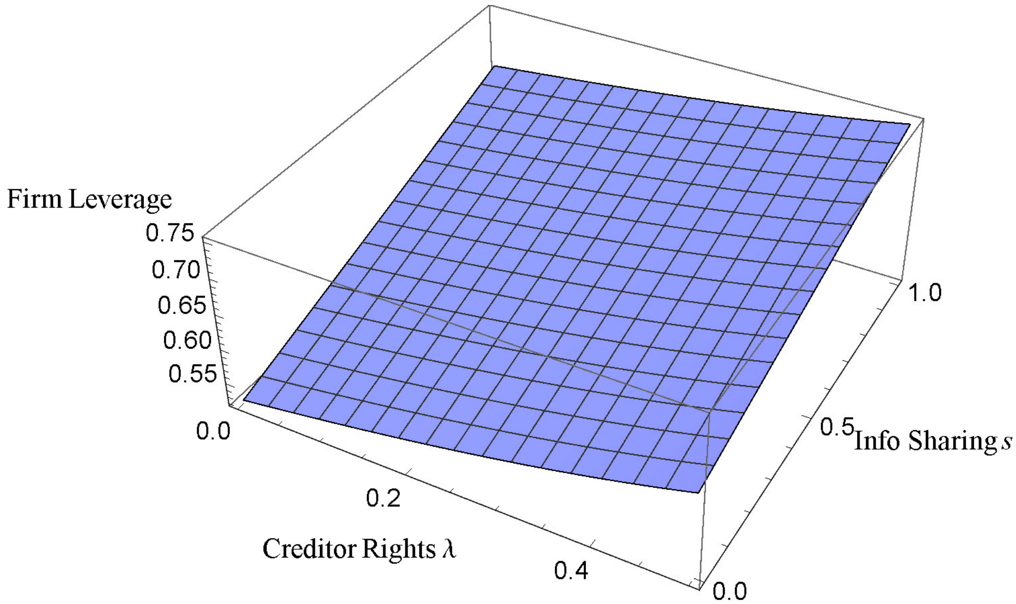

Figure 2: Firm Leverage $(I - A)/A$
For this simulation, the parametrization is $Y(I) = 2 - I/3$ such that $I^* = 3$, then $c(q) = -\ln(1-q)/20$, $A = 1/2$, $\gamma = 2/3$, and $r = 1$. Just as an example, for $\lambda = 0.2$ and $s = 0.5$ this yields $q^* \approx 0.85$, $R \approx 1.46$, $I \approx 0.81$ and a leverage of Lev≈ 0.63.

Hence, in equilibrium, projects become loss profitable (per unit of investment). The argument for information sharing is similar. The following proposition, confirmed numerically by Figure 3, is thus another immediate consequence of Lemma 3.

Proposition 2 *With $ROA = Y(I)$, we have $\frac{dROA}{d\lambda} < 0$ and $\frac{dROA}{ds} < 0$. Finally, there is a $\bar{\lambda} \in [0, y]$ such that $\frac{d^2 ROA}{d\lambda\, ds} > 0$ for all $\lambda > \bar{\lambda}$.*[8]

Risk. In the model, risk appears in different places. For example, if creditor rights increase, the loss given default (LGD) decreases. However, the probability of default (PD) increases because banks screen less. If we define risk as PD $\times$ LGD, then we get

$$\text{risk} = \text{PD} \times \text{LGD} = \frac{(1-q)\,(1+q\,(1-s))\,(1-\gamma)}{\gamma + (1-q)\,(1+q\,(1-s))\,(1-\gamma)} \times (1-\lambda). \tag{9}$$

[8] In numerical simulations, we found that $\bar{\lambda} = 0$. This means that, although the proof is more specific, it seems to hold more generally.

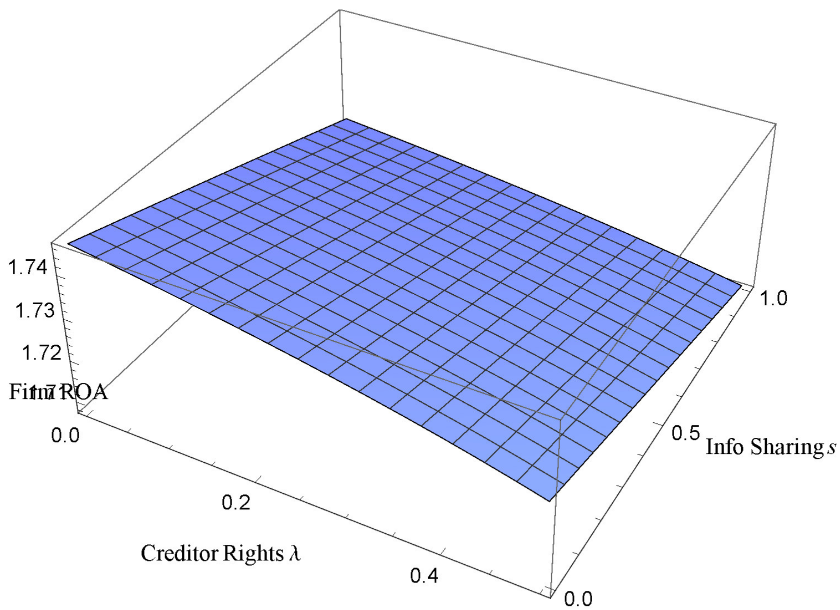

Figure 3: Firm profitability (ROA) $Y(I)$
The parameterization is the same as in Figure 2. Using the same example, for $\lambda = 0.2$ and $s = 0.5$, we get ROA ≈ 1.73.

This time, let us start with discussing the easier case, which is the effect of information sharing s on risk. Because information sharing does not influence the LGD, we can focus on the effect on the PD. We have

$$\frac{d\text{PD}}{ds} = \frac{\partial \text{PD}}{\partial s} + \frac{dq}{ds} \cdot \frac{\partial \text{PD}}{\partial q}, \tag{10}$$

where we know from Lemma 2 that $dq/ds < 0$, more information sharing means less screening. Now,

$$\begin{aligned} \frac{\partial \text{PD}}{\partial s} &= -\frac{q\,(1-q)\,\gamma\,(1-\gamma)}{\big(\gamma + (1-q)\,(1+q\,(1-s))\,(1-\gamma)\big)^2} < 0 \qquad \text{and} \\ \frac{\partial \text{PD}}{\partial q} &= -\frac{(2\,q\,(1-s)+s)\,\gamma\,(1-\gamma)}{\big(\gamma + (1-q)\,(1+q\,(1-s))\,(1-\gamma)\big)^2} < 0. \end{aligned} \tag{11}$$

There are two countervailing effects. First, the information leads to fewer bad firms applying for loans. Second, the banks' screening gets laxer. In the specification of our numerical example, the first (direct) effect dominates, though this is not a general property. If the function $q(s)$ has a jump somewhere, then $dq/ds \approx -\infty$, and the second (indirect) effect dominates.

Now, look at the effect of creditor rights. We have

$$\begin{aligned}\frac{d\,\text{risk}}{d\lambda} &= \frac{d\text{PD}}{d\lambda}\cdot\text{LGD}+\text{PD}\cdot\frac{d\text{LGD}}{d\lambda}\\ &= \frac{dq}{d\lambda}\cdot\frac{\partial\text{PD}}{\partial q}\cdot\text{LGD}-\text{PD}\end{aligned}\tag{12}$$

From Lemma 2, we know that $dq/d\lambda < 0$, and from right above, we know that $\partial\text{PD}/\partial q < 0$. Therefore, depending on the relative sizes of LGD and PD, the effect of creditor rights on aggregate risk can be positive or negative. Again, in the specification for our numerical simulations, the effect is always negative. See Figure 4.

Finally, we would also like to know whether the effects of creditor rights and information sharing on risk are substitutes. In our numerical simulation, they are: $d^2\text{risk}/d\lambda ds > 0$.

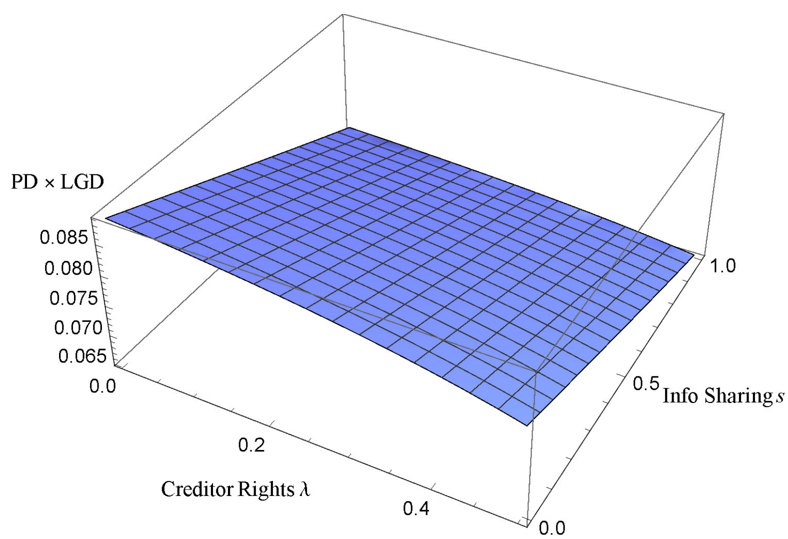

Figure 4: Firm Risk
The parameterization is the same as in Figure 2. Using the same example, for $\lambda = 0.2$ and $s = 0.5$, we get $\text{LGD} = 1 - \lambda = 0.8$, $\text{PD} \approx 0.096$ and thus risk $= \text{LGD} \times \text{PD} \approx 0.077$.

Firm Risk Choice. We have assumed that creditor rights and information sharing do not influence the firm's risk choice. In reality, if a firm knows that he can keep less in default, he will of course try to avoid it (Nini, Smith, and Sufi, 2009, 2012). To capture this effect, let us modify our model and assume that a good firm, after having obtained a loan, can take a private benefit of B, at the detriment of turning his good asset into a risky asset that defaults with probability τ. In other words, the firm can increase the risk of his asset, which leads to an increased PD. We discuss this modification on page 19. An extension that allows the *loss given default* to be influenced by information sharing can be constructed along the same line.

This exercise has two goals. First, it can be seen as a robustness check for the current, simpler model. Second, in the empirical part, we use the z-score to measure risk, which arguably measures the risk of a single firm rather than the PD in the bank's portfolio.

The firm could take risk at different moments in the time structure. Most naturally, it could decide how to shape the project's risk after the investment stage. To fix ideas, assume that after the investment, a good firm can take a private benefit of B, which raises the risk of the asset, leading to a default probability of τ. Of course, one could also allow for a continuous risk choice, or for a continuously distributed return variable for the asset. The good firm will then take risk if

$$\Pi_G < (1-\tau)\,\Pi_G + \tau\,(r-\lambda) + B \quad \Longleftrightarrow \quad \Delta\Pi \equiv \Pi_G - (r-\lambda) < \frac{B}{\tau}. \tag{13}$$

Now,

$$\frac{d\Pi_G}{d\lambda} = \frac{\partial \Pi_G}{R} \cdot \frac{\partial R}{\partial \lambda} = -(I-A) \cdot \frac{\partial R}{\partial \lambda}$$

due to the envelope theorem. We have already shown that the second factor is negative, so the whole term is positive. $(r-\lambda)$ obviously decreases in λ, so the whole difference increases in λ. The argument with respect to s is identical. Concerning the cross-derivative,

$$\frac{d^2\Pi_G}{d\lambda ds} = \frac{\partial \Pi_G}{R} \cdot \frac{\partial R}{\partial \lambda} = -(I-A) \cdot \frac{\partial R}{\partial \lambda}$$

With the same procedure as for the other propositions, we can show that $d\Delta\Pi/d\lambda > 0$ and $d\Delta\Pi/ds > 0$. In addition $d^2\Delta\Pi/d\lambda ds < 0$. This implies that stronger creditor rights make the firm reluctant to take risk. The same is true for a higher level of information sharing. The cross derivative has the opposite signs, which implies that regarding firm risk choice, creditor rights and information sharing are again substitutes. Note that the comparative statics in Figure 4 (and thus in Table 1, third line) are the same as in this subsection. This implies that implementing this moral hazard problem leads to hypotheses about firm risk-taking that are identical to those pertaining to bank portfolio risk.

Alternatively, one could assume that the firm type is not fixed right from the beginning. Instead, by spending a non-monetary effort at date $t = 0$, firms can increase the probability to find a good project. Let us fix ideas and assume that spending $\bar{B}$ leads to an increase of the fraction of good types from γ to $\gamma + \bar{\tau}$. Then, the algebra is the same as in (13). Firms will spend the extra effort as soon as the difference $\Pi_G - (r - \lambda)$ is large enough. As a consequence, the comparative statics are also the same.

Welfare. The model is a partial equilibrium model. Therefore, we should not overemphasize any welfare result. Within the model, however, welfare can be defined as the aggregate profits of firms (good and bad) and banks, which is equal to (good and bad) projects' NPVs net of screening costs. Because the mass of firms is 2, and because good firms are not rejected, the aggregate NPV generated by good firms is $2\,\gamma\,\big(Y(I^*) - r\big)\,I^*$. First, let's examine bad firms who apply for loans at the first bank. These firms have a mass of $1-\gamma$ and generate a (negative) NPV or $(y - r)\,I$. Each firm is rejected by the first bank with probability q^*, so $1 - q^*$ get a loan from the first bank. The first bank communicates the negative information to the second bank with probability s. Hence, $q^*\,(1 - s)$ apply at the second bank, where they get a loan with probability $1 - q^*$. Summing up, a fraction $(1 - q)\,(1 + q\,(1 - s))$ gets a loan. This must be multiplied with $2\,(1 - \gamma)$ times the NPV. The last part of the welfare function are the screening costs of banks, also multiplied with the factor 2. This yields

$$W = 2\,\gamma\,\big(Y(I^*) - r\big)\,I + 2\,(1-\gamma)\,(1-q^*)^2\,(y-r)\,I^* - 2\,\big(1 + (1-\gamma)\,q^*\,(1-s)\big)\,(I^* - A)\,c(q*).$$

Now, we want to know how welfare changes if either creditor rights or information sharing increases. First, start with creditor rights λ. Since λ does not appear in the welfare function, any effect must be indirect. The loan rate also does not appear in the welfare function, so the only endogenous variables are investment size I^* and screening intensity q^*. The banks' choice of the screening intensity has two externalities. First, bad firms get $y - \lambda$ in case of default. With more screening, there are fewer bad firms, and this is a negative externality on this group. Second, if a bank screens out a bad applicant, this information is transmitted to the other bank with probability s. If s is positive, there is a positive externality from screening. Taken together, this means the screening level q^* could be too high or too low from a welfare perspective. It will be too low if $s \approx 0$, and it will be too high if $\lambda \approx y$. Therefore, if we only look at screening intensity, there will be an optimal level of creditor rights.

The investment volume I^*, on the other hand, is always too small. The optimal level would maximize $I\,(Y(I)-r)$. The good firm, however, maximizes $I\,Y(I)-R\,(I-A)$ or equivalently $I\,(Y(I)-R)$. Because higher creditor rights lead to lower loan rates and thus an increase in investment volume I, this channel always yields a positive welfare effect.

Information sharing s has a double direct positive influence on welfare. First, treating I and q as constant, it reduces the volume of bad firms, and it reduces screening costs. In addition, there are indirect effects. These are exactly parallel to those of creditor rights. The screening intensity will decrease, though the welfare implication depends on whether the positive or negative externalities in the banks' screening decision dominates. The investment volume will increase, which is conducive for welfare.

Discussion. The model tries to be as simple as possible, yet produce comparative statics that we can test. It does not try to be as realistic as possible. For example, the time structure implies that information sharing does not influence *bank competition*. In other words, our model keeps the degree of bank competition constant. Gehrig and Stenbacka (2007) argue that information sharing can be used as an anti-competitive device. Without information sharing, banks bid aggressively to shift the lemons problem from themselves to their competitor. With information sharing, this rationale for aggressive price setting disappears.

In the model, we have assumed there are two types of firms, good and bad, and that by spending $C(q)$, a bank can detect a bad firm with probability q. With this assumption, there are are false positives (firms that are screened good, that is, not bad, but who are in fact bad), but there are no false negatives (no firms that are screened bad but are in fact good). One could, slightly more generally, assume that there are both false positives and false negatives and that the probabilities of both are going down as the bank spends more on screening. Even more generally, the screening result could be a continuous variable. Of course, the type of firms could also be made continuous. We discuss an alternative screening structure in the Online Appendix under Section C.2.

In our model, the firm has assets A, and these are liquid so he can invest them into the project. Consequently, there is no role for *collateral*. To discuss the potential role of collateral, let us assume that in addition to the liquid A, the firm owns assets of value B. These assets are assumed to be illiquid, and the liquidation value is only βB. Let us assume that β is relatively small, such that it is not optimal for the firm to liquidate the asset right away. Let us also assume that B is not too large. Otherwise, good firms could signal their true type by providing a large amount of collateral and thus generating a separating equilibrium. In that case, screening and information sharing would be obsolete. We discuss this extension in Section C.1.

We have assumed that banks must share information with exogenous probability s. One can show that bank profits increase in s, so *ex ante*, banks have an incentive to join into an information sharing agreement. This agreement is also time consistent. When one bank rejects a firm, it does not interact with this firm again in the model. Therefore, its own profits are independent from whether it passes the negative information on or not. Consequently, even if the commitment were not possible, information sharing is part of one subgame perfect equilibrium. In another equilibrium, banks do not share the information, but this equilibrium has lower profits for banks. One can construct equilibria with any sharing probability, so it is consistent to assume that this probability is given by an exogenous number s. In Appendix C.3, we describe a model in which banks choose s *ex ante*, at a cost.

In the model, we have considered firm risk, as measured by PD times LGD, but not bank risk. Bank risk is influenced by a number of factors. First, the volume of individual loans is important. As creditor rights or information sharing increase, the loan volume increases. This means that risk per volume decreases, but loan volume, such that the aggregate effect can take both directions, even for a single loan. Second, firm risk affects bank risk more if the correlation between individual firms is high. For example, one could assume that firm defaults depend on one single common risk factor but are independent otherwise, like in Vasicek (2002) or Martinez-Miera and Repullo (2010). Then

$$F(x) = \Phi\left(\frac{\sqrt{1-\rho}\,\Phi^{-1}(x) - \Phi^{-1}(\mathrm{PD})}{\sqrt{\rho}}\right),$$

where $\rho \in (0,1)$ is the correlation coefficient between loan defaults, PD is the probability of failure of a single loan, x is the aggregate failure rate from the bank's perspective, Φ is the standard normal distribution, and F is its cumulative distribution function. Then $\partial F/\partial p < 0$, which implies that an lower PD of firms p leads to a first-order stochastic dominant distribution of returns from the loan portfolio, i. e., credit risk. Both LGD and loan volume are not affected by the correlation ρ. This implies that for a low correlation ρ, higher creditor rights will increase risk, due to an increased loan volume. Aggregate bank risk, however, constitutes from credit risk plus other risk sources, such as market risk or operational risk. If credit risk increases, the bank may reduce risk in other sectors because of risk aversion, or because of regulatory concerns. This second effect may even dominate. All in all, an increase in creditor rights or information sharing may lead to increased aggregate bank risk, in line with Houston, Lin, Lin, and Ma (2010).

Table 1 summarizes our comparative statics, and thus our predictions.

	Creditor rights λ	Information sharing s	Interaction $\lambda \times s$
Leverage	+ (see Prop. 1)	+ (see Prop. 1)	− (see Prop. 1)
ROA	− (see Prop. 2)	− (see Prop. 2)	+ (see Prop. 2)
Bank portfolio risk	− (simulation)	− (simulation)	+
Firm risk choice	− (simulation)	− (simulation)	+ (simulation)

Table 1: Summary of Comparative Statics

5 Data and Variables of Interest

Creditor Rights and Information Sharing Variables The original creditor rights index was established by LLSV, but it was updated to a time series between 1978-2003 by DMS. The creditor rights index takes on integer values from 0 to 4 where larger values indicate more creditor friendly bankruptcy codes. For each of the four types of rights creditors have, an additional unit is added to the index value. DMS find that creditor rights are very sticky over time and LLSV show that they are primarily a function of legal origin. We use the most recent 2003 value of creditor rights from DMS.[9]

Specifically, the first component of the creditor rights index is $Reorg$, which indicates whether restrictions, such as creditor consent, exist when a borrower files for reorganization. The second element of the index, $NoAutostay$, is whether or not secured creditors are able to seize their collateral once a reorganization petition is approved or whether the courts impose an automatic stay of assets. If there is no automatic stay of assets in place and secured creditors can immediately seize collateral, the variable $NoAutostay$ is 1. If the secured creditor is paid first out of the proceeds of liquidating a bankrupt firm, the value of *Secured* is 1. The final component of the index, $Manages$, takes a value of 1 if management is removed during times of bankruptcy and an administrator is appointed by the courts to run the firm. The creditor rights index measure for each country are reported in Table 2. Both the mean and median country has a creditor rights index of two, though the individual components tend to differ between countries.

The proxy for information sharing between banks, *Depth*, comes from the World Bank. The index ranges from 0 to 6, where higher values indicates greater information sharing. There are six components of this index.[10]

[9] Results are also robust to using the original LLSV measure.

[10] Brown, Jappelli, and Pagano (2009) construct a variant on the depth of information sharing index where component six is removed. Our results are robust to constructing this index in the same fashion.

1. Both positive information and negative information are distributed.
2. Data on both firms and individual borrowers are distributed.
3. Data from retailers, trade creditors, or utilities, as well as from financial institutions are distributed.
4. More than two years of historical data are distributed.
5. Data are collected on all loans of value 1% of income per capita.
6. Laws provide for borrowers rights to inspect their own data.

A value of one is added to the index if each component is present in either a public credit registry or a private credit bureau. Jappelli and Pagano (2002) find that there is a substitution effect between the information shared between public credit registries or private credit bureaus, which is why we calculate this variable at the economy-level.[11] The World Bank collects information regarding the depth of information for each country annually. For the final sample of 26 countries, both the average and mean of the *Depth* variable are about four, though, the exact type of information that is shared varies by country.[12]

Firm-Level Variables. The primary firm data source for this analysis is the 2015 Amadeus Database by Bureau Van Dijk.[13] This database has extensive data on many public and private companies within Europe, and its heterogeneity makes it ideal for testing our predictions. Bureau Van Dijk assembles its data from country regulatory agencies and purchases additional firm information from third party providers, however, firms of different sizes or different ownership structures may be required to file financial statements in different countries.

[11] Taking a closer look at coverage within our sample, almost every country has both a public registry as well as a private credit bureau, but for a given country, coverage tends to be high for either the public credit registry or private credit bureau. For example, for Belgium, public registry coverage is at about 97% over the course of our sample, while private bureau coverage is nonexistent. However, in the UK, those coverage ratios are reversed.

[12] One of the information proxies in HLLM is the existence of a credit registry or bureau. Though the type of information shared varies between countries, almost all countries within our sample period have both a credit bureau and registry according to World Bank data. HLLM's sample predates ours, which explains why they have variation in the existence of credit registries and bureaus, while we do not.

[13] Each version of Amadeus only contains eight years of data. Thus, the 2015 version of Amadeus only contains data from 2006-2014. Data before 2006 is unavailable using the 2015 database.

Importantly, the firms within this database are small, private, and likely to be impacted by the local creditor rights and information sharing environment. The Amadeus data is designed to be comparable across countries, but there are cross-country differences disclosure requirements and the way variables are reported.[14] Furthermore, even for countries that require private firms to disclose financial documents, the disclosure requirements may be different. For example, both Finland and Poland require companies with more than 50 employees to file, though Finland requires firms with more than 3.65 million euros to file, while the threshold for France is 2.5 million euros. Thereby, the firms filing financial documents in each country within our sample will not be exactly the same. We will further address this within the robustness section. Bureau Van Dijk does not introduce bias by reconstructing unreported variables. This data set has a great deal of missing information, especially for small private firms, which limits the sample. Both academics and practitioners have relied on this data for analysis in previous studies, though it is still important to bear in mind the comparability of balance sheet data across countries.[15]

We follow the private firm literature (Badertscher, Shroff, and White, 2013; Badertscher, Shanthikumar, and Teoh, 2016) and eliminate financial firms, firms with missing financial information, as well as firms with sales less than $100,000 and total assets less than $500,000. This helps alleviate the possibility that the data contained within Amadeus is unreliable for very small firms.[16]

The 2015 Amadeus database contains available firm data for the years 2006-2014. The final sample of firms consists of 1,877,901 private firms. Table 2 shows the 26 European countries in the sample and the types of creditor rights that are present in each economy. Previous

[14]As a specific example, German accounting standards place a great deal of value on conservatism, which could mean that assets of the firms within Germany are undervalued relative to asset values in other European countries. Furthermore, expenditure in research and developments is not required to be disclosed on the firm balance sheets in many countries, and Bureau Van Dijk cannot acquire data for small firms in Switzerland. However, differences in accounting practices are not unique to Amadeus and also exist in other more widely used data sets including Global Vantage and Compustat.

[15]An additional problem worth noting is the issue of survivorship within the Amadeus database. If a company is absent for four years, the company is deleted from the database and historical records are not obtained by Bureau van Dijk.

[16]This primarily affects firms contained in Italy, France, and Spain where there is very strict reporting standards for firms of all sizes.

papers utilizing the Global Vantage database (Acharya, Amihud, and Litov, 2011; Acharya, Sundaram, and John, 2011) have only examined publicly traded companies, and previous literature has shown that there are substantial differences between public and private companies (Claessens and Tzioumis, 2006; Giannetti, 2003).

Furthermore, the relationship lending literature suggests that small firms are most likely to borrow from local banks (Berger and Hannan, 1989; Berger and Udell, 2002). The sample consists almost entirely of private firms that cannot easily access equity markets (Berger and Udell, 1998) and depend primarily on funding from commercial banks along with the equity of the principal owner (Berger and Udell, 2002). Because both the local banks and small firms are within the same economy, the small firms within this sample are the ones that are most likely to be impacted by the local creditor rights and information sharing conditions.

Firm-level variables of interest are constructed using the Amadeus database. The three primary variables of analysis in this study are firm leverage, profitability, and risk (distance to default). The total amount of borrowing ($FDebt$) is the sum of non-current liabilities in long-term debt and current liabilities in loans.[17] The two most common ways for a firm to acquire debt is either to obtain a loan or issue debt. Since the majority of the firms are small and private, most of the debt on their balance sheet is likely bank loans, which closely links to the predictions in our model.

Total borrowing (*FDebt*) scaled by total firm assets (*FAssets*) is the definition of firm leverage (*FLeverage*) in regressions. Leverage is winsorized at 1% in each tail. Profitability, ROA, is defined as $EBITDA/FAssets$.

The variable *ZScore* represents firm risk-taking and measures number of standard deviations the firm is away from default. The *ZScore* for a firm-year has a numerator that is equal to the average ROA of the preceding three years plus the average ratio of capital to assets (CAR) over the preceding three years. The denominator is the standard deviation of ROA for the preceding three years. The *ZScore* used in the analysis is calculated each year. The median (average) firm in our sample is 3.5737 (8.8825) standard deviations from bankruptcy.

[17]Due to data limitations, commercial paper is not included in the estimate of FDebt because the specific types of debt are unknown. However, this would bias estimates down (against our findings).

Further firm-level controls are primarily taken from Myers (1977) and Booth, Aivazian, Demirgüç-Kunt, and Maksimovic (2001). These firm-level controls include log total firm assets, *LogFAssets*, in order to control for any size effects. The variable *TanAssets* measures the percentage of total assets that are recorded as fixed assets, a proxy for collateral.

Additionally, Tobin's Q, which is the ratio of the market value of the firm's total assets to its book value, is typically an indicator of investment opportunity. However, because over 99% of firms in the sample are privately held, it is not possible to compute a market value. As a result, investment opportunities are proxied by, *Growth*, which is computed by examining the natural log of the increase in sales growth consistent with the private firm investment literature (Shin and Stulz, 1998; Lehn and Poulsen, 1989; Whited, 2006; Whited and Wu, 2006; Bloom, Bond, and Van Reenen, 2007; Asker, Farre-Mensa, and Ljungqvist, 2015; Badertscher, Shroff, and White, 2013). The amount of years since incorporation, *Age*, proxies for reputation, which is important according to Diamond (1991).[18] In total, there are 5,664,488 firm-years in the sample spanning twenty-six countries. Firm-Level summary statistics are presented in Table 3 Panel A.

Table 3 Panel A shows that many of the firm-level variables are extremely right skewed. The small number of public firms in the sample have significantly more assets than the average private firm in the sample, skewing all of the firm-level variables, except for *LogFAssets*. The median (mean) firm has a leverage of 0.1118 (0.2325), corresponding to assets of $1.9 million ($6.8 million) and loans of $196,592 ($1,520,895). Subsequent analysis will examine the impact of this right-skewedness.

Additional Macro Controls. A selection of macro-level controls is included for all firm-level regressions that are designed to control for the macro lending environment. These country-level variables attempt to control for differences in economic development across countries, and they are shown in Panel B of Table 3. Real Per Capita GDP and Inflation

[18]The firms in our sample may be fairly small, but the age variable indicates that they are not start-ups. The median firm has been incorporated for thirteen years, while the mean firm is about 15 years old.

data are from the World Bank, and legal origin dummy variables (*English*, *French*, *German*, and *Scandinavian*)[19] are from DMS.

Claessens and Klapper (2005) suggest that when certain components of the creditor rights index are higher, there are more bankruptcies. However, a number of papers also suggest that it is not just the rules that are in place but the way that they are enforced that determines their implications (Bae and Goyal, 2009; Bhattacharya and Daouk, 2002, 2009). Since we are interested in how much a country's bankruptcy code favors the debtor, it is important to understand how this variable translates to practice.

In each regression, we include a variety of controls designed to control for control of corruption (*Corruption*), government effectiveness (*Effectiveness*), quality of regulation (*Regulation*), and rule of law (*Law*), and political stability (*Stability*) to capture government stability and the degree of law enforcement. These variables are explained in Appendix C and displayed in Table 3 Panel B. Panel C displays summary statistics for the country-level variables.

6 Empirical Specification

Leverage Analysis. We start our empirical analysis focusing on firm leverage. Within the model, as creditor rights and information sharing increase, each bank loses less on bad loans. Banks then compete harder to attract larger size loans by lowering the interest rate, which leads to an increase in investment volume and firm leverage. In order to test this hypothesis, we use the following empirical model,

$$\begin{aligned} FirmLeverage_{f,c,t} &= \alpha_1' \, CRights_c + \alpha_2' \, Depth_{f,c,t} + \alpha_3' \, CRights_c \times Depth_{f,c,t} \\ &\quad + \alpha_4' \, FirmControls_{f,c,t-1} + \alpha_5' \, CountryControls_{c,t-1} + \varepsilon_{f,c,t} \qquad (14) \end{aligned}$$

Industries are classified at the three-digit SIC level. Both industry and year fixed effects are included in the regressions, and errors are clustered at the country and year level for

[19] The dummy variable representing the Scandinavian legal origin is omitted from regression results because it is collinear with the other three legal origin dummy variables.

all regressions.[20] Firm-level controls include log firm assets (*LogFAssets*), firm profitability (*ROA*), the proxy for collateral (*TanAssets*), sales growth (*Growth*), and firm reputation (*Age*). Macroeconomic controls that vary by year include *LogGDPperCap* and *Inflation*, along with the variables to capture government stability and the degree of law enforcement (*Corruption*, *Stability*, *Effectiveness*, *Regulation*, and *Law*). Finally, Cole and Turk-Ariss (2015) and Haselmann, Pistor, and Vig (2010) show that legal origin is an important determinant of bank loan ratios, so we include legal origin dummies as controls.

The model suggests that enhanced creditor protection and greater information sharing lead to larger loan sizes, indicating $\alpha_1 > 0$ and $\alpha_2 > 0$. The model also predicts that there is a substitution effect between creditor rights and information sharing, which would be reflected if $\alpha_3 < 0$. The results of the leverage regressions are presented in Table 4.

The results of Table 4 are consistent with the theoretical model presented in Section 3. The coefficients on both *CRights* and the depth of information sharing, *Depth*, are both positive and statistically significant in columns 1-4. This indicates that stronger creditor rights and greater information sharing between banks is associated with greater firm borrowing.

Column 1 shows that when creditor rights are increased by one unit, leverage increases by .0716 on leverage. The magnitude of this estimate is huge, considering that the average (median) firm in the entire sample has a leverage ratio of 0.2325 (.1118). If information sharing is examined without creditor rights in column 2, the regression results suggest that a one unit increase in information sharing leads to an increase of .0257, also quite large. In column three, when both variables of interest are included in the model, the magnitudes of the effects on leverage only slightly decrease.

The results in Column 4 show that creditor rights and information sharing are substitutes. They also correct for the unrealistic magnitudes obtained in columns 1-3. Holding infor-

[20]Unfortunately, we cannot include country-level or firm-level fixed effects because the creditor rights measure is from 2003, which is the most recent year of the data provided by Djankov, McLiesh, and Shleifer (2007), while the earliest year of firm-level data included in the sample is 2006. However, as previously discussed, creditor protection is very constant over time and are likely to accurately estimate the degree of investor protection during the sample period. If the creditor rights are stable over time for a given country and country-level fixed effects are included, the direct effect would be differenced out.

mation sharing at the mean amount of 4 and examining the impact of increasing creditor rights by unit indicates that firm leverage will increase by 0.03966 ($0.0793 - 0.00991 \times 4$). This is a 45% reduction in magnitude compared to the estimated effect of creditor rights on leverage that was obtained in column 1. Furthermore, if we hold creditor rights constant at the mean level of 2, this means that increasing information sharing by one unit will have an effect on leverage of 0.00588 ($.0257 - 0.00991 \times 2$), which is a 77% drop in the magnitude compared to column 2. The fit of the model (R^2) also improves once the interaction term is included in regression framework in column 4. As discussed in the literature review section, this result is potentially very important, because the literature focusing on creditor rights up to now is largely separate from the one on information sharing.

Column 4 indicates that adding an interaction term between creditor rights and information sharing improves the fit of the model, and the negative sign on the coefficient demonstrates that these variables are substitutes. HLLM also focuses their bank-level analysis on the way creditor rights and information sharing jointly impact bank-level distance to default and profit. They find evidence suggesting that creditor rights and information sharing move in opposite directions, but as previously discussed, one reason for the difference between our findings is that bank risk (z-score) does not have to perfectly correlate to the risk within the loan portfolio.

The firm-level controls presented in Table 4 indicate that firms with more assets (*LogFAssets*), a greater ability to offer collateral (*TanAssets*), and more investment opportunities (*Growth*) are more levered, while firms that are older (Age) are less levered. The macroeconomic controls indicate that greater real per capita GDP (*LogGDPperCap*) and inflation lead to lower levels of firm-leverage, while greater control of corruption (*Corruption*) has a positive effect on firm leverage. English, French, and German legal origin are also shown to be positively associated with firm leverage.

Profitability Analysis. As previously shown in the model, as creditor rights and information sharing increase, this causes the rate that the bank charges to decrease. As a consequence, firm investment and leverage increases. However, because the bank is screening less and earning a better return on each unit of investment, it is willing to lend to less profitable firms. Thus, higher creditor rights and information sharing should be negatively related to firm profitability. Empirically, we test this prediction in (15) and expect $\beta_1 < 0$ and $\beta_2 < 0$. The model also predicts that there is a substitution effect between creditor rights and information sharing, which would be reflected if $\beta_3 > 0$.

$$\begin{aligned} ROA_{f,c,t} = {} & \beta_1' \, CRights_c + \beta_2' \, Depth_{f,c,t} + \beta_3' \, CRights_c \times Depth_{f,c,t} \\ & + \beta_4' \, FirmControls_{f,c,t-1} + \beta_5' \, CountryControls_{c,t-1} + \delta_{f,c,t} \end{aligned} \tag{15}$$

All controls are identical to those presented in equation 15 (14), except that, since leverage has been shown to be an important determinant of firm profitability, leverage (*FLeverage*) is included as a control. The results are presented in Table 5.

Consistent with theory, both creditor rights and information sharing are negatively and significantly related to firm profitability, as can be seen from Table 5 columns 1-4. Just as we had seen within the leverage framework, the magnitudes of both variables when examined separately in columns 1-3 are unrealistically huge, considering the median (mean) firm ROA is .0295 (.0494).

Holding information sharing constant at the mean level of 4, a one unit increase in creditor rights leads to ROA decreasing by 0.00102. Holding creditor rights constant at the mean level of 2, a one unit increase in information sharing is associated with a decrease in profitability of 0.00268. Just as what we found in the leverage framework, when jointly examining creditor rights and information sharing, the magnitudes decrease dramatically, as compared to examining each variable individually.

Distance to Default Analysis. Within the model, firm risk appears in a number of different places. When creditor rights are stronger, by definition, the loss given default (LGD) of the bank's loan portfolio goes down. However, banks screen less, which leads to more bad borrowers getting loans, indicating that the probability of default (PD) of the loan portfolio increases. Using firm-level data, we are unable to test the risk predictions associated with the bank's loan portfolio. However, we can test the predictions derived in the Firm Risk Choice model extension that focus on firm-level risk.

The Amadeus dataset only contains information on solvent firms. Without defaulted firms, we cannot calculate a loss given default (LGD) measure at the firm-level. However, for each firm in our sample, we can calculate the distance to default, which is essentially a firm-level measure of risk. According to the model, we expect that when creditor rights or information to go up, firms will decrease their risk-taking, thus moving further away from default.

Empirically, we construct the risk measure at the firm-year level. The z-score represents the number of standard deviations that the firm is away from bankruptcy. Larger z-scores indicate greater financial stability and decreased probability of bankruptcy. If the data are consistent with the theoretical predictions, we would expect that in equation (16), $\gamma_1 > 0$ and $\gamma_2 > 0$, corresponding to both creditor rights and information sharing being associated with greater distance to default (larger z-score). The substitution effect between creditor rights would be reflected if $\gamma_3 < 0$.

$$\begin{aligned} ZScore_{f,c,t} = {} & \gamma_1' \, CRights_c + \gamma_2' \, Depth_{f,c,t} + \gamma_3' \, CRights_c \times Depth_{f,c,t} \\ & + \gamma_4' \, FirmControls_{f,c,t-1} + \gamma_5' \, CountryControls_{c,t-1} + \upsilon_{f,c,t} \end{aligned} \tag{16}$$

Our empirical results, presented in Table 6, confirm the model predictions. Columns 1-4 again show that greater levels of creditor rights and information sharing (individually or jointly) have a positive impact on a firm's distance to default, which indicates that firms are less risky. In column 3, once both variables of interest are included in the regression, both regression coefficients drop by more than 30% as compared to the ones obtained in columns 1-2. By examining borrower-level data, our analysis examines the outcomes associated with the bank lending patterns predicted by our model, suggesting that creditor rights and information sharing are substitutes within the bank loan portfolio.

As done in previous sections, if we hold information sharing constant at 4, the results in column 4 indicate that a one unit increase in creditor rights increases z-scores by 0.145, indicating that the firm is 0.145 standard deviations further away from bankruptcy. An increase in information sharing indicates that z-scores increase by 0.144 when creditor rights are held constant and the interaction effect is considered. The median (mean) firm has a z-score of 3.5737 (8.8825), indicating that not only are these results statistically significant but also economically meaningful. Just as the model predicts, when creditor rights and information sharing increase, firms take on less risk, as indicated by being further away from default.

7 Robustness Results

As pointed out in Section 5, the Amadeus dataset is extremely heterogenous. This heterogeneity is a strength of the database, since it provides the opportunity to focus on the firms that most closely match the model. However, since the data is so skewed to the right, a few extremely large firms may determine our results.

A key assumption of the model presented in Section 3 is that the firms are approaching banks for loans. This makes both the local firm and local bank exposed to the local creditor rights and information sharing environment. It could be the case that large private firms can obtain debt across country lines or obtain syndicated loans consisting where all syndicate members are not from their home country, causing a question as to whether borrower creditor protection laws are applicable in practice. It is most likely that the largest firms in our analysis may have the opportunity to obtain financing through international debt markets or have alternatives to local bank loans.

In order to address this possibility, we remove the largest 10% of firms in the sample, as determined by asset size. The results reported in Table 7 are all quantitatively similar to those from Tables 4, 5, and 6, except that the magnitudes on the estimated coefficients are consistently larger, indicating that both creditor rights and information sharing have a greater effect on smaller firms.

This same robustness check also applies to a number of different questions. One such question is how the differences of ownership structures may differ between countries and how this relates to creditor rights. It could be possible that the holding companies can obtain more favorable financing terms through wholesale debt markets. This group of firms would be less reliant on bank loans. Using the Amadeus database, we cannot determine which firms are held by holding companies and which are not. However, holding companies typically do not hold firms as small as the ones that primarily make up our sample. By removing the top 10% or 20% of observations, we remove the group of firms that is also most likely to be held by a holding company. We report the results with the largest 10% of observations removed in Table 7 and the largest 20% of observations removed in Table 8. Again, when the largest 20% of observations are removed, the estimated coefficients only increase in magnitude as compared to those from Tables 4, 5, 6 , and 7, indicating the importance that these variables have on small firms.

We also control for the size of the equity market in Table 9. This addresses the possibility that the size of the equity market, a substitute for bank debt, is driving our results. It also adds an additional proxy for financial market development. Columns 1-3 present the results for robustness checks when the dependent variable is firm leverage, profitability, and z-score respectively. These regressions are quantitatively similar to those presented in Column 4 of Table 4, Table 5, and Table 6 respectively. The data on stock market capitalization is acquired from the World Bank, though the data is unavailable for a number of country-years, reducing our sample. In Table 10, we perform similar analysis only controlling for the ratio of private credit to GDP. Again, the results are quantitatively similar to baseline patterns. In Table 11, we include country fixed effects to control for any unobserved country-specific characteristics that are time invariant. Creditor rights do not change over time, so they are absorbed by the country fixed effect. However, the coefficients on both information sharing and the interaction between creditor rights and information sharing are quantitatively similar to the previous specifications.

In subsequent analysis, we consider the fact that countries with larger amounts of firms are biasing our results. Our results are robust to removing either Italy or France, the two countries with the largest number of observations. In a second robustness test, for each country, every year, we pick a random sample of 100 firms with assets between $0.5 million, the lower bound of our sample selection, and \$1 million. Then, we pick another 100 firms with assets between \$1 million and \$1.5 million and for each bucket thereafter, up to \$6 million. This essentially forces our panel to be more balanced and helps us adjust for the differences in reporting standards between firms and allowing us to compare the cross-sectional effects of creditor rights and information sharing have on similarly sized firms across countries. The differences are quantitatively similar to previous regressions and are presented in Table 12.[21]

We also conduct a number of robustness checks that are applicable only to certain outcome variables. We construct leverage net of cash and examine the log of the z-score measure. Results are quantitatively similar to those reported in tables 4 and 6. Additionally, because the calculation of the z-score involves averages over time, autocorrelation could be a problem and bias our results. Instead, we construct three separate three-year non-overlapping windows, and the model predictions are robust. We also address the idea that certain firms target "zero leverage," indicating that they do not wish to incur debt. The right-skewedness of leverage and firm debt reported in Table 4 suggest that this could be true. Within the data, it is difficult to determine which firms target "zero leverage." However, if we remove the group of 5% or 10% of firms with the lowest leverage in our sample, the results are robust. Additionally, firm leverage, risk, and profit are all outcome variables. Though ROA is typically a control for leverage and firm risk, while $FLeverage$ is typically a control for profit and risk (Houston, Lin, Lin, and Ma, 2010; Rajan and Zingales, 1995; Acharya, Amihud, and Litov, 2011), we remove ROA and $FLeverage$ as controls from all regressions, and all regression results persist.

Additionally, we examine alternative measures of creditor rights and information sharing. Instead of using the DMS measure of creditor rights, we perform analysis using the measure from LLSV. In our model, information sharing is between banks, not between banks and borrowers. The sixth component of the information sharing index, laws provide for borrowers rights to inspect their own data, does not directly apply to our model framework, since it is information sharing between banks and borrowers. Brown, Jappelli, and Pagano (2009) also

[21] This is an alternative to a weighted regression. In the context of the theory model, smaller firms are more likely to be most directly impacted. However, weighting by something like the inverse of assets may put too much weight on the small firms in the sample that may have issues with data reliability.

drop this component from their analysis. Whether we examine a five or six component depth of information sharing index, all of our results are robust. The theoretical model focuses on whether banks share negative information about a borrower to each other. In another follow-up robustness test, we focus on the first component of the information sharing index, whither both positive and negative information are distributed, and all empirical results hold.

In a final robustness check, Klapper, Laeven, and Rajan (2006) suggest removing a number of industries where the activity is country specific (such as uranium mining) and utilities, which tend to be largely state-owned in Europe. After removing all of the industries that they outline, our results still hold.

8 Conclusion

A large literature examines cross-country differences in creditor rights and information sharing, and the impact on capital markets, bank lending, as well as firm borrowing. Previous literature has found that enhanced creditor rights have associated with a number of positive outcomes, including greater lending, cheaper debt, as well as greater economic growth. However, creditor rights are largely established at the time of a country's inception, are sticky over time, and are not converging to a common level. On the contrary, information sharing is improving over time and has the ability to help countries with low levels of creditor rights realize some of the positive outcomes associated with higher levels.

Theoretically, this our paper shows that greater levels of creditor rights and information sharing are associated with greater firm leverage, lower firm profitability, as well as greater distance to default. Within the model, the two variables are also shown to be substitutes.

Empirically, we use over 1.8 million private firms within Europe and confirm the model predictions. Our empirical results show that not only do creditor rights and information sharing interact, but this interaction is a necessary component to understanding the impact of each individual variable. These results are robust to a number of further specifications.

By focusing on private firms, we can closely link the empirical results to the theoretical model, as well as explain some of the existing paradoxes within the existing creditor rights and information sharing literature.

The theoretical and empirical results within this paper are suggestive of a policy implication. Since creditor rights and information sharing are robust substitutes, countries with low levels of creditor protection could consider increasing the collection and transmission of information sharing between banks, if they desire the outcomes associated with greater levels of creditor rights.

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A Proofs

Proof of Lemma 1 (Loan Demand). Taking the derivative of the implicit function (2) with respect to R yields

$$2\,I'(R)\,Y'(I) + I\,I'(R)\,Y''(I) - 1 = 0,$$
$$I'(R) = \frac{1}{2\,Y'(I) + I\,Y''(I)}. \tag{17}$$

The loan demand is thus downward sloping, $I'(R) < 0$. We are also interested in the second derivative, $I''(R)$, and therefore derive the first order condition once more,

$$0 = (2\,Y'(I) + I\,Y''(I))\,I''(R) + I'(R)^2\,(3\,Y''(I) + I\,Y'''(I)),$$
$$I''(R) = -I'(R)\,\frac{3\,Y''(I) + I\,Y'''(I)}{(2\,Y'(I) + I\,Y''(I))^2} < 0. \tag{18}$$

Hence, the loan demand is downward sloping and concave. ■

Proof of Lemma 2 (Screening Intensity). We first show that $dq^*/d\lambda < 0$. (6) implicitly defines q^*. Let Γ denote the left-hand side of equation (6). Then

$$\frac{dq^*}{d\lambda} = -\frac{\partial\Gamma/\partial\lambda}{\partial\Gamma/\partial q^*}. \tag{19}$$

At $q = 0$, we have

$$\Gamma(q = 0) = (1-\gamma)(r-\lambda) - c'(0). \tag{20}$$

We have assumed that $c'(0)$ is small, for example $c'(0) = 0$. Therefore, $\Gamma(q = 0) > 0$. Also, per definition, $\Gamma(q = q^*) = 0$. Therefore, by a purely geometric argument, $\Gamma(q)$ at q^* must cross the 0 from above, hence $\partial\Gamma/\partial q < 0$ at $q = q^*$. We also have

$$\partial\Gamma/\partial\lambda = -(1 + q(1-s))(1-\gamma) < 0, \tag{21}$$

which implies that $dq^*/d\lambda < 0$. Second, we must show that $dq^*/ds < 0$. To learn how information sharing influences the screening decision, take

$$\begin{aligned} \partial\Gamma/\partial s &= q(1-\gamma)[c'(q) - (r-\lambda)] \\ &= -\frac{q\,\gamma(1-\gamma)(r-\lambda)}{1 + q(1-s)(1-\gamma)}, \end{aligned} \tag{22}$$

which implies that $dq^*/ds < 0$.

Finally, turn to the cross derivative. In general, we have

$$\frac{d^2 q}{d\lambda ds} = \frac{\Gamma_q\left(\Gamma_\lambda\Gamma_{qs} + \Gamma_s\Gamma_{q\lambda} - \Gamma_q\Gamma_{\lambda s}\right) - \Gamma_s\Gamma_\lambda\Gamma_{qq}}{\Gamma_q^3} \tag{23}$$

where indices stand for derivatives with respect to that variable. It can easily be shown that the signs of the terms in the bracket differ even in a numerical example, so it is futile to try and lead a general proof. Therefore, we use the additional assumption that creditor rights

λ are not too small, that is, close enough to the return r.

For exactly $\lambda = r$, banks do not lose money on bad loans, hence they do not screen, $q^* = 0$. This is independent of information sharing s. Hence for $\lambda = r$, we have $dq/ds = 0$. We have just shown that for weaker creditor rights (smaller λ), the loan rate q is increasing in s. Hence a lower λ makes q increase more in s: the cross derivative $d^2q/d\lambda ds$ is negative. ■

Proof of Lemma 3 (Loan Rate). We start with the first inequality. Let Δ denote the left-hand side of (8) in the symmetric equilibrium,

$$\Delta = \gamma\,(I(R) - A) + \gamma\, I'(R)\,(R - r)$$
$$- (1-q)\,(1 + q\,(1-s)(1-\gamma) - \gamma)\,(r - \lambda)\, I'(R) = 0. \tag{24}$$

We want to know how R^* reacts upon changes in parameters, first of all creditor rights λ. The implicit function theorem gives us

$$\frac{dR^*}{d\lambda} = -\frac{d\Delta/d\lambda}{\partial\Delta/\partial R^*}. \tag{25}$$

Here, $\partial\Delta/\partial R = \partial\Pi_1/\partial {R_1}^2$ must be negative, otherwise R^* would not maximize, but minimize expected profits.

The derivative $d\Delta/d\lambda$ consists of the partial derivative plus the indirect effect through q^*,

$$\frac{d\Delta}{d\lambda} = \frac{\partial\Delta}{\partial\lambda} + \frac{\partial\Delta}{\partial q^*}\cdot\frac{dq^*}{d\lambda}. \tag{26}$$

We now look at the separate terms. First,

$$\frac{\partial\Delta}{\partial\lambda} = (1-q)\,(1 + q\,(1-s))\,(1-\gamma)\, I'(R) < 0 \tag{27}$$

because all but the last factors are positive. Second,

$$
\begin{aligned}
\frac{\partial \Delta}{\partial q^*} &= \left[(2q(1-s)+s)(1-\gamma)(r-\lambda) - (1-\gamma)(1-s)c(q^*) - (1+q(1-s)(1-\gamma))c'(q^*)\right] I'(R) \\
&= -(1-s)\,(1-\gamma)\,((1-q^*)\,(r-\lambda) + c(q^*))\, I'(R) > 0. \qquad (28)
\end{aligned}
$$

Finally, we have already shown that $dq^*/d\lambda < 0$ in the above section. Consequently, $dR^*/d\lambda < 0$.

We go on to prove the second statement. The implicit function theorem gives us

$$
\frac{dR^*}{ds} = -\frac{d\Delta/ds}{\partial \Delta/\partial R^*}. \qquad (29)
$$

with again $\partial\Delta/\partial R^* < 0$ and

$$
\frac{d\Delta}{ds} = \frac{\partial \Delta}{\partial s} + \frac{\partial \Delta}{\partial q^*}\cdot\frac{dq^*}{ds}. \qquad (30)
$$

Here, we already know that $\partial\Delta/\partial q^* > 0$ and $dq^*/ds < 0$. It remains to check

$$
\frac{\partial \Delta}{\partial s} = q\,(1-\gamma)\,\big((1-q)\,(r-\lambda)\big)\, I'(R^*) < 0 \qquad (31)
$$

because all factors are positive, except the last. Summing up, $dR^*/ds < 0$.

We now come to the third statement. In general, we have

$$
\frac{d^2 R}{d\lambda ds} = \frac{\Delta_q\left(\Delta_\lambda \Delta_{qs} + \Delta_s \Delta_{q\lambda} - \Delta_q \Delta_{\lambda s}\right) - \Delta_s \Delta_\lambda \Delta_{qq}}{\Delta_q^3} \qquad (32)
$$

where indices stand for derivatives with respect to that variable, for example $\Delta_s = d\Delta/ds$ as in (30). It can easily be shown that the signs of the terms in the bracket differ even in a numerical example, so it is futile to try and lead a general proof. Therefore, we use the additional assumption that creditor rights λ are not too small, that is, close enough to the return r.

For exactly $\lambda = r$, banks do not lose money on bad loans, hence they do not screen, $q^* = 0$.

There is perfect competition between banks, thus $R = r$, which is independent of information sharing s. Hence for $\lambda = r$, we have $dR/ds = 0$. For weaker creditor rights (smaller λ), the loan rate R is decreasing in s (see Lemma 3). Hence a lower λ makes R decrease more in s: the cross derivative $d^2R/d\lambda ds$ is thus positive. ■

Proof of Proposition 1 (Leverage). The first two statements are direct consequences of the definition of leverage, $\text{Lev} = (I - A)/A = I/A - 1$, Lemma 1, and Lemma 3. For the third statement, we have

$$\begin{aligned} \frac{d^2}{d\lambda ds}\text{Lev} &= \frac{d^2\text{Lev}}{dR^2} \cdot \frac{dR}{ds} \cdot \frac{dR}{d\lambda} + \frac{d\text{Lev}}{dR} \cdot \frac{d^2R}{d\lambda ds} \\ &= \frac{d^2I}{A^2\, dR^2} \cdot \frac{dR}{ds} \cdot \frac{dR}{d\lambda} + \frac{dI}{A\, dR} \cdot \frac{d^2R}{d\lambda ds} \end{aligned} \tag{33}$$

Because of Lemma 1, the first and second derivative of I with respect to R are negative. Because of Lemma 3, both $dR/d\lambda$ and dR/ds are negative. If also $d^2R/d\lambda ds > 0$, then both parts of the sum are negative, and consequently $d^2\text{Lev}/d\lambda ds < 0$. ■

Proof of Proposition 2 (Profitability/ROA). The first two statements are direct consequences of the definition of the ROA, $Y(I(R))$, Lemma 1, Lemma 3, and the assumption that $Y'(I) < 0$. Third, we want to establish that $d^2Y(I(R))/d\lambda ds > 0$. We have

$$\frac{d^2}{d\lambda ds}Y(I(R)) = \big(Y''(I)\, I'(R)^2 + Y'(I)\, I''(R)\big) \cdot \frac{dR}{ds} \cdot \frac{dR}{d\lambda} + Y' \cdot I' \cdot \frac{d^2R}{d\lambda ds}. \tag{34}$$

Because $Y' < 0$, $Y'' < 0$, $I' < 0$ and $I'' < 0$, the sign of the bracket term seems to be ambiguous. The other two factors are both negative, hence the sign of the first part of the sum seems to be ambiguous. The second part of the sum is negative times negative times positive, which is positive. Now remember (17) and (18),

$$\begin{aligned} I'(R) &= \frac{1}{2\,Y'(I) + Y''(I)}, \\ I''(R) &= -I'(R)^2\, \frac{3\,Y''(I) + I\,Y'''(I)}{2\,Y'(I) + I\,Y''(I)} < 0. \end{aligned}$$

Substituting this into (34), the bracket term of (34) becomes

$$\frac{I\,Y''(I)^2 - Y'(I)\left(Y''(I) + I\,Y'''(I)\right)}{(2\,Y'(I) + Y''(I))^2\,(2\,Y'(I) + I\,Y''(I))} \tag{35}$$

If a function $f(x)$ is decreasing and concave, then $x\,f'(x) < f(x) - f(0)$ for $x > 0$ (the absolute of $x\,f'(x)$ is larger, though). Consequently, if $Y'(I)$ is decreasing and concave (which it is by assumption), then $I\,Y''(I) < Y'(I) - Y'(0) = Y'(I)$ because of the assumption that $Y'(I) \approx 0$. Because $Y'''(I) < 0$, the numerator of the fraction is negative. The denominator is also negative, hence the complete fraction is positive. Consequently, the cross derivative of (34) is positive. ■

B Tables

Table 2:Amadeus Firm Composition

Country	Total Firms	Crights	Depth in 2006	Depth in 2014
Austria	6,873	3	5	5
Bosnia and Herzegovina	4,008	3	5	4
Belgium	22,207	2	0	4
Bulgaria	16,683	2	0	4
Switzerland	401	1	5	5
Czech Republic	50,813	3	5	5
Germany	60,997	3	5	6
Spain	297,271	2	4	5
Finland	33,906	1	4	4
France	424,184	0	0	4
United Kingdom	67,371	4	6	6
Greece	18,273	1	4	5
Croatia	18,737	3	0	5
Hungary	28,590	1	0	4
Ireland	4,162	1	5	5
Italy	482,694	2	5	5
Lithuania	2,838	2	4	6
Latvia	11,919	3	0	5
Netherlands	1,294	3	5	5
Norway	75,851	2	4	4
Poland	37,273	1	4	6
Portugal	58,421	1	5	5
Sweden	110,173	1	4	4
Slovenia	8,415	3	0	3
Slovak Republic	28,538	2	3	4
Turkey	6,009	2	4	5
Total	1,877,901			

Table 2 describes the type of firms that are used for subsequent analysis. Column 1 shows the twenty-six countries examined, and Columns 2 shows the breakdown of the number of firms in each country contained in the sample. Column 3 indicates the amount of creditor rights that exist within each country. The creditor rights index ranges from 0 to 4 where a greater index value indicates more investor protection. The four components of the creditor rights include creditor consent is required for borrowers to file for reorganization, creditors can automatically seize collateral once the reorganization petition is approved, the secured creditor is paid first out of the proceeds of liquidating a bankrupt firm, and either creditors or the courts have the ability to appoint a manager to run the firm during the bankruptcy process. Columns 4 and 5 indicate the value of information sharing in each country in 2006 and 2014, the start and end of the sample period. The index ranges from 0 to 6, where where higher values indicates greater information sharing. There are six components of this index. 1) Both positive information and negative information are distributed 2) Data on both firms and individual borrowers are distributed. 3) Data from retailers, trade creditors, or utilities, as well as from financial institutions are distributed 4) More than two years of historical data are distributed. 5) Data are collected on all loans of value 1% of income per capita. 6) Laws provide for borrowers rights to inspect their own data. A value of one is added to the index if each component is present in either a public registry or a private bureau. Variables are defined in Appendix C.

Table 3:Descriptive Statistics

Panel A: Firm-Level Variables						
Variable	mean	sd	p25	p50	p75	N
FirmLeverage	0.2325	0.3007	0.0005	0.1118	0.3581	5,646,779
FAssets	6,813,445	12,600,000	919,865	1,886,917	5,404,621	5,646,779
Floans	1,520,895	3,695,376	1,223	196,592	910,352	5,646,779
ZScore	8.8825	13.1764	1.3681	3.5737	9.4763	5,646,779
ROA	0.0494	0.1056	0.0034	0.0295	0.0853	5,646,779
LogFAssets	14.5929	1.3448	13.5735	14.3116	15.3774	5,646,779
TanAssets	0.2702	0.2894	0.0340	0.1487	0.4433	5,646,779
Growth	-1.9226	0.9114	-2.6359	-1.8727	-1.2538	5,646,779
Age	14.7069	9.6964	7.0000	13.0000	21.0000	5,646,779
Panel B: Country-Year Variables						
Variable	mean	sd	p25	p50	p75	N
Depth	3.9442	1.8757	4.0000	5.0000	5.0000	233
LogGDPperCap	10.1213	0.7777	9.5307	10.2628	10.7420	233
Inflation	0.0254	0.0213	0.0106	0.0219	0.0352	233
Corruption	0.9476	0.8742	0.1500	0.9100	1.7300	233
Stability	0.6636	0.5670	0.4700	0.7800	1.0600	233
Effectiveness	1.0760	0.6717	0.6200	1.0100	1.6200	233
Regulation	1.1191	0.5009	0.8000	1.1100	1.5700	233
Law	1.0573	0.6965	0.5300	1.0100	1.7600	233
Panel C: Country-Level Variables						
Variable	mean	sd	p25	p50	p75	N
Crights	2.0000	0.9798	1.0000	2.0000	3.0000	26
English	0.0769	0.2717	0.0000	0.0000	0.0000	26
French	0.3462	0.4852	0.0000	0.0000	1.0000	26
German	0.4615	0.5084	0.0000	0.0000	1.0000	26
Scandinavian	0.1154	0.3258	0.0000	0.0000	0.0000	26
Socialist	0.0000	0.0000	0.0000	0.0000	0.0000	26

Table 3 shows the firm-level (Panel A), country-year level (Panel B) and country-level variables (Panel C) for analysis. In Panel A, *FirmLeverage* is the ratio of firm loans to firm assets. *FAssets* represents total firm assets in US Dollars, and *FLoans* represents total firm loans in US dollars. *LogFAssets* is total assets in log form, while *Growth* is computed by examining the natural log of the increase in sales growth. *TanAssets* is the ratio of tangible assets to total assets, and *Age* is years since the firm incorporated. *ROA* is defined as the ratio of *EBITA* to *FAssets*. The *ZScore* calculates the number of standard deviations the firm is from bankruptcy and is calculated over a three-year window. It is defined as the sum of the average *ROA* and capital asset ratio divided by the standard deviation of *ROA*. The *ZScore* is the average(ROA_{t-2}, ROA_{t-1}, ROA_t) plus the average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by $\sigma(ROA_{t-2}, ROA_{t-1}, ROA_t)$. Panel B shows the country-year variables that represent depth of information sharing (*Depth*), inflation (*Inflation*), Real Per Capita GDP in log form (*LogGDPperCap*) as well as variables to proxy for the degree of enforcement for a given country year. These enforcement variables are from Kaufmann, Kray, and Mastruzzi, 2008 and represent control of corruption (*Corruption*), political stability (*Stability*), government effectiveness (*Effectiveness*), quality of regulation (*Regulation*), and rule of law (*Law*). Panel C shows the country-level creditor rights (*CRights*) variable and dummy variables indicating legal origin (*English*, *French*, *German*, *Scandinavian*, and *Socialist*). Variables are defined in Appendix C.

Table 4: Leverage Results

	Dependent Variable is Firm Leverage			
	(1)	(2)	(3)	(4)
CRights	0.0716***		0.0557***	0.0793***
	(0.00682)		(0.00780)	(0.0127)
Depth		0.0257***	0.0129***	0.0257***
		(0.00353)	(0.00350)	(0.00487)
CRights*Depth				-0.00991***
				(0.00306)
LogFAssets	0.0127***	0.0137***	0.0122***	0.0116***
	(0.00215)	(0.00210)	(0.00218)	(0.00219)
ROA	-0.383***	-0.384***	-0.377***	-0.375***
	(0.0276)	(0.0276)	(0.0273)	(0.0271)
TanAssets	0.220***	0.222***	0.217***	0.214***
	(0.0142)	(0.0145)	(0.0141)	(0.0142)
Growth	0.00531***	0.00570***	0.00538***	0.00525***
	(0.00117)	(0.00119)	(0.00118)	(0.00119)
Age	-0.00413***	-0.00416***	-0.00416***	-0.00415***
	(0.000323)	(0.000320)	(0.000322)	(0.000323)
LogGDPperCap	-0.143***	-0.0632***	-0.135***	-0.105***
	(0.0240)	(0.0211)	(0.0210)	(0.0226)
Inflation	-0.915*	-0.472	-0.841*	-1.078**
	(0.473)	(0.619)	(0.497)	(0.477)
Corruption	0.151***	0.142***	0.159***	0.149***
	(0.0289)	(0.0250)	(0.0264)	(0.0246)
Stability	0.00118	-0.0652***	-0.00624	-0.0109
	(0.0207)	(0.0189)	(0.0182)	(0.0185)
Effectiveness	-0.00683	0.0834**	0.0398	0.0441
	(0.0312)	(0.0352)	(0.0331)	(0.0329)
Regulation	-0.00114	-0.0288	-0.0210	-0.0221
	(0.0331)	(0.0358)	(0.0324)	(0.0327)
Law	0.00873	-0.0780*	-0.0195	-0.0108
	(0.0449)	(0.0409)	(0.0443)	(0.0413)
English	0.266***	0.383***	0.296***	0.398***
	(0.0298)	(0.0272)	(0.0298)	(0.0411)
French	0.309***	0.289***	0.336***	0.366***
	(0.0265)	(0.0268)	(0.0232)	(0.0278)
German	0.0415	0.143***	0.0803***	0.136***
	(0.0301)	(0.0293)	(0.0273)	(0.0353)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,646,779	5,646,779	5,646,779	5,646,779
R^2	0.237	0.232	0.239	0.241

Table 4 reports the OLS regression results for the dependent variable firm leverage (*FLeverage*), defined as the ratio of firm loans to firm assets. The sample consists of 1,877,901 private firms within twenty-six countries shown in Table 2. Columns 1-4 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level and year fixed effects. All independent firm-level and country-level variables are lagged by one year. Standard errors are adjusted for cluster effects at the country and year levels. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 5: Profit Results

	Dependent Variable is Firm ROA			
	(1)	(2)	(3)	(4)
CRights	-0.00682***		-0.00268***	-0.00514***
	(0.00107)		(0.000996)	(0.00132)
Depth		-0.00401***	-0.00341***	-0.00474***
		(0.000406)	(0.000426)	(0.000744)
CRights*Depth				0.00103***
				(0.000367)
LogFAssets	-0.00755***	-0.00750***	-0.00744***	-0.00738***
	(0.000594)	(0.000581)	(0.000586)	(0.000591)
TanAssets	-0.0306***	-0.0301***	-0.0300***	-0.0297***
	(0.00321)	(0.00318)	(0.00319)	(0.00321)
FLeverage	-0.0449***	-0.0446***	-0.0441***	-0.0438***
	(0.00148)	(0.00142)	(0.00144)	(0.00142)
Growth	0.00214***	0.00212***	0.00213***	0.00215***
	(0.000503)	(0.000501)	(0.000501)	(0.000502)
Age	0.000151***	0.000159***	0.000161***	0.000161***
	(0.0000437)	(0.0000433)	(0.0000433)	(0.0000432)
LogGDPperCap	-0.00119	-0.00682**	-0.00333	-0.00641*
	(0.00329)	(0.00284)	(0.00306)	(0.00338)
Inflation	0.0900	0.0529	0.0710	0.0959
	(0.0869)	(0.0650)	(0.0670)	(0.0685)
Corruption	-0.000456	-0.00168	-0.00256	-0.00163
	(0.00352)	(0.00363)	(0.00347)	(0.00352)
Stability	-0.00865***	-0.00387**	-0.00668***	-0.00620***
	(0.00225)	(0.00189)	(0.00197)	(0.00207)
Effectiveness	0.00971**	-0.00470	-0.00265	-0.00311
	(0.00488)	(0.00520)	(0.00512)	(0.00524)
Regulation	-0.0138***	-0.00819*	-0.00854*	-0.00842*
	(0.00492)	(0.00487)	(0.00482)	(0.00490)
Law	0.0174***	0.0276***	0.0248***	0.0239***
	(0.00607)	(0.00588)	(0.00585)	(0.00595)
English	0.0209***	0.00864***	0.0126***	0.00198
	(0.00372)	(0.00305)	(0.00331)	(0.00530)
French	-0.0254***	-0.0303***	-0.0327***	-0.0358***
	(0.00396)	(0.00365)	(0.00366)	(0.00382)
German	0.0132***	-0.0000745	0.00286	-0.00297
	(0.00359)	(0.00411)	(0.00417)	(0.00478)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,646,779	5,646,779	5,646,779	5,646,779
R^2	0.094	0.095	0.095	0.095

Table 5 reports the OLS regression results for the dependent variable firm profitability (ROA), defined as the ratio of $EBITA$ to $FAssets$. The sample consists of 1,877,901 private firms within twenty-six countries shown in Table 2. Columns 1-4 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level, and year fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 6: Risk Results

Dependent Variable is Firm Z-Score				
	(1)	(2)	(3)	(4)
CRights	1.016***		0.600***	1.281***
	(0.176)		(0.186)	(0.160)
Depth		0.479***	0.343***	0.712***
		(0.0723)	(0.0760)	(0.159)
CRights*Depth				-0.284***
				(0.0703)
LogFAssets	1.031***	1.035***	1.021***	1.005***
	(0.0540)	(0.0537)	(0.0533)	(0.0529)
TanAssets	3.056***	3.028***	3.008***	2.922***
	(0.347)	(0.343)	(0.343)	(0.338)
ROA	8.556***	8.642***	8.666***	8.699***
	(0.557)	(0.551)	(0.550)	(0.548)
FLeverage	-3.247***	-3.213***	-3.320***	-3.385***
	(0.372)	(0.371)	(0.374)	(0.376)
Growth	-0.784***	-0.779***	-0.781***	-0.785***
	(0.0628)	(0.0624)	(0.0624)	(0.0622)
Age	0.0125*	0.0120*	0.0116*	0.0116*
	(0.00697)	(0.00690)	(0.00696)	(0.00696)
LogGDPperCap	-2.678***	-1.682***	-2.462***	-1.610**
	(0.643)	(0.589)	(0.595)	(0.669)
Inflation	0.340	6.279	2.230	-4.647
	(12.02)	(12.76)	(12.11)	(12.38)
Corruption	0.337	0.352	0.548	0.294
	(0.847)	(0.798)	(0.819)	(0.790)
Stability	-0.899*	-1.725***	-1.096**	-1.229**
	(0.526)	(0.473)	(0.484)	(0.487)
Effectiveness	-0.116	1.585*	1.127	1.253
	(0.882)	(0.908)	(0.843)	(0.823)
Regulation	-5.561***	-6.169***	-6.090***	-6.124***
	(0.650)	(0.730)	(0.701)	(0.727)
Law	4.534***	3.161**	3.782**	4.030***
	(1.570)	(1.547)	(1.516)	(1.454)
English	-2.312***	-0.593	-1.480***	1.460
	(0.555)	(0.537)	(0.561)	(1.052)
French	4.122***	4.319***	4.857***	5.728***
	(0.699)	(0.698)	(0.699)	(0.723)
German	0.547	2.242***	1.584**	3.198***
	(0.744)	(0.709)	(0.691)	(0.918)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,646,779	5,646,779	5,646,779	5,646,779
R^2	0.076	0.076	0.076	0.077

Table 6 reports the OLS regression results for the dependent variable firm profitability (*ZScore*). The *ZScore* is the average(ROA_{t-2}, ROA_{t-1}, ROA_t) + average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by $\sigma(ROA_{t-2}$, ROA_{t-1}, $ROA_t)$. The sample consists of 1,877,901 private firms within twenty-six countries shown in Table 2. Columns 1-4 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level, and year fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 7: Small Firm Results, Top 10% Removed

	(1)	(2)	(3)	(4)
Dependent Variable is Firm Leverage				
CRights	0.0768***		0.0618***	0.0831***
	(0.00704)		(0.00836)	(0.0136)
Depth		0.0258***	0.0117***	0.0231***
		(0.00363)	(0.00357)	(0.00471)
CRights*Depth				-0.00894***
				(0.00318)
Panel C: Dependent Variable is Firm ROA				
CRights	-0.00811***		-0.00374***	-0.00647***
	(0.00112)		(0.00109)	(0.00143)
Depth		-0.00428***	-0.00344***	-0.00490***
		(0.000435)	(0.000464)	(0.000795)
CRights*Depth				0.00114***
				(0.000403)
Panel B: Dependent Variable is Firm Risk				
CRights	1.174***		0.719***	1.341***
	(0.189)		(0.195)	(0.176)
Depth		0.520***	0.358***	0.691***
		(0.0741)	(0.0747)	(0.167)
CRights*Depth				-0.260***
				(0.0771)
Firm-Level Controls	Yes	Yes	Yes	Yes
Country-Level Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,082,102	5,082,102	5,082,102	5,082,102

Table 7 reports the results for the 5,082,1020 firm-year observations that are left in the sample once the firms with the largest 10% of assets are dropped from the sample. Panel A reports the the coefficients on the creditor rights (*CRights*), depth of information sharing (*Depth*), and interaction (*CRights* $*$ *Depth*) for when firm leverage (*FLeverage*) is the dependent variable. The firm-level, country-level, and fixed effects are identical to those presented in Table 4 but are unreported. Panel B reports select coefficients when the dependent variable is firm profitability (*ROA*), and unreported controls are consistent with those presented in Table 5. The dependent variable in Panel C is Firm ZScore (*ZScore*). The *ZScore* is the average(ROA_{t-2}, ROA_{t-1}, ROA_t) + average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by $\sigma(ROA_{t-2}, ROA_{t-1}, ROA_t)$. The controls in Panel C are identical to those presented in Table 6. Columns 1-4 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level and year fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 8: Small Firm Results, Top 20% Removed

	(1)	(2)	(3)	(4)
Dependent Variable is Firm Leverage				
CRights	0.0818***		0.0681***	0.0907***
	(0.00700)		(0.00854)	(0.0138)
Depth		0.0258***	0.0101***	0.0216***
		(0.00369)	(0.00354)	(0.00463)
CRights*Depth				-0.00919***
				(0.00317)
Panel C: Dependent Variable is Firm ROA				
CRights	-0.00951***		-0.00478***	-0.00795***
	(0.00113)		(0.00117)	(0.00153)
Depth		-0.00460***	-0.00352***	-0.00512***
		(0.000459)	(0.000506)	(0.000854)
CRights*Depth				0.00129***
				(0.000436)
Panel B: Dependent Variable is Firm Risk				
CRights	1.285***		0.811***	1.426***
	(0.195)		(0.206)	(0.186)
Depth		0.537***	0.354***	0.666***
		(0.0749)	(0.0740)	(0.170)
CRights*Depth				-0.250***
				(0.0795)
Firm-Level Controls	Yes	Yes	Yes	Yes
Country-Level Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	4,517,423	4,517,423	4,517,423	4,517,423

Table 8 reports the results for the 4,517,423 firm-year observations that are left in the sample once the firms with the largest 20% of assets are dropped from the sample. Panel A reports the the coefficients on the creditor rights (*CRights*), depth of information sharing (*Depth*), and interaction (*CRights* $*$ *Depth*) for when firm leverage (*FLeverage*) is the dependent variable. The firm-level, country-level, and fixed effects are identical to those presented in Table 4 but are unreported. Panel B reports select coefficients when the dependent variable is firm profitability (*ROA*), and unreported controls are consistent with those presented in Table 5. The dependent variable in Panel C is Firm ZScore (*ZScore*). The *ZScore* is the average(ROA_{t-2}, ROA_{t-1}, ROA_t) + average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by σ(ROA_{t-2}, ROA_{t-1}, ROA_t). The controls in Panel C are identical to those presented in Table 6. Columns 1-4 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level and year fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 9: Stock Market Capitalization Robustness

	Leverage (1)	ROA (2)	ZScore (3)
CRights	0.0804***	-0.00548***	1.039***
	(0.0103)	(0.00130)	(0.156)
Depth	0.0209***	-0.00441***	0.811***
	(0.00444)	(0.000750)	(0.139)
CRights*Depth	-0.00915***	0.00105***	-0.258***
	(0.00268)	(0.000359)	(0.0608)
Stockmarketcap	-0.000872***	-0.0000373	0.0205**
	(0.000222)	(0.0000363)	(0.00889)
ROA	-0.402***		7.870***
	(0.0314)		(0.732)
FLeverage		-0.0449***	-4.419***
		(0.00157)	(0.424)
LogFAssets	0.00977***	-0.00771***	1.140***
	(0.00237)	(0.000720)	(0.0547)
TanAssets	0.252***	-0.0303***	4.017***
	(0.0160)	(0.00328)	(0.435)
Growth	0.00764***	0.00255***	-0.952***
	(0.00146)	(0.000639)	(0.0678)
Age	-0.00491***	0.000135**	0.0153
	(0.000329)	(0.0000608)	(0.00989)
LogGDPperCap	-0.0743***	-0.0207***	-1.450*
	(0.0252)	(0.00368)	(0.799)
Inflation	-1.904***	-0.0211	-9.694
	(0.389)	(0.0719)	(10.81)
Corruption	0.134***	0.00805*	-1.585
	(0.0334)	(0.00460)	(1.196)
Stability	-0.0507***	-0.00666**	-0.383
	(0.0175)	(0.00267)	(0.655)
Effectiveness	-0.00427	-0.00225	1.866**
	(0.0270)	(0.00479)	(0.917)
Regulation	-0.0978***	0.00420	-5.759***
	(0.0264)	(0.00514)	(1.001)
Law	0.103**	0.0166**	3.855**
	(0.0419)	(0.00685)	(1.758)
English	0.490***	-0.0144**	-0.410
	(0.0369)	(0.00651)	(1.115)
French	0.388***	-0.0467***	3.992***
	(0.0240)	(0.00398)	(0.704)
German	0.198***	-0.0201***	0.854
	(0.0291)	(0.00546)	(0.943)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	5,646,779	5,646,779	5,646,779
R^2	0.267	0.092	0.077

Table 9 reports the OLS regression results in Column 1 for the dependent variable firm leverage (*FLeverage*), defined as the ratio of firm loans to firm assets. Column 2 reports the results for the OLS regressions for where the dependent variable firm profitability (*ROA*), defined as the ratio of *EBITA* to *FAssets*. Column 3 indicates the results for the OLS regressions where the dependent variable is firm z-score (*ZScore*), defined as the average(ROA_{t-2}, ROA_{t-1}, ROA_t) + average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by $\sigma(ROA_{t-2}$, ROA_{t-1}, $ROA_t)$. Columns 1-3 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level, and year fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 10: Total Private Credit Robustness

	Leverage	ROA	ZScore
	(1)	(2)	(3)
CRights	0.0671***	-0.00461***	1.262***
	(0.0127)	(0.00135)	(0.177)
Depth	0.0174***	-0.00383***	0.886***
	(0.00450)	(0.000765)	(0.208)
CRights*Depth	-0.00770***	0.000910***	-0.307***
	(0.00270)	(0.000324)	(0.0879)
Privatecreditgdp	0.000827***	-0.000101***	-0.00981
	(0.000263)	(0.0000322)	(0.00696)
ROA	-0.396***		8.545***
	(0.0284)		(0.596)
FLeverage		-0.0433***	-3.306***
		(0.00140)	(0.384)
LogFAssets	0.0127***	-0.00722***	0.988***
	(0.00226)	(0.000611)	(0.0559)
TanAssets	0.220***	-0.0274***	2.956***
	(0.0145)	(0.00314)	(0.359)
Growth	0.00549***	0.00212***	-0.798***
	(0.00124)	(0.000508)	(0.0640)
Age	-0.00427***	0.000145***	0.0159**
	(0.000328)	(0.0000425)	(0.00717)
LogGDPperCap	-0.0712***	-0.0140***	-2.956***
	(0.0211)	(0.00352)	(0.669)
Inflation	-0.788	0.0660	-21.64*
	(0.534)	(0.0768)	(11.15)
Corruption	0.141***	0.000383	0.251
	(0.0245)	(0.00365)	(0.777)
Stability	0.0248	-0.00966***	-1.697**
	(0.0170)	(0.00233)	(0.658)
Effectiveness	0.0399	-0.00228	2.068***
	(0.0346)	(0.00507)	(0.773)
Regulation	-0.0389	-0.000768	-4.730***
	(0.0375)	(0.00705)	(0.971)
Law	-0.0382	0.0242***	3.549**
	(0.0390)	(0.00752)	(1.559)
English	0.370***	0.00632	2.515**
	(0.0368)	(0.00513)	(1.256)
French	0.342***	-0.0290***	6.925***
	(0.0279)	(0.00439)	(0.833)
German	0.165***	-0.00562	3.208***
	(0.0350)	(0.00448)	(0.928)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	5,646,779	5,646,779	5,646,779
R^2	0.236	0.093	0.077

Table 10 reports the OLS regression results in Column 1 for the dependent variable firm leverage (*FLeverage*), defined as the ratio of firm loans to firm assets. Column 2 reports the results for the OLS regressions for where the dependent variable firm profitability (*ROA*), defined as the ratio of *EBITA* to *FAssets*. Column 3 indicates the results for the OLS regressions where the dependent variable is firm Z-Score (*ZScore*), defined as the average(ROA_{t-2}, ROA_{t-1}, ROA_t) + average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by σ(ROA_{t-2}, ROA_{t-1}, ROA_t). Columns 1-3 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level, and year fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 11: Country Fixed Effects Robustness

	Leverage (1)	ROA (2)	ZScore (3)
Depth	0.00659**	-0.00241***	0.299***
	(0.00254)	(0.000568)	(0.0740)
CRights*Depth	-0.00425***	0.000563**	-0.170***
	(0.00123)	(0.000258)	(0.0321)
LogFAssets	0.0132***	-0.00743***	0.963***
	(0.00231)	(0.000623)	(0.0551)
ROA	-0.390***		8.536***
	(0.0285)		(0.600)
FLeverage		-0.0436***	-3.576***
		(0.00145)	(0.389)
TanAssets	0.217***	-0.0265***	2.945***
	(0.0146)	(0.00310)	(0.364)
Growth	0.00527***	0.00210***	-0.798***
	(0.00121)	(0.000508)	(0.0634)
Age	-0.00423***	0.000139***	0.0135*
	(0.000331)	(0.0000427)	(0.00706)
LogGDPperCap	0.0494	-0.0128	-1.163
	(0.0353)	(0.00829)	(0.858)
Inflation	-0.868**	0.101*	-6.048
	(0.383)	(0.0518)	(7.862)
Privatecreditgdp	0.000659**	0.0000482	-0.0221***
	(0.000260)	(0.0000531)	(0.00651)
Corruption	0.0613**	-0.00885**	1.155*
	(0.0280)	(0.00436)	(0.662)
Stability	0.0163	-0.00435	1.129**
	(0.0199)	(0.00335)	(0.486)
Effectiveness	-0.00874	-0.00559	0.728
	(0.0413)	(0.00487)	(0.820)
Regulation	-0.0309	0.0141***	0.166
	(0.0278)	(0.00446)	(0.689)
Law	-0.0323	-0.000548	-1.214
	(0.0474)	(0.00721)	(0.969)
English	0.0871	0.0113	-0.672
	(0.379)	(.)	(6.428)
French	0.0218	-0.00449	1.695
	(0.414)	(.)	(7.289)
German	-0.0149	-0.00696	1.710
	(0.983)	(0.238)	(19.59)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
N	5,646,779	5,646,779	5,646,779
R^2	0.259	0.095	0.084

Table 11 reports the OLS regression results in Column 1 for the dependent variable firm leverage (*FLeverage*), defined as the ratio of firm loans to firm assets. Column 2 reports the results for the OLS regressions for where the dependent variable firm profitability (*ROA*), defined as the ratio of *EBITA* to *FAssets*. Column 3 indicates the results for the OLS regressions where the dependent variable is firm Z-Score (*ZScore*), defined as the average(ROA_{t-2}, ROA_{t-1}, ROA_t) + average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by $\sigma(ROA_{t-2}, ROA_{t-1}, ROA_t)$. Columns 1-3 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level, year fixed effects, and country fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 12: Even Sample Robustness

	Leverage (1)	ROA (2)	ZScore (3)
CRights	0.107***	-0.00362**	0.906***
	(0.0116)	(0.00175)	(0.194)
Depth	0.0361***	-0.00484***	0.841***
	(0.00503)	(0.000891)	(0.121)
CRights*Depth	-0.0182***	0.00162***	-0.274***
	(0.00241)	(0.000392)	(0.0499)
ROA	-0.393***		5.399***
	(0.0309)		(0.527)
LogFAssets		-0.0130***	0.933***
		(0.000750)	(0.0659)
TanAssets	0.181***	-0.0377***	3.767***
	(0.0123)	(0.00223)	(0.316)
Growth	0.00286**	0.00160***	-0.802***
	(0.00119)	(0.000574)	(0.0427)
Age	-0.00383***	0.000102*	0.0841***
	(0.000336)	(0.0000600)	(0.00987)
LogGDPperCap	-0.104***	-0.0248***	0.0563
	(0.0197)	(0.00325)	(0.510)
Inflation	-1.433***	-0.0321	-0.00806
	(0.398)	(0.0712)	(8.346)
Corruption	0.125***	-0.00582	-1.365*
	(0.0294)	(0.00444)	(0.791)
Stability	-0.0223	-0.00490*	-3.114***
	(0.0185)	(0.00292)	(0.510)
Effectiveness	0.00617	-0.00897	2.710***
	(0.0358)	(0.00611)	(0.875)
Regulation	0.000277	0.0182***	-7.824***
	(0.0362)	(0.00523)	(0.736)
Law	0.0702*	0.0257***	4.429***
	(0.0411)	(0.00711)	(1.279)
English	0.392***	-0.0233***	0.427
	(0.0333)	(0.00478)	(0.721)
French	0.303***	-0.0332***	4.411***
	(0.0349)	(0.00437)	(0.647)
German	0.133***	-0.0222***	2.584***
	(0.0351)	(0.00533)	(0.684)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	131,117	131,117	131,117
R^2	0.232	0.081	0.107

Table 12 reports the robustness results for the group of firms that was randomly selected from the full sample based on their size categories. The OLS regression results in Column 1 for the dependent variable firm leverage (*FLeverage*), defined as the ratio of firm loans to firm assets. Column 2 reports the results for the OLS regressions for where the dependent variable firm profitability (*ROA*), defined as the ratio of *EBITA* to *FAssets*. Column 3 indicates the results for the OLS regressions where the dependent variable is firm z-score (*ZScore*), defined as the average(ROA_{t-2}, ROA_{t-1}, ROA_t) + average(CAR_{t-2}, CAR_{t-1}, CAR_t) divided by $\sigma(ROA_{t-2}, ROA_{t-1}, ROA_t)$. Columns 1-3 report full sample OLS regression results, accounting for industry fixed effects at the three-digit SIC level, and year fixed effects. Standard errors are adjusted for cluster effects at the country and year levels. All independent firm-level and country-level variables are lagged by one year. Variables are defined in Appendix C. Significance is denoted by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

C Variable Descriptions

Variable	Definition	Source
Corruption	This indicator measures the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Higher values indicate more control over corruption.	Kaufmann, Kraay, and Mastruzzi (2008)
CRights	An index aggregating the four components of the creditor rights as originally proposed by La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998) and extended by DMS. This index ranges from zero to four where higher values indicate greater levels of investor protection. The four components of the creditor rights index are the variables *Restrictions*, *NoAutostay*, *Secured*, and *Manages*. The 2003 value is used.	DMS
Depth	Depth of Information Sharing. An index that measures the information sharing within an economy. A value of one is added to the index when each of the following characteristics is present in either a public registry or private bureau. The index ranges from 0 to 6, where where higher values indicates greater information sharing. There are six components of this index. 1) Both positive information and negative information are distributed 2) Data on both firms and individual borrowers are distributed. 3) Data from retailers, trade creditors, or utilities, as well as from financial institutions are distributed 4) More than two years of historical data are distributed. 5) Data are collected on all loans of value 1% of income per capita. 6) Laws provide for borrowers rights to inspect their own data.	World Bank
EBITDA	Earnings before interest, taxes, depreciation, and amortization	
Effectiveness	Government Effectiveness. This variable indicates the quality of public services, the quality of the civil service, and the degree of its independence from political pressures, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Higher values mean higher quality of public and civil service.	Kaufmann, Kraay, and Mastruzzi (2008)
FAssets	Total firm assets. The data are winsorized at 1% in each tail and reported in U.S. dollars.	Amadeus
FLeverage	Firm leverage. Ratio of firm loans to firm assets truncated at 1 and winsorized at 1% in each tail	Amadeus
FDebt	Firm Debt. Sum of on-current liabilities in long-term debt and current liabilities in loans (in US dollars) winsorized at 1% in each tail	Amadeus
Growth	Sales growth. Log increase in sales winsorized at 1% in each tail	Amadeus
Inflation	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used, and the data are winsorized at 1% in each tail.	World Bank

Law	Rule of law measures the extent to which agents abide by and have confidence in the rules of society. In particular, this measure captures the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence. Higher values indicate stronger law and order.	Kaufmann, Kraay, and Mastruzzi (2008)
Legal Origin	Dummy variables for English, German, French, Scandinavian, or Socialist legal origin	DMS
LogFAssets	Log total firm assets (in US dollars) winsorized at 1% in each tail	Amadeus
LogGDPperCap	Log Real Per Capita GDP	World Bank
Manages	Management Removal. One component of the creditor rights index that takes the value of one if during the reorganization of a business, an official is appointed by the court, or by the creditors, takes responsibility for operating the business. The firm management does not retain administration of its property pending the resolution of reorganization. The dummy variable takes a value of one if the firm does not keep the administration of its property pending the resolution of the reorganization process.	DMS
NoAutostay	One component of the creditor rights index that equals one if the reorganization process does not impose an automatic stay on assets of the firm upon filing the reorganization petition and creditors are able to seize their collateral after the reorganization petition is approved. This variable is zero otherwise.	DMS
Privatecreditgdp	Domestic credit to private sector (% of GDP)	World Bank
Regulation	This variable represents the ability of the government to formulate and implement sound policies and regulations that permit and promote market competition and private-sector development. Higher values mean higher quality of regulation	Kaufmann, Kraay, and Mastruzzi (2008)
Reorg	Restrictions on Reorganization. This component of the creditor rights index has a value of 1 if the reorganization procedure imposes restrictions such as creditor's consent or minimum dividend for a debtor to be able to file for reorganization. If a country does not have such a restriction, this component takes a value of zero.	DMS
ROA	Profit. EBITDA/Total Assets winsorized at 5% in each tail	Amadeus
Secured	One component of the creditor rights index that takes a value of one if secured creditors are ranked first in the distribution of the proceeds that result from the disposition of the assets of a bankrupt firm, opposed to other creditors such as employees or government. If non-secured creditors such as the government or employees are given priority, this component takes a value of zero.	DMS
Stability	Government Stability. This indicator measures the perceptions of the likelihood that the government will be overthrown or destabilized by violent or unconstitutional methods, including violence or terrorism. Higher values mean more stable environments.	Kaufmann, Kraay, and Mastruzzi (2008)
Stockmarketcap	Stock Market capitalization of listed domestic companies (% of GDP)	World Bank
TanAssets	Fixed assets scaled by total assets winsorized at 1% in each tail	
Zscore	Distance to Default. Indicates the number of standard deviations that the firm is away from bankruptcy where higher values indicate the that firm is less risky. The z-score numerator is equal to the average ROA of the preceding three years plus the average ratio of capital to assets over the preceding years. The denominator is the standard deviation of ROA for the preceding three years.	Amadeus

C Online Appendix

C.1 The Role of Collateral

To consider collateral, assume that a good firm's profit is $\Pi_G = I\,Y(I) - R\,(I - A) + B$. Good firms do not default. Their collateral is never liquidated, so they do not bear any liquidation costs. Hence, they will pledge the available collateral in full. Bank 1's profit function becomes

$$\begin{aligned} \Pi_1 &= \gamma\,(R_1 - r)\,(I - A) \\ &\quad + (1 - q_1)\,[(1-\gamma) + (1-\gamma)\,q_2\,(1-s)]\,[(\lambda - r)\,(I - A) + \beta\,B] \\ &\quad - \big(1 + (1-\gamma)\,q_2\,(1-s)\big)\,(I - A)\,c(q_1). \end{aligned} \tag{1}$$

The return from bad firms increases with some immediate consequences. Banks suffer less from a default, so they screen less. Their costs decrease, so loan rates will fall. As a consequence, leverage will increase, and profitability will drop. Because of an argument parallel to that in the main paper, the effect on risk is ambiguous. If the reduction in screening is sharp, risk may increase. Typically, however, the direct effect will dominate the indirect effect, and risk will fall. In our numerical simulations, this was the case for quadratic cost functions $c(q)$.

With collateral, our predictions and hypotheses remain intact. In addition, the higher the level of collateral, the smaller the loss given default from bad firms becomes. As a consequence, the effect of creditor rights and information sharing would diminish. Hence, all three, creditor rights, information sharing, and collateral, have complementary effects.

C.2 General Screening Structure

For exposition, let us consider the other extreme, which is a model with only false negatives but no false positives. If the bank spends $C(q)$, a good applicant sends a positives signal with probability q. A bad applicant never sends a positive signal. If there is no positive signal, the applicant could still be good or bad. Then, depending on the fraction of good firms γ, the NPVs of good and bad projects, and the shape of the screening cost function $C(q)$, there is a regime where banks offer loans only to firms with a positive screening signal and a regime where they offer loans to *all* firms, independent from the screening result, only at different prices. Let us consider the first regime. Let us also assume that also good loans can default. Otherwise creditor rights would have no impact on the equilibrium because loans would never default.

In this model, an increase in creditor rights λ would directly raise bank profits per loan. This would mean that the bank would like to increase volume, thus lowering loan rates, which would lead to increase leverage and reduced profitability. The screening intensity would decrease, but the probability of default would not be affected because all bad loans would be screened out. The loss given default $1 - \lambda$ would obviously decrease. These effects broadly go into the same direction as in our model.

An increase in information sharing s would lead to fewer bad firms in the pool of applicants. As a consequence, banks would screen more. In the extreme case of no good firms in the pool, banks would not screen at all; with more good, or less bad, firms in the pool, banks screen more. Screening costs per loan would increase, which would raise loan rates in equilibrium. This would lead to lower leverage and higher profitability. The probability of default would not be affected because all bad loans would still be screened out. Also the loss given default $1 - \lambda$ would remain constant, hence risk would not change at all. Summing up, these effects broadly go into the opposite direction of those in our model. Hence, we postulate that in a model with both false positives and false negatives, the comparative statics with respect to changes in creditor rights would remain unchanged. Those with respect to information sharing would depend on the relative effects of screening on the probabilities of false positives and false negatives.

C.3 Endogenous Intensity of Information Sharing

We have argued in the discussion of the model that ex interim, banks do not have incentives to share more or less information. Therefore, any value of s can be an equilibrium outcome, and consequently, one can consistently assume it to be endogenous. In effect, this means that banks coordinate on an exogenous focal point. However, if banks could decide ex ante how much information to share, they would choose $s = 1$, because bank profits increase in information sharing, see Figure 1. Therefore, we could not make any predictions about the consequences of changes in information sharing.

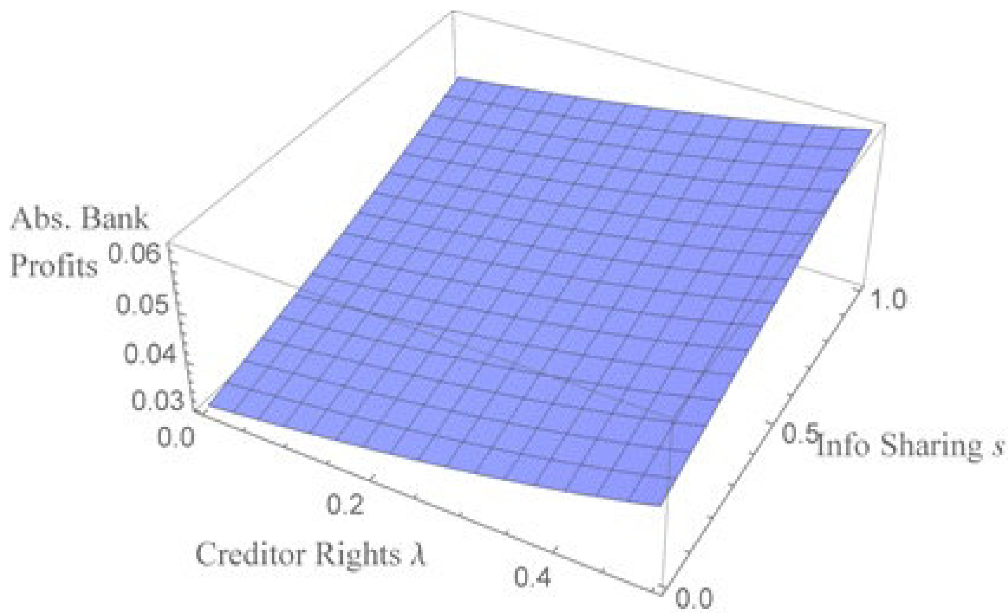

Figure 1: Bank Profits

Let us therefore assume that information sharing comes at a cost $C(s)$, for example the cost of generating and maintaining the credit registry. If $C'(s) > 0$, $C''(s) > 0$, $C'(0) = 0$ and $C'(1) = \infty$, then the equilibrium level of information sharing is finite. The first-order condition would be $\partial\Pi/\partial s - C'(s) = 0$. In the figure, we see that $\partial\Pi/\partial s > 0$, such that this condition has a solution.

The endogenous level s^* of information sharing depends on all other parameters, most prominently on creditor rights. Using the implicit function theorem, the comparative static is

$$s'(\lambda) = -\frac{\partial^2 \Pi / (\partial \lambda \partial s)}{\partial^2 \Pi / (\partial s)^2 - C''(s)}.$$

Here, the denominator is negative if the choice of s is optimal, and the numerator is negative because s and λ are substitutes. Consequently, $s'(\lambda) < 0$. This means that in economies with strong creditor rights, a lower level of information will be chosen endogenously.