PhD THESIS DECLARATION

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Abstract

I investigate some of the consequences of the information asymmetry between lenders and borrowers on the behaviors of both banks and borrowing firms. The main findings are: (i) despite banks' private information over the borrower, banks' loan decision outcome—measured as the proportion of non-performing loans and loan mispricing—is a function of the public information contained in borrowers' financial statements; (ii) borrowing companies that enter into intense relationship with banks adapt their existing corporate governance structures to minimize banks' risk of expropriation; (iii) some features of debt contracts—namely, covenants and pricing provisions—provide different risk-taking incentive to managers of borrowing companies. Overall, this work highlights unexplored consequences of information asymmetry and accounting information in the private debt market.

Introduction

The subject of my research is the information asymmetries between borrowers and lenders, especially how these asymmetries affect the decision process of banks and borrowing firms. In the first chapter, *Borrowers' Accounting Information and Banks' Lending Decisions*, I explore whether and to what extent the information conveyed in borrowers' financial statements influences banks' loan decision outcomes, measured both as the proportion of non-performing loans and as loan mispricing. Previous work shows that banks use the information contained in the borrower accounting system to write debt contracts. However, little is known on the effects of such information on the way banks screen and monitor their borrowers and, ultimately, on their lending decisions, especially in light of the private information banks have thanks to their personal relation with their borrowers. Using an international sample of banks and loan contracts, I find that banks report lower proportions of non-performing loans and less mispricing when borrowers prepare their financial statements according to accounting rules that rely less on fair value accounting and that, in general, provide managers with less discretion. The evidence collected is consistent with the idea that borrowers' public accounting numbers are a non-trivial information element of banks' information set, providing a link between borrowers' accounting characteristics and banks' loan decision outcomes.

While the first chapter investigates the effects of borrower-lender information asymmetry on banks, the second and third chapter focus on whether and to what extent borrowers' behaviors are affected. In my second chapter (a joint work with Richard Lambert and Jason Xiao, "*Bank Relations and Borrower Corporate Governance Structures*"), we investigate whether borrowing firms entering into intense relationships with banks adapt their corporate governance structures to minimize banks' risk of expropriation. We find that firms engaging in intense relationships with banks are more likely to become entrenched, to include bank-employees among their board of directors, and to increase the information asymmetry with other capital providers. On the other hand, those firms also provide their CEO with more risk-taking incentives, which both accommodates shareholders' lower risk aversion and increases the likelihood of future lending from the bank.

How such risk-taking incentives interact with debt contract provisions is the subject of the third chapter of my thesis (a joint work with Christopher Armstrong and David Tsui, *Debt Contracting and Risk Taking Incentives*”). Examining a comprehensive set of loan contracts with different types of covenants and performance pricing provisions, we find that different types of provisions have different effects on operating risk, with some provisions being positively associated with the levels of operating risk. Those provisions are also negatively associated with financial risk, supporting the notion that different types of covenants address different agency conflicts (e.g., asset substitution vs. claim dilution). Both adverse selection and moral hazard help explain the results.

Chapter 1

Borrowers' Accounting Information and Banks' Lending Decisions

"Without restricting the nature of the decision problem faced or the nature of the controlling preferences or beliefs, we simply cannot guarantee that any set of standards will single out the most preferred accounting alternative." (Demski 1973)

1. Introduction

In this chapter, I study whether and to what extent borrowers' accounting information affects the quality of the lending decisions made by banks, defined in terms of both banks' non-performing loans (NPLs) and the inability to price loans according to future borrower performance (mispricing).[1] Although a vast literature in accounting investigates how debt contracts are shaped according to the characteristics of borrowers' financial statements, there is still little evidence on the economic consequences of borrowers' public information for lenders.[2] On the one hand, borrowers' reporting choices may impact banks' screening and monitoring activities and affect the quality of lending decisions. On the other hand, banks can use the personal relation with their borrower to collect additional private information and complement or substitute existing accounting numbers, leaving the level of NPLs and mispricing independent of the accounting system.

Banks use borrower public information both *ex ante*, to screen their borrowers through ratio analysis or more sophisticated models, and *ex post*, to monitor them after the loan is granted through accounting covenants.[3] If the accounting numbers are perceived as not sufficiently informative, banks may integrate them, for example, by engaging in private conversations with the borrower chief financial officer or requiring additional details such as reconciliations or item breakdowns. However, collecting private information requires

[1] NPLs are loans that have a low probability of being collected. Usually, loans are classified as non-performing when borrowers fail to pay loan installments for more than 90 days, although the specific criteria vary by country.
[2] Armstrong et al. (2010) provide a recent literature review on the role of accounting information in debt contracts.
[3] The use of ratio analysis as a mandatory step in the evaluation of loan requests has been confirmed in private conversations with loan officers. Many of the ratios used in the screening process are based on the items on which accounting covenants are based, such as leverage and interest coverage.

additional time and effort, which increase bank screening and monitoring costs. Moreover, information obtained privately is less verifiable since it is not under the scrutiny of external entities such as auditors and may be of lower quality (Minnis 2011). On the one hand, if integrating the accounting numbers in the financial statements requires only additional effort but provides information of the same quality, banks will charge higher rates to cover the additional costs but will maintain the same quality in their lending decisions (i.e., same NPLs and mispricing). On the other hand, if the numbers privately collected are less informative, banks will still apply higher interest rates but screening and monitoring will be less effective, increasing reported NPLs and loan mispricing.

To test the above predictions, I examine banks' decisions under different borrower accounting systems and determine whether NPLs and loan mispricing vary according to their characteristics. Prior studies argue that systems reporting the lower bound of firm accounting numbers are more informative to lenders than systems relying on fair value (FV), which report more timely gains but also more volatile net assets and earnings, and give borrowers higher measurement discretion.[4] Consistent with this view, under the latter set of accounting systems, accounting numbers have been shown to be less informative for lenders and less often included in debt covenants (Demerjian 2011; Ball et al. 2013). Therefore, if banks cannot completely offset the higher information asymmetry using private information, I expect to observe higher values of NPLs and loan mispricing among banks operating in more "FV-oriented" or, in general, in accounting systems providing managers with more discretion in the measurement of firms' assets.[5]

Using an international sample of banks and loan contracts from 32 countries, I start my analysis by exploring any association between countries' use of FV-oriented accounting rules and NPL levels, after controlling for enforcement, macroeconomic, and bank characteristics. The use of banks from different countries provides enough variation in accounting systems to investigate the association between NPLs and borrower accounting numbers without necessarily knowing the identity of the banks' clients.[6] To overcome possible endogeneity concerns, I then switch to dynamic identification and measure the quality of banks' lending decisions around a variation in national accounting rules provided by the adoption of the

[4] See, for example, Watts (2003), Beatty et al. (2008), and Zhang (2008).
[5] For brevity, "FV-oriented" accounting systems.
[6] Subsequent tests also match lenders with their borrowers.

International Financial Reporting Standards (IFRS).[7] Under IFRS, borrower assets are more volatile and managers are given greater measurement discretion, especially compared to more conservative systems such as those of continental Europe prior to IFRS adoption. [8] As discussed, these features characterize FV-oriented accounting systems and fail to satisfy the information demand of lenders. In line with IFRS providing less useful information for lenders, Ball et al. (2013) report a sharp decline in the use of accounting covenants after their adoption.[9]

To obtain a cleaner identification strategy, on the one hand, I measure NPLs using banks' unconsolidated financial statements prepared according to local Generally Accepted Accounting Principles (GAAP) even after the adoption of IFRS, which prevents NPLs from being affected by changes introduced by the new standards.[10] On the other hand, to limit the effects of the financial crisis and other concurrent events (e.g., the European Capital Directive),[11] I measure banks' decisions in the years 2002–2007.[12] I also use an alternative within-country control group consisting of private companies and other cross-sectional tests to avoid confounding effects (e.g., changes in enforcement levels).

The results show that bank NPLs and loan mispricing are systematically lower under accounting systems that rely less on FV accounting. In the cross section, moving one standard deviation closer to countries with greater use of conservative accounting systems corresponds to a 0.22 standard deviation reduction in banks' NPLs. After the adoption of IFRS, banks in IFRS countries, on average, report an unconditional 31% increase in NPLs and a 34% increase compared to banks in non-IFRS countries and conditional on other controls.[13] Moreover, the

[7] IFRS represent an interesting research setting, since their adoption was largely exogenous and many *but not all* countries adopted IFRS, allowing a quasi-natural experiment design that better addresses endogeneity concerns. Moreover, within each adopting country, not all firms were allowed to switch to IFRS, which leaves an alternative control group to find complementary evidence that is robust to concurrent country-level changes that may have taken place around IFRS adoption.

[8] Hung and Subramanyam (2007) compare the reconciliation values between IFRS and German GAAP and find higher average values and standard deviations of net assets, while Horton and Serafeim (2010) find no significant difference in the United Kingdom, which is suggestive of more conservative GAAP (such as the German ones) experiencing greater variations. In my sample, the average change in the mean and standard deviation of borrowing firms' total assets are 11% and 33%, after firms adopt IFRS.

[9] In addition, IFRS have generally been associated with an overall increase in transparency, which may create a separating equilibrium among borrowers and banks may be left to contract with underperforming borrowers. I address the issue further in later tests and show that this is not the case.

[10] The use of unconsolidated financial statements also decreases the impact of cross-country lending activity. See Section 4.1.1.

[11] The European Capital Directive is related to the adoption of Basel II, see Section 3.

[12] I use the years 2000–2009 as a robustness check.

[13] To provide some perspective on the magnitude of these numbers, the increase in NPLs during the financial crisis is almost four times larger.

increase in NPLs is greater among countries that used less FV accounting and more managerial discretion prior to IFRS adoption, and in which firms' assets increased the most after the adoption of IFRS. Further tests reveal that NPLs are an increasing function of the number and amount of loans contracted with borrowing companies using IFRS (hereafter IFRS borrowers) and are clustered among banks that are less familiar with the new standards.

The results on loan mispricing confirm the evidence obtained using NPLs: After IFRS adoption, banks charge on average 50 basis points more to outperforming IFRS borrowers but lower or the same rates to underperforming IFRS borrowers, which is consistent with underperforming borrowers extracting an economic rent from outperforming borrowers due to higher information asymmetry. Moreover, under IFRS, loan interest rates exhibit a 29% drop in dispersion, which is also consistent with higher borrower–lender information asymmetry and banks' increased pooling behavior. Again, the effects are stronger among countries with less FV-oriented systems prior to IFRS adoption. Finally, I find that the average loan spread increases under IFRS of about 40 basis points, which is consistent with banks relying more on price protection.[14] Jointly considered, higher interest spreads, higher proportions of NPLs, and increased mispricing indicate that borrowers' accounting numbers are important elements of bank screening and monitoring activities and that banks can only partially offset the effects of reporting choices that fail to meet their information needs.

The use of two different datasets—bank-level data for NPLs and loan contract-level data for mispricing—and measuring the quality of bank lending decisions from different angles is important because it allows to address measurement concerns and to rule out alternative explanations. For example, banks may shift the composition of their loan portfolio over time and start contracting with riskier borrowers. Banks may also face a "lemons problem" (Akerlof 1970) if more transparent accounting standards allow more creditworthy firms to be financed in the equity markets and thus leave the debt market. Both alternative explanations would account for the rise in NPLs and the average increase in interest rates. They fail, however, to explain the mispricing results, which are consistent with an increase in information asymmetry between borrowers and lenders.

The paper contributes to the literature in several ways. First, it provides empirical evidence on the relation between borrowers' accounting systems and bank NPLs and mispricing

[14] Similar results are found by Ball et al. (2014) and Chen et al. (2013).

behavior. The findings support the idea that borrowers' public information is not completely subsumed by private information available to banks (Bushman et al. 2004), nor can it be fully substituted by contractual adjustments (e.g., Beatty et al. 2008), given that banks contracting with borrowers using specific sets of accounting rules systematically report more NPLs and mispricing. Banks play an important welfare role in promoting economic growth by selecting creditworthy projects and limiting resources wasted on undeserving ones (e.g., Jayaratne and Strahan 1996). Hence, understanding which accounting regime allows banks to achieve more efficient lending decisions seems useful for a variety of subjects, including policy makers.

My findings also contribute to the ongoing debate on the benefits of FV accounting. Many studies claim that systems relying more on lower of cost or market and less on FV are considered to decrease lenders' information risk by increasing the financial reporting system sensitivity to low states of the world (e.g., Watts 2003). Others, however, note that FV does not necessarily provide less information on losses, but it does provide more precise information on gains, which begs the question of why lenders should prefer biased information at all (Guay and Verrecchia 2006). My results add to this debate by showing that banks make more efficient loan decisions when borrowers use less FV-oriented accounting systems.

Finally, this paper relates to the recent studies evaluating the consequences of IFRS for debt markets: Under the new standards, lenders rely less on covenants computed using only accounting information (Ball et al. 2013), charge higher interest rates, and use more stringent contractual provisions (Chen et al. 2013). These results suggest that a set of standards meant to be beneficial for a large range of financial statement users, including banks,[15] may have only benefited a specific set of users, namely, equity holders.[16] This contrasting effect of IFRS on debt and equity markets likely depends on the different information needs of shareholders and debtholders, which reminds one of the impossibility of normative accounting standards (Demski 1973).

The remainder of the paper proceeds as follows: Section 2 discusses the literature and develops the hypotheses, Section 3 outlines the empirical research design, Section 4 describes

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[15] According to the International Accounting Standards Board (IASB), "The objective of general purpose financial reporting is to provide financial information about the reporting entity that is useful to existing and potential investors, *lenders* and other creditors in taking decisions about providing resources to the entity" (IFRS 2012, Conceptual Framework, OB2, emphasis added).

[16] For positive results of IFRS on equity markets see, for example, Barth et al. (2008) and Landsman et al. (2012). For recent works questioning the effect of IFRS, see Christensen et al. (2013).

the samples, and Sections 5 and 6 illustrate the results of the empirical tests. Section 7 concludes the paper.

2. Literature review and hypothesis development

2.1. Literature review

Although the results of theoretical works are mixed,[17] empirical studies indicate that lenders prefer accounting systems that report the earnings and assets of borrowing firms conservatively. Accounting conservatism is found to be negatively associated with the cost of debt (Ahmed et al. 2002; Zhang 2008), with information asymmetry in the secondary loan market (Wittenberg-Moerman 2008), the use of accounting covenants (Nikolaev 2010),[18] and inversely related to more timely control rights transfer (Zhang 2008) and borrower recovery rates (Carrizosa and Ryan 2013; Donovan et al. 2013). These studies rely on the notion that conservative accounting systems have more stringent verification standards for the lower bound of assets and cumulative earnings distribution, limiting the risk of overstatement (Watts 2003). Consistent with these studies, those of Demerjian (2011) and Ball et al. (2013) show that accounting systems that rely more on FV and allow greater measurement discretion to borrowers provide accounting numbers that are less informative for lenders and which are less likely to be used in debt covenants.

2.1.1. IFRS and FV accounting

Specifically, Ball et al. (2013) find that lenders rely less on accounting-based covenants after the adoption of IFRS. They argue that IFRS significantly increased the use of FV accounting, which makes accounting numbers less informative for lenders for a number of

[17] Göx and Wagenhofer (2009) show that a system that recognizes impairment losses but no unrealized gains (i.e., not FV) represents the optimal accounting system for borrowers, since it "undermines the firm's *ex ante* interest in reporting favorable asset values for convincing the lender to fund the project" (p. 9). Guay and Verrecchia (2006) note that FV accounting does not necessarily provide less information on losses, but it does provide more precise information on gains, which questions why lenders should have a preference for biased information after all. Gigler et al. (2009) show that debt contracts are less efficient under conservative accounting systems, while Beyer (2012) finds that historical cost accounting is more informative than FV if the decision problem at hand involves knowing whether any of the borrower's assets dropped in value and the accounting system reports aggregated assets values.

[18] On the same point, Tan (2013) shows that when lenders have control rights, such as after a covenant violation, borrowing firms in breach of their contracts introduce higher conservatism in their financial statements.

reasons, such as the higher transitory shocks in earnings, the greater managerial discretion in providing estimates, and the possibility of measuring firm liabilities at FV.[19] IFRS require or allow FV measurements in many accounting items, such as property, plant, and equipment (PPE, IAS 16), investment properties (IAS 40), share-based payments (IFRS 2), business combinations (IFRS 3), and financial instruments (IAS 39 and IFRS 9). Practitioners agree that IFRS substantially increased the amount of FV,[20] although there is limited evidence of the extent of FV use in actuality.

Christensen and Nikolaev (2013) note that few companies in Germany and the United Kingdom use FV to report their PPE (3%) and investment properties (46%) when presented with a choice. However, as mentioned, those are not the only accounting items recognized at FV under IFRS. For instance, business combinations (IFRS 3) represent another potentially important source of FV accounting (and managerial discretion) as the acquired assets and liabilities, together with any goodwill and other intangibles, are recognized at FV (IFRS 3). IFRS 3 is also applied to consolidation accounting (IAS 27 and IFRS 10), which means that every time companies acquire a controlling interest in another entity, the entity assets and liabilities have to be incorporated into the group financial statements at their FV.[21]

If more FV accounting is used, firms' assets should present higher mean and standard deviations, given that they are no longer recognized according to the conservative lower of cost or market principle. Consistent with this view, Hung and Subramanyam (2007) analyze the reconciliation statements of German firms during the transition to IFRS and report that under IFRS firms significantly increased their total and net asset values, together with their standard deviation. Horton and Serafeim (2010) show that goodwill recognition increases for firms in

[19] Many models that banks apply to evaluate borrower risk are based on the face value of borrower debt, as, for example, Merton's (1974) distance to default model.
[20] Deloitte (2012) notes how "fair value measurement and disclosures is taking on increased importance as the IASB continues to require recognition and measurement at fair value in the financial statements in more and more situations." Similarly, PricewaterhouseCoopers observes how "accounting standard setters continue to turn to fair value as a relevant measure of assets and liabilities for financial reporting purposes" (available at http://www.pwc.com/us/en/audit-assurance-services/accounting-advisory/fair-value-assessments.jhtml) and Ernst & Young reports that "a substantial portion of a reporting entity's assets and liabilities will be stated in the balance sheet at 'fair value'" (available at https://www2.eycom.ch/publications/items/ifrs/single/200506_fair_value/en.pdf).
[21] To facilitate the first-time adoption of IFRS, IFRS 1, par. C1, allows companies discretion on whether to retrospectively apply IFRS 3 for business combinations prior to the adoption year. Given the non-negligible costs of retrospective adoption, of IFRS 3, it is likely that only the assets and liabilities of those subsidiaries consolidated around the adoption year are recognized at FV.

the United Kingdom but report roughly the same or slightly lower net assets, which is consistent with the higher use of FV under the UK GAAP compared to German GAAP, pre-IFRS. Those studies looked at the reconciliations between local GAAP and IFRS in the cross-section. Looking at changes in the distribution of firms' assets over time using a dynamic difference-in-differences estimator, I find that the average increase in total assets (standard deviation) is about 11% (33%) after firms adopt IFRS, which again is suggestive of higher FV use.[22]

In conclusion, prior studies and the data indicate, with some variation among countries, an increase in firms' asset value and standard deviation after IFRS are adopted, which is consistent with more FV accounting being used under the new set of rules.

2.1.2. Effects of IFRS on equity and debt markets

Different effects of IFRS have been documented among equity and debt markets. Generally, IFRS have been associated with higher transparency levels and less information asymmetry among equity markets (e.g., Barth et al. 2008; Landsman et al. 2012; Horton et al. 2013), although recent evidence cautions against drawing inferences from those studies.[23] Only recently have the effects of mandatory IFRS adoption in private debt markets started to be investigated and a clear trend has not emerged yet, although the direction is pointing toward no or negative effects for debt contracting.

For instance, Florou and Kosi (2013) find no change in loan interest rates charged by banks after IFRS. Chen et al. (2013) report that, subsequent to IFRS, debt contracts have higher interest rates and more restrictive terms, motivating their finding through the higher discretion allowed by IFRS compared to local GAAP. As already discussed, the work of Ball et al. (2013) predicts and finds that lenders rely less on borrowers' accounting information produced under IFRS to set up debt contracts. The different effects of IFRS on equity and debt markets can be explained in light of the different payoff structures of equity holders and debt holders, which

[22] The approach exploits the different adoption year of borrowing firms and provides the average difference-in-differences effects of IFRS adoption on assets (see section 3). The change in assets is the change of total assets over lagged total assets and the standard deviation is computed over a three-year rolling window. Results are unchanged when I limit the analysis to mandatory IFRS adopters around 2005 and use the classical difference-in-differences around that year. The model exploits non-IFRS companies as control group but the reported changes are significant also only among IFRS adopters.
[23] Christensen et al. 2013 note that studies on the effect of IFRS on equity markets may have overlooked contemporaneous changes in European Union countries' enforcement, overstating the market consequences of the new set of standards in terms of transparency and comparability.

generate different information needs that are unlikely to be satisfactorily addressed by a unique set of standards (Demski 1973).[24]

The reviewed studies suggest that accounting systems reporting the lower bound of firm accounting numbers are more informative to lenders than systems relying on FV; that, on average, borrowers increase the use of FV under IFRS; and that such an increase is not homogeneous among adopting countries.

2.2. Hypothesis development

Banks use borrower accounting information both *ex ante* to screen them through ratio analysis or more sophisticated models and *ex post* to monitor them through accounting covenants. In a recent survey, Donelson et al. (2014) report that borrower financial statements are considered "very important" in evaluating whether to extend credit by 97% of commercial banks and in setting credit terms by 73% of banks.[25] However, if the accounting numbers are perceived as not sufficiently informative, banks may integrate them by acquiring private information such as reconciliations or item breakdowns. While financial reports already contain a ready-to-use set of information about firms' past performance, collecting private information is a costly activity because it requires additional time and effort on the part of the bank. Moreover, privately obtained information may be less verifiable then public information, which is under the scrutiny of several subjects (e.g., external auditors; Minnis 2011). Finally, while borrowing managers may have a natural incentive to withhold information from lenders, given their different payoff functions (Jensen and Meckling 1976), they will include such information in the financial statements to inform shareholders of their activity.

If integrating borrower accounting numbers with private information requires only additional effort but provides information of the same quality, banks will charge higher rates to cover the additional costs but will maintain the same quality of lending decisions. If the privately collected numbers are less informative, banks will still apply higher interest rates but

[24] Beyer (2012) shows that FV accounting provides superior information content compared to a historical cost regime when it is more important to know the average value of firm assets (which seems in line with shareholders' information needs) but the historical cost dominates the FV when it is more important to know whether any assets incurred a loss (which seems in line with lenders' priorities).
[25] On the other hand, Minnis and Sutherland (2014) find that financial statements are often not requested in evaluating small commercial loans by banks. Cassar et al. (2015) find that the information contained in financial statements, specifically accruals, are not used by banks in their decision to extend the loan, but are a significant determinant of loan interest rates.

screening and monitoring will be less effective, increasing reported NPLs and loan mispricing. The following sections describe more in detail the link between the information content of borrower accounting numbers and NPLs and loan mispricing. [26]

2.2.1. Borrower accounting numbers and NPLs

To see the link between NPLs and borrowers' accounting numbers, suppose, first, the case in which there is no information asymmetry between lenders and borrowers; that is, the borrower accounting numbers represent a perfect signal of the borrower "type."[27] Under this scenario, the bank will only finance creditworthy borrowers and the only uncertainty faced is related to the creditworthy borrower's risk of default. Suppose, now, that borrowers possess private information about themselves; that is, based on the borrowers' accounting numbers, the bank cannot determine with which type of borrower they are contracting. Under this scenario, the bank decides to lend if it can break even *in expectation* and the risk beard is not only related to the creditworthy borrower's default risk but also to the risk of selecting non-creditworthy borrowers. The bank will increase the interest rate to cope with the higher risk but will still, on average, mistakenly finance a number of non-creditworthy projects, which increases the proportion of NPLs.[28]

The discussion above implies a negative relation between the proportion of NPLs and the information contained in borrower accounting numbers. Based on prior studies' finding that more FV-oriented systems are less informative to lenders, I expect banks operating in countries where borrowers use accounting rules relying more on FV to be associated with higher proportions of NPLs. Formally,

H1a: *Banks in countries where borrowing firms employ accounting systems that rely less on FV exhibit lower proportions of NPLs.*

As discussed in the literature review section, the adoption of IFRS has increased the number of FV-oriented rules and was characterized by increased assets' value and volatility. I

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[26] Jayaratne and Strahan (1996) also use NPLs to proxy for the screening and monitoring abilities of banks.

[27] The present discussion features only two borrower types: creditworthy and non-creditworthy. Similar results are obtained for more than two borrower types, although additional assumptions are needed. In the Appendix, a simple model analyzes the case with three borrower types.

[28] One may argue that, under higher information asymmetry, not only are more loans given when they should not have been (type II errors), but also loans are not given when they should have been (type I errors). While type II errors increase both the non-performing and total loans, type I errors will only decrease the total number of loans, leaving NPLs unchanged. The proportion of NPLs over total loans captures both types of errors in a consistent way, with higher values indicating more type I and II errors.

therefore expect banks in IFRS adopting countries to experience an increase in information asymmetry and a related increase in NPLs. Moreover, the increase in NPLs should be greater in those countries where FV accounting had the biggest impact. Formally,

H1b: *Banks operating in countries where borrowers switch to accounting systems closer to FV (IFRS countries) report higher proportions of NPLs compared to banks operating in countries that did not switch. The effect is larger in countries where local GAAP relied less on FV.*

2.2.2. Alternative explanations

Higher proportions of NPLs under accounting systems closer to FV could be justified by mechanisms other than the use of borrower accounting numbers by banks. A first mechanism is represented by the adverse selection effect related to financial transparency: If firms in countries with more FV rules have systematically more transparent financial statements, they may more easily access other funding opportunities (e.g., equity markets) and banks may face a "lemons problem" (Akerlof 1970). A similar argument applies after countries adopt IFRS, since IFRS have been associated by previous research with increased financial statement transparency (e.g., Landsman et al. 2012). A second mechanism, always connected to transparency, is represented by shifts in bank risk appetite. In a contemporaneous working paper, Jayaraman and Kothari (2013) relate the transparency of borrower financial statements with bank risk appetite ("charter view"): Threatened by the possibility that after IFRS firms might approach alternative funding, banks engage in riskier behavior to prevent a loss in future profitability. If more FV-oriented accounting systems are also more transparent, NPLs would increase because of differences in the risk tastes of banks and not because the borrower accounting numbers are less informative.

Measuring borrowers' risk levels among different accounting systems, especially following the adoption of IFRS, provides initial evidence on whether NPLs are higher because borrower accounting numbers are less informative under FV accounting regimes or because of adverse selection or changes in bank risk appetite: If the rise in NPLs is due to either or both of these alternative explanations, I expect to observe a contemporaneous increase in the average riskiness of borrowers. In case their riskiness remains the same, changes in information asymmetry remain the more likely explanation. To further disentangle these alternative explanations, I also analyze whether banks are able to price loans according to borrower future performance (mispricing). In the next paragraph, I first describe the link between the information contained in borrower accounting numbers and banks mispricing and then provide the intuition for why mispricing fails to explain both the lemons problem and the charter view.

2.2.3. Borrower accounting numbers and loan mispricing

To illustrate the relation between loan mispricing and borrowers accounting numbers, I still rely on the previous example. Under no information asymmetry (i.e., the accounting numbers perfectly reveal the borrower type), the bank prices each loan conditionally on the underlying project and borrower characteristics, so that borrowers with a high (low) probability of success are charged low (high) interest rates. Under information asymmetry, the bank cannot distinguish creditworthy borrowers based on accounting numbers and applies an average interest rate to every borrower, independent of type. Compared to the scenario with no information asymmetry, the average interest rate is higher (lower) for creditworthy (non-creditworthy) borrowers. In other words, non-creditworthy borrowers can extract economic rent from the creditworthy ones. The difference among interest rates charged to different borrower types is then informative on the degree of information asymmetry between borrowers and lenders: if borrowers accounting numbers convey information to banks, banks will be able to charge different interest rates to outperforming and underperforming borrowers. If borrowers numbers are not informative, banks will apply an average interest rate which penalizes (rewards) outperforming (underperforming) borrowers. In other words, the bank will misprice its borrowers. Building on studies finding that accounting numbers containing higher proportions of FV are less informative to lenders, I formulate the following hypothesis:

H2: *Banks operating in countries where borrowers switch to accounting systems closer to FV (IFRS countries) after the switch misprice their borrowers more often compared to banks in countries that did not switch.*

Both the lemons problem and the charter view illustrated in the previous paragraph are empirically associated with an increase in NPLs under more FV-oriented accounting systems. However, they fail to explain observed loan mispricing activity, since both mechanisms are consistent with higher *unconditional* interest spreads applied to borrowers but the average spread *conditional* on borrower type should remain unchanged. In other words, if banks are either left with underperforming borrowers (lemons problem) or seek more risky borrowers (charter view), they should apply higher interest rates only to those borrowers.

3. Estimation strategy

The cross-sectional evidence is obtained through a regression model in the form of

$$\mathrm{LQI_{bt}} = \alpha_0 + \alpha_1 \mathrm{FV\ Distance_c} + \boldsymbol{\alpha_c}\mathbf{CountrCNTR_{ct}} + \boldsymbol{\alpha_b}\mathbf{BankCNTR_{bt}} + \mathrm{year_t} + \varepsilon_{bt} \quad (1a)$$

for bank *b*, country *c*, and time *t*, where *LQI* is either the bank's NPLs over total loans (*NPL*) or the (net) loan amount actually charged off, scaled by total loans (*NCO*), and *FV Distance* is an index measuring the extent to which each country's set of local GAAP rules relies on historical cost as opposed to FV accounting. This index, suggested by Ball et al. (2013), assigns a score to each country in terms of the number of provisions contained in their accounting rules that are related to the use of FV. The index is computed following Ball et al. (2013) and using data from Bae et al. (2008). The higher the index, the less a country's accounting system rely on FV. *CountrCNTR* and *BankCNTR* are country- and bank-level vectors of control variables, while *year* represents year fixed effects. Since *FV Distance* is measured at the country level and is time-invariant,[29] I cannot include country or bank fixed effects. H1a is verified finding α_1 negatively significant.

Next, I compare the change in NPLs in IFRS adopting countries to the change in NPL in non–IFRS adopting countries around the adoption year using a difference-in-differences (DID) estimator. This estimation technique is particularly useful when the investigated outcome variable is perturbed by an exogenous variation (e.g., a change in regulation) that affects only a subset of subjects (the treatment group) which can be compared against other comparable subjects that did not experience the same perturbation (the control group). The comparability assumption (also called the parallel trend assumption) between the two groups is crucial for the correct estimation of the effect of IFRS on NPLs, since, after the perturbation, the control group is used to infer the counterfactual level of NPLs (e.g., Angrist and Pischke 2009). Usually, the parallel trend assumption is tested by looking at the average values of the outcome variable (*NPL* in the present case) in the treatment and control groups before the perturbation (IFRS adoption). If the average values move in parallel, then it is reasonable to assume they would

[29] The survey on local GAAP differences between countries used by Bae et al. (2008) was conducted in 2001.

have also done so after the perturbation and any deviation is attributed to the effect of the perturbation.

Figure 1 reports the results of the test. The parallel trend assumption seems generally satisfied and is robust to different sample selection procedures (untabulated results, available upon request). The *NPL* values are increasing in 2005–2006 and 2008–2009. The latter two years are likely related to the financial crisis (the control group banks also report a steep rise in these years) and potentially to the implementation of Basel II,[30] while the first two years are concurrent with the adoption of IFRS. Notably, the effect is observed in both 2005 and 2006. Loans are usually classified as non-performing after 90 days of missed payments (although there is variation in the way banks account for them) and the average contract has a three- to four-year stated maturity, although most of the loans need to be renegotiated before that date (Roberts and Sufi 2009). If borrower accounting numbers impacted only bank screening abilities, I would expect a wider lag between the adoption of IFRS and NPLs (i.e., most of loans made in 2005 would become NPLs in 2006). However, as described in the previous section, accounting numbers are also used to monitor borrowers through covenants. If accounting numbers under IFRS decrease the usefulness of loan covenants, banks are prevented from making timely interventions to avoid borrower delinquencies even on loans initiated before the new accounting regime and the increase on NPLs will be observed sooner. Moreover, firms start collecting the information needed in the financial statements in advance. If IFRS require different information, part of the old information will not be collected any more, if not required under the new rules, already from or before the beginning of the fiscal year, which is also consistent with the effect being captured already from 2005.[31]

Operationally, to estimate the DID, I use the following regression model:

$$\mathrm{LQI}_{bt} = \beta_0 + \beta_1 \mathrm{IFRS}_b + \beta_2 \mathrm{Post}_t + \beta_3 \mathrm{IFRS}_b \times \mathrm{Post}_t + \boldsymbol{\beta_c \mathrm{CountrCNTR}_{ct}} + \boldsymbol{\beta_b \mathrm{BankCNTR}_{bt}} + \varepsilon_{bt} \quad (1b)$$

[30] Specifically, the European Capital Directive introduced an updated supervisory framework in Europe that basically enforces the Basel II rules on capital standards agreed at the G-10 level, starting from the beginning of 2007, and requires compliance from January 2008 (see, e.g., http://ec.europa.eu/internal_market/bank/regcapital/index_en.htm).

[31] This is the case, for instance, of business combinations. Some firms report in their financial statements that they started recognizing business combinations according to IFRS 3 (i.e., recognizing acquired assets and liabilities at fair value) already from 2004 (that is, one year in advance of the mandatory adoption year), given that the new rules were going to be soon implemented.

where *Post* is an indicator variable that equals one if the year is 2005 or later, *IFRS* is an indicator that equals one if the country adopted IFRS and *IFRS* × *Post* is a dummy variable for IFRS countries after IFRS adoption. A positive β_3 coefficient, which captures the relative change in *NPL* among adopting countries relative to non-adopting countries, supports H1b.

For robustness, I run several specifications of (1b), including year and country or bank fixed effects. In those specifications, the main effect coefficients (i.e., the variables IFRS_b and Post_t) drop out and I estimate what is sometimes known as the generalized difference in differences, which is more robust to local differences among different countries or years since it does not assume that all banks in the treatment or control group, pre or post IFRS, to have the same *NPL* (Angrist and Pischke 2009).

To test for lender mispricing behavior (H2), I again use the DID estimator and measure the change in loan spread charged to borrowers conditional on their future performance. I measure future performance as both future solvency (Altman's Z-score or Ohlson's O-score) and return on assets (ROA) measured at $t + 1$ ($t + 2$ and $t + 3$ are used to test for robustness). Operationally, I form four portfolios of borrowers according to the above variables and estimate the following regression within each portfolio:

$$\text{Allindrawn}_{\text{ft}} = \beta_0 + \beta_1\text{IFRS}_\text{f} + \beta_2\text{Post}_\text{t} + \beta_3\text{IFRS}_\text{f} \times \text{Post}_\text{t} + \boldsymbol{\beta_\text{b}}\textbf{FirmCNTR}_{\textbf{bt}} + \boldsymbol{\beta_\text{f}}\textbf{LoanCNTR}_{\textbf{ft}} + \boldsymbol{\beta_\text{c}}\textbf{CountrCNTR}_{\textbf{ct}} + \varepsilon_{\text{blt}} \quad (2)$$

for borrower *b*, loan facility *f*, country *c*, and time *t*, where *Allindrawn* is the interest spread at the contract level, as defined in the Appendix; *Post* and *IFRS* are dummy variables defining IFRS years and countries, respectively; *FirmCNTR* is a vector of control variables that includes firm leverage, size, profitability, asset tangibility, current ratio, growth opportunities, an indicator for whether financial statements are prepared according to US GAAP, and firm risk; *LoanCNTR* is a vector of control variables that includes the size and maturity of the loan, any collateral, the loan type, covenants and performance pricing provisions, an indicator for relationship loans, and the number of lenders included in the loan; and *CountryCNTR* is the usual vector of country-level controls. The model also uses two-digit Standard Industrial Classification industry fixed effects. All variables are standard debt contracting study control variables, defined in the Appendix, and are discussed in Section 5.

4. Sample and descriptive statistics

To estimate the models, I use different datasets, both separately and merged. Specifically, to estimate models (1a) and (1b), I use bank-level data, while to estimate model (2) I use loan contract- and borrower-level data. In all models, I use country-level data taken from various sources, which include the World Bank and previous literature.[32] To collect the cross-sectional evidence in (1a), I exclude IFRS years to compare homogeneous within-country GAAPs and my sample period spans 2000–2004.[33] To estimate (1b), I restrict the sample years to 2002–2007 (i.e., three years before and after the event). I use an extended period (2000–2009) as a robustness check.

4.1. Sample

4.1.1. NPLs sample (bank-level data)

At the bank level, I use data from Bureau van Dijk's Bankscope.[34] The population of Bankscope for the selected countries between 2002 and 2007 with non-missing observations for unconsolidated loans initially comprises 82,972 bank–year observations. To focus on banks that are more likely to deal with IFRS borrowers, I exclude banks with total assets lower than USD 1 billion.[35] While including only bigger banks enhances the measurement of any IFRS-related effect, my results are likely to be conservative, since bigger banks are also likely to be more sophisticated screeners. I use banks' unconsolidated financial statements prepared according to local GAAP. Constraining the sample to banks that continue to prepare their financial statements according to pre-IFRS rules prevents NPLs from being affected by any accounting changes IFRS may had on bank numbers. The use of unconsolidated financial

[32] The set of country-level controls includes the country's legal origin; the strength of the country's creditor protection; the importance of the country's private long-term debt financing market; the level of the country's capital market integration; the growth and level of the country's gross domestic product (GDP); the relevance of the country's equity market both in terms of the market value of listed companies over the GDP and dollar price changes in the stock markets measured by Standard & Poor's; the country's rule of law, indicating the perceptions of the extent to which agents have confidence in and abide by the rules of society; and banks' risk premium on lending, measured as the interest rate charged by banks on loans to private sector customers minus the risk-free Treasury bill interest rate at which short-term government securities are issued or traded in the market.
[33] Previous studies show that the companies that adopted IFRS before 2005 comprise a negligible proportion of adopting countries' population of firms.
[34] Other international banking studies using Bankscope include those of Laeven and Majnoni (2003) and Gropp et al. (2011).
[35] To prevent the results from being driven by this threshold, I alternatively select banks using a relative ranking measure provided by Bankscope. The results are qualitatively similar. Other studies use bank size as a selection criterion (e.g., Bushman and Williams, 2012).

statements also decreases the impact of cross-country lending activity.[36] Table 1 reports the sample selection process. The final NPL sample consists of 11,371 bank–year observations from 27 countries (see Tables 1 and 2, Panel A) and appears slightly unbalanced in favor of non-IFRS countries, with Italy (15%) and France (7%) leading in the number of observations among IFRS countries and the United States (48%) and India (5%) in the non-IFRS subsample.

4.1.2. Mispricing sample (borrower- and loan-level data)

To measure banks' mispricing behaviors, I use information at the borrower and loan levels from the Worldscope and DealScan databases.[37] I merge the information in the two databases following prior international studies (e.g., Kim et al. 2011) as, unfortunately, there is no common identifier allowing a direct merge. Specifically, for the US subsample, I use the classification made available by Chava and Roberts (2008);[38] for the rest of the world, I manually merge based on the borrowing company's ticker, when available, and the borrowing company's name and other available information (mainly the borrower's nation, address, and sales), following the indications of previous and concurrent studies (e.g., Dichev and Skinner 2002; Kim et al. 2011; Florou and Kosi 2013). I also use company webpages and information from other datasets to solve residual uncertainty in the correct matches. Finally, companies with no clear match are dropped from the sample. The details of the merging procedure are omitted to save space but are available upon request.

The population of firms in DealScan between 2000 and 2009 comprises more than 29,000 borrowers, while Worldscope includes almost 37,000 non-financial companies in the selected countries.[39] Table 1, Panel B, shows the differences in the international coverage of

[36] Suppose that bank *a* in country A lends to borrower *b* in country B. Banks operate regionally, so this transaction is likely to be handled through bank *a*'s local subsidiary. Suppose country A applies IFRS but not country B. The question is whether I want the loan to be considered under IFRS. I would rather not, given that the loan is decided by a local subsidiary of bank *a*, whose loan officers are likely familiar with country B's local GAAP. Consolidated financial statements would include this loan under bank *a*'s financial statements, while unconsolidated accounting prevents this.

[37] See, for example, Dichev and Skinner (2002) or Chava and Roberts (2008) for a description of the Dealscan dataset.

[38] To be more precise, Chava and Roberts (2008) offer a linking table between DealScan and Compustat datasets. I then used a two-step merging procedure for the US sample: In the first step I merged the Compustat and Worldscope data using their CUSIP identifier; in the second step, I then merged the Worldscope and DealScan data using the Compustat firm identifier.

[39] The number of available observations in DealScan appears to be slightly lower than that reported by Florou and Kosi (2013) for the same period. This might be due to my conservative merging procedure (details on the merging procedure are available on request) or to the fact that I merge Worldscope data with a version of DealScan data that already includes all loan-relevant variables.

the two datasets, with Worldscope data almost uniformly distributed across countries, as opposed to the DealScan data, whose coverage is clearly superior in the United States. Accordingly, the United States is excluded from the main analyses and included as a robustness check. The final sample comprises 6,625 borrowing companies corresponding to 26,616 facilities. Table 2 provides the year and cross-country composition of the analyzed sample.[40] The majority of the coverage is provided by the United Kingdom (4%) and Australia (2.5%) for the IFRS subsample and by the United States (58%) and Japan (12%) for the non-IFRS countries.

4.2. Descriptive statistics

Table 3, Panel A and B, provides the descriptive statistics for the main variables used in the NPL and mispricing samples in the extended period (2000–2009).[41] All continuous variables are winsorized at the 0.01 and 0.99 levels. The average bank among IFRS countries appears slightly bigger, although less capitalized, and less profitable than the average bank among non-IFRS countries. The average IFRS borrower is similar to the average non-IFRS borrower except for the credit ratio, which is lower, and for the characteristics of her loan contracts, which on average are bigger, have longer maturity, are less likely to require collateral, and are more relationship-based.

Table 3, Panel C, reports the results of the unconditional DID analysis of the dependent variables and other useful indicators in the years around the IFRS adoption (2002–2007). The table shows that the proportion of NPLs increases among banks in IFRS countries after the change in accounting rules by 38% (0.010/0.026), while the amount of loans is not significantly different, which is consistent with banks lending more to non-creditworthy or riskier borrowers. The increase is lower (31%) if we compare the change in the proportions of NPLs against a longer pre-IFRS time horizon (from 1996). The magnitude of the effect compared to the control group is even bigger and cautions against drawing inferences from the univariate setting. Loan interest rates (*Allindrawn*) also increase of about 39 basis points after borrowers start to apply IFRS, consistent with banks facing higher uncertainty. The risk indicators, however, show that

[40] Among IFRS countries, observations prior to 2005 are all voluntary adopters, while firms still not applying IFRS after 2005 are a mix of allowed exceptions. Consistent with other studies, I exclude both from my analysis to guarantee that they do not drive the results (Ball et al. 2013).

[41] The samples include banks and loan contracts with non-missing observations of NPLs and loan spreads, to improve the comparability with the estimation results.

borrowers after IFRS are adopted have the same or lower risk levels (*Zscore* and *Oscore*) and are on average more profitable (*ROA*), providing a first indication that neither the lemon problem nor the charter view can explain the increase in NPLs.[42]

5. Results

5.1. Cross-sectional evidence (H1a)

Table 4 reports the estimation results of regression model (1a) on the cross-sectional variation of *NPL* and the proximity of a country's accounting system to FV measurements (*FV Distance*). Specifically, *FV Distance* is computed according to Ball et al. (2013), using data from Bae et al. (2008), and measures how far from FV accounting local GAAP are (higher values indicate less use of FV).[43] Models (1) to (3) report the regression results. As an alternative measure of *NPL*, I use net loan charge-offs (NCOs) over total loans in Models (2) and (4). The remaining variables are defined in the Appendix to save space. Models (1) and (2) use country–year average values, while Model (3) and (4) use bank–year observations. All models are estimated over the period 2000–2004, that is, before the adoption of IFRS, and the coefficients are multiplied by 100 to ease the exposition.

The coefficient of *FV Distance* is significant and negative in all specifications of *NPL* ($p < .05$) and negative and significant for *NCO* at the bank–year level ($p < .05$). Looking at the average country–year coefficients, moving one standard deviation closer to countries using fewer FV provisions corresponds to a 0.22 standard deviation reduction in banks' *NPL*. Higher magnitudes are obtained using bank–year coefficients. However, FV Distance is just a condensed non-linear indicator of FV, so caution should be used in the interpretation of its magnitude. Moreover, this evidence should be treated as rather descriptive, since there may be many factors, which I am not controlling for, that induce countries closer to historical cost accounting to be associated with lower levels of NPLs and NCOs. The positive coefficients on the variables *Credit Rights Strength*, *Private Debt Importance*, and *Lending Risk Premium*

[42] To improve comparability with the other measures, I compute the O-score as the original index multiplied by (-1) so that higher levels indicate lower risk. I also leave out the United States from the sample, for the reasons explained.
[43] As suggested by Ball et al. (2013), FV Distance is normalized to lie between zero and one, to facilitate its economic interpretation.

suggest that banks are taking more risk when loan markets are more developed and that higher risk is associated with higher interest spreads.

5.2. Difference-in-differences estimator: NPL and IFRS (H1b)

To improve the identification, I then measure the change in the proportion of NPLs following the adoption of IFRS, which exogenously increased the levels of FV used under the local GAAP of adopting countries. Table 5 reports the results of regression (1b). Models (1), (6), and (7) use the standard DID estimation framework, while Models (2)–(4) report results for the generalized version of the DID estimator. I mainly focus on NPLs, since NCOs could involve considerable noise in international settings and over short horizons.[44] I include NCOs in Model (7), using an extended period (2000–2009) to estimate it. Coefficients are multiplied by 100 to ease the exposition.

Table 5 shows that the interaction variable IFRS × Post, which captures the relative change in *NPL* among adopting countries relative to non-adopting countries, is positive and significant in all specifications. The results validate H1b: Banks operating in countries where borrowers switch to accounting systems closer to FV (IFRS countries) report higher proportions of NPLs after the adoption relative to the control sample, which is in line with FV systems having lower information value for banks. Models (1) to (7) are estimated using different sets of controls and time periods. The economic impact of the change in accounting information is remarkable. Taking the most conservative estimate ($\beta_3 = 1.105$)—if, on average, banks in IFRS countries used to have 2.6% of loans classified as non-performing pre-IFRS (Table 3, Panel C)—after IFRS are in place, those banks increased their proportion of NPLs to 3.7% when benchmarked against non-IFRS country banks. This corresponds to a relative change of about 40%. Computing the average pre-IFRS proportion of NPLs using a longer time horizon (from 1996) reports an initial *NPL* value of 0.032, which corresponds to a relative increase in the proportion of NPLs of 34% (0.011/0.032) after IFRS are adopted. Similar effects are observed for loans that are charged off.

All models are estimated using only bank unconsolidated financial statements prepared according to local GAAP to prevent IFRS from changing the way banks report NPLs and NCOs.

[44] Unlike NPLs, loans are usually charged off only when sufficient evidence is collected to deem the loan uncollectable, which might take up to several years. Moreover, tax-related incentives may let banks have different timelines in charging off loans, depending on the country's fiscal policy, possibly introducing measurement error in the analysis. I am grateful to Catherine Schrand for bringing this to my attention.

In addition, the United States is excluded from most of the models (except Model 2) for the reasons discussed in Section 4, but the results are robust to their introduction.[45] To reduce the probability that the results are driven by a change in banks' risk taking behavior, I control for changes in banks' gross profit, non-interest income, risk-weighted assets, and lending risk premium.[46] The coefficients of the control variables are similar to those in Table 4 and not reported to save space. Standard errors are clustered at the country level.[47] I also include only countries whose banks have available information on NPLs both before and after IFRS adoption.

To strengthen the link between banks' NPLs and FV accounting, I exploit the cross-sectional variation in the use of FV among adopting countries pre-IFRS adoption. Accordingly, I constrain my sample to IFRS countries and interact the Post variable with the FV Distance indicator used in (1a).[48] In other words, I estimate the following model:

$$NPL_{bt} = \beta_0 + \beta_1 Post_t + \beta_2 FV\ Distance_c + \beta_3 FV\ Dist{\times}Post_{tc} + \boldsymbol{\beta_c CountrCNTR_c} + \boldsymbol{\beta_b BankCNTR_b} + \varepsilon_{bt} \qquad (1c)$$

If the change is related to the introduction of FV accounting, I should find higher proportions of NPLs among countries whose accounting rules included fewer FV provisions before IFRS. This is verified if β_3 is positive and significant, which is what I find in Table 6. I also use the country-demeaned average change in firms' total assets between 2004-2005 as an alternative source of variation. Again, a positive interaction coefficient is suggestive of a correlation between the rise in NPL and the use of FV, which is the result of Table 6.

5.3. Difference-in-differences estimator: Mispricing and IFRS (H2)

Table 7 contains the estimation results of equation (2), which tests the pricing abilities of banks after IFRS adoption. Borrower types are defined in terms of their future performances (Z-score, O-score, and ROA) and are evaluated by forming quartiles of each performance

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[45] Additional specifications are available on request.
[46] The risk lending premium and bank assets' risk variables are used to test the robustness of the results, but not in all models, since they significantly reduce the number of observations.
[47] Results are robust to double-clustering at the year- and country-level.
[48] The test is adopted from Ball et al. (2013).

measure at $t + 1$.[49] Quartile 1 corresponds to underperforming borrowers, while Quartile 4 corresponds to outperforming borrowers. According to the theoretical prediction, under greater information asymmetry, banks apply an interest rate that is less convenient for outperforming borrowers and more convenient for underperforming borrowers.[50] The interaction term (*IFRS* × *Post*) measures the change in the loan interest spread among IFRS borrowers relative to non-IFRS borrowers for each borrower type, after IFRS are adopted. A positive value of the interacted coefficient (β_3) indicates an increase in interest rates, within each quartile.

The coefficient β_3 is monotonically increasing in the quality of the borrowers (i.e., across portfolios): After IFRS, banks charge higher interest spreads to outperforming borrowers but not to underperforming borrowers, which is consistent with lenders having less information on borrowers according to the theoretical framework. The difference in loan spreads between outperforming borrowers (quartile 4) and underperforming borrowers (quartile 1) is significantly different from zero ($p < .01$) for two out of the three performance measures used, ranging from 45 to 85 basis points. The results are stronger if I limit the sample to non–relationship-lending contracts.[51] The results further support the evidence at the bank level and highlight how the rise in loan interest rates following IFRS adoption documented by Chen et al. (2013) is mostly due to more expensive financing concerning creditworthy borrowers.

Control variables at the country, borrower, and contract levels along with industry fixed effects are included but not reported to save space (and are available on request). In general, bigger, less risky, and more profitable borrowers are charged lower rates, as well as larger, shorter, and relationship-based loans, which is consistent with the findings of prior studies. The downside of including the additional covariates with DID estimators is the risk of endogeneity, given that the shock may affect other contract features.[52] I then repeat the analyses including only country-level controls and the results (untabulated) are unchanged. The results are confirmed regardless of the inclusion of the United States in the control sample. To prevent the results from critically depending on the correct classification of borrower types adopted, the next section includes an alternative test of H2, along with other additional tests.

[49] The times $t + 2$ and $t + 3$ are also used for robustness.
[50] To test the ability of the model to capture bank mispricing behavior, I perform an out-of-sample analysis before IFRS implementation. The results are as expected (interest rates are a decreasing function of borrowers' future economic performance), validating the model, and are available on request.
[51] In this case, all hedged portfolios are significantly different from zero ($p < .01$) and range from 43 to 96 basis points. See the Appendix for the measure of relationship lending used.
[52] In other words, I may introduce "bad controls," as defined by Angrist and Pischke (2009, pp. 64–68).

6. Additional tests

6.1. Additional tests relating NPLs to IFRS adoption

6.1.1. Loans toward IFRS borrowers

If the documented increase in NPLs is due to the new set of accounting standards, the proportion of NPLs should be an increasing function of the lending activity each bank had with IFRS borrowers. To collect further evidence, I then merge the bank sample with the contract-level database, obtaining specific information on the loans each bank makes. To construct the sample, I manually merge the bank data available from Bankscope to estimate (1d) with the information from DealScan. Although the merging procedure significantly reduces the sample size, this additional test allows me to collect evidence that is more robust to concurrent IFRS events, such as changes in enforcement (Christensen et al. 2013). I then estimate the following regression:

$$NPL_{bt} = \beta_0 + \beta_1 IFRSLoans_{bt} + \boldsymbol{\beta_c CountrCNTR} + \boldsymbol{\beta_b BankCNTR} + \varepsilon_{bt} \quad (1d)$$

where *IFRSLoans* is either the dollar amount (*% IFRSLoans ($ Amt)*) or number (*% IFRSLoans (Nr)*) of loans each bank lends to borrowers applying IFRS in year *t* over the total number (amount) of all bank loans in the same year. A positive β_1 provides additional evidence that the change in the proportion of bank NPLs is related to IFRS. Table 8 reports the estimation results. Both the coefficients of the relative amount and number of loans with IFRS borrowers are positive and generally significant, especially when larger samples are considered, providing cross-sectional evidence that the effects of IFRS on banks' NPLs are proportional to banks' lending activities to IFRS borrowers.

6.1.2. Bank knowledge of IFRS financial statements

To further investigate the link between NPLs and IFRS adoption, I exploit the heterogeneity in banks' ability to process borrowers' accounting information. If the effect is ultimately related to the new accounting rules, banks less familiar with the new accounting standards should face higher levels of information asymmetry and, on average, report higher proportions of NPLs. To proxy for bank familiarity with IFRS, I use bank size (since bigger banks have a higher probability of being exposed to a different range of financial statements and are more sophisticated lenders) and their group structure (banks belonging to a group have a higher probability of being exposed to IFRS, for instance, by preparing their own consolidated financial statements).

My null hypothesis is that banks with a better knowledge of IFRS report the same proportion of NPLs as banks less familiar with IFRS do, which I test using the following DID model:

$NPL_{bt} = \beta_0 + \beta_1 Post_t + \beta_2 ExpertBank_b + \beta_3 Post_t \times Expert_b + \boldsymbol{\beta_c CountrCNTR} + \boldsymbol{\beta_b BankCNTR} + \varepsilon_{bt}$ (1e)

where *ExpertBank* is an indicator that equals one if the bank's assets are above the sample median and the bank belongs to a group.[53] The coefficient β_3 captures the relative change in *NPL* among banks that are more familiar with IFRS relative to banks that are less familiar. I estimate the model among IFRS countries and report the results in Table 9, which reports coefficients multiplied by 100 to ease the exposition. The effect is significant ($p < .05$ or $p < .1$) in all the specifications and economically relevant: *ceteris paribus*, expert banks report about 0.012 lower *NPL* than banks less familiar with IFRS, further strengthening the link between NPLs and IFRS adoption.

6.2. Placebo test and banks' learning effect

The last analysis may suggest a learning effect by banks: After the initial change in accounting rules, banks update their knowledge on how to process the new information contained in the IFRS. If the updating is not instantaneous, the rise in the proportions of NPLs may be due to a learning process rather than due to the different information content of FV accounting. To see how persistent the difference in NPLs is, I run equation (1b) using a dummy variable for each year instead of the *Post* indicator and plot the year-interacted coefficients in Figure 2, which represent the difference in the proportions of NPLs among the treatment and control groups in each year. The results confirm the evidence found in Figure 1: 2005 is the first year with a significant increase (the confidence interval is above the zero line) in the *NPL* difference reported by banks in IFRS and non-IFRS countries and suggest learning behavior, since the proportion of NPLs is decreasing after 2007. However, the financial crisis hampers

[53] I define banks as belonging to a group if there is another bank covered by Bankscope with whom they prepare consolidated financial statements.

the identification of the learning effect, as Figure 1 shows that non-IFRS countries also increased their proportion of NPLs from 2007 on.

Slightly better identification is obtained by exploiting the pre-IFRS use of FV by countries' accounting systems (*FV Distance*): If the rise in the proportion of NPLs is only related to learning, the differential effect measured in (1c) should converge to zero relatively quickly as less FV-familiar countries learn to interpret the new standards. To measure the effect, I replace the indicator *Post* in (1c) with an indicator variable for each year and plot the interacted coefficients. The results are plotted in Figure 3, which shows a pattern close to that reported in Figure 2, although there is slower convergence to lower *NPL* values and the difference persists for all the years considered, suggesting that any learning effect, if present, is unlikely to explain, alone, the rise in NPLs.

6.3. Alternative information asymmetry measure and control sample for H2.

To prevent the measurement error in the classification of borrower types from introducing systematic noise and biasing the results, I also estimate mispricing by banks using the dispersion, instead of the mean, of the loan spreads. The stylized model in the Appendix better explains the relation, while here the main intuition is provided. For comparable investments, if accounting numbers were perfectly informative, we would observe as many loan prices as borrower types in the economy, since banks can price them according to their future risk of default. Conversely, if borrowers' accounting numbers are poor indicators of their risk of default, we would observe only one (average) interest rate. Hence, intuitively, the dispersion of the interest spreads is informative about the degree of information asymmetry present in the loan market and more informative accounting numbers should be associated with greater dispersion (i.e., low information asymmetry).

To perform the test, I compute the dispersion in interest rates for both IFRS and non-IFRS borrowers among country–year–industry buckets and use the usual DID estimator in the following specification:

$$\text{Dispersion}_{tci} = \beta_0 + \beta_1\text{IFRS}_b + \beta_2\text{Post}_t + \beta_3\text{IFRS}_b\times\text{Post}_t + \text{AvgRate}_{tci} + \boldsymbol{\beta_c\text{CountrCNTR}} + \varepsilon_{bt} \quad (2b)$$

for year *t*, country *c*, and industry *i*, where *Dispersion* is the industry–country–year standard deviation of interest rates. The standard deviation is either unconditional or conditional on other loan characteristics (*LoanSize*, *Maturity*, *Secured*, *IstInv*, *Revolver*, *NrGC*, *NrFinCov*, *PP*, *RelLoan*, and *NrLend*), computed over the residuals from a regression of interest rates on the recalled loan characteristics. *AvgRate* is the average industry–country–year interest rate. *IFRS* is an indicator variable taking the value of one for listed firms in IFRS-adopting countries, and the other variables are as previously defined. Since I do not need borrower accounting information, this alternative test allows me to use an alternative control group, that is, private companies from the same country, which is more robust to within-country changes (e.g., changes in regulation) that may drive the results.[54]

If the accounting numbers provided under IFRS do not allow banks to screen and monitor their borrowers as effectively, I expect a negative β_3 coefficient (i.e., lower relative dispersion). The results are reported in Table 10, Model (1) to (6), and strongly support the prediction. Moreover, if the effect is due to FV accounting, β_3 should be an increasing function of the initial distance that each local GAAP had with reference to FV accounting (*FV Distance*). Accordingly, I estimate equation (2b) among IFRS-adopting borrowers and using *FV Distance* instead of the IFRS dummy indicator. Model (7) and (8) summarize the findings, which are in line with the evidence collected so far: The interest rate dispersion is lower in countries whose pre-IFRS accounting systems relied less on FV accounting.

7. Conclusions

Despite the vast literature in accounting investigating how debt contracts are shaped according to the characteristics of borrowers' financial statements, there is still little evidence on the economic consequences of borrowers' public information for lenders. Banks use borrowers' public information both *ex ante* to screen their borrowers and *ex post* to monitor them after the loan is granted. When borrowers use accounting systems that fail to meet banks' information needs, banks may reduce the quality of their loan decisions, which translates into higher proportions of NPLs and the inability to price loans according to future borrower performance (mispricing).

Building on debt contract studies indicating that accounting numbers prepared under more FV-oriented accounting systems are less informative to lenders, I expect higher

[54] The selection procedure and the resulting sample are not reported to save space and are available upon request.

proportions of NPLs and mispricing among banks lending to borrowers preparing their financial statements using a more FV-oriented set of rules. To test my prediction, I use cross-country differences in accounting rules and their differences in reliance on FV accounting, together with the adoption of IFRS, which exogenously increased the extent of FV used in borrower accounting numbers.

The results report lower proportions of NPLs and less mispricing under accounting systems that rely less on the use of FV and before the introduction of IFRS. Consistent with the effect being driven by IFRS and the wider use of FV, I find that bank NPLs and mispricing (i) increase more in countries that relied less on the use of FV before IFRS, (ii) are an increasing function of the number and dollar amount of loans contracted with IFRS borrowers, and (iii) are reported by banks less familiar with the new set of accounting standards. The results are robust to different times, control samples, and identification strategies.

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Chapter 2

Bank Relations and Borrower Corporate Governance Structures, joint work with Richard A. Lambert and Jason J. Xiao

1. Introduction

It is well known that banks generally exert an important monitoring role on borrowing firms (e.g., Diamond, 1984; Diamond, 1991). However, the way banks operationalize their monitoring activities is not completely understood yet. On the one hand, banks restrain managerial opportunism to the benefit of both shareholders and debtholders.[55] On the other hand, banks have concave payoff structures and part of their monitoring is spent to prevent possible wealth expropriation by shareholders. In this work, we examine how banks perform and adjust their monitoring activities over time, as they build relationships with their borrowers. We document that, when banks and borrowers enter into closer relationships, borrowers adapt their corporate governance structure to better suit banks' monitoring needs and to minimize their risk of expropriation.

At the origin of the agency cost of debt, lenders and shareholders have conflicting payoff functions (Jensen and Meckling, 1976). Given these conflicting structures, lenders price protect against the risk of expropriation through their contract terms. Borrowers, to lower their borrowing costs, offer contingent provisions such as covenants or collateral requirements to constrain potential misbehavior (e.g., Smith and Warner, 1979; Bradley and Roberts, 2004). Besides these *contractual* mechanisms, another way lenders can reduce the risk of being expropriated is by aligning borrowers' interests with their own. For instance, they may attempt to do so by increasing mangers' sensitivity to downside risk. At the extreme, if borrowers and lenders share the same payoff function, no agency conflict – and hence, no expropriation risk – would exist.

Although effective, the cost of aligning borrowers' risk incentives is likely greater than that of including a contingent provision in the debt contract. Accordingly, banks and borrowers

[55] The positive market reaction to loan announcements is one example of how shareholders perceive bank monitoring activity to be valuable (e.g., Billett et al., 1995).

will use the alignment strategy only when its incremental benefit is large enough to at least break even relative to the contractual mechanisms. While this is rarely the case for arm's-length transactions, when banks and borrowers expect to engage in repeated borrowing arrangements ("relationship lending"), the benefits of the *non-contractual* mechanisms for each loan can collectively outweigh the initial costs to employ them. In other words, non-contractual alignment mechanisms are fixed investments able to lower future variable costs by lowering the risk of expropriation for lenders and by providing cheaper funding for borrowers.[56] If the likelihood of future borrowing is large enough, non-contractual mechanisms are positive NPV projects for both lenders and borrowers, and should be undertaken in equilibrium. Conversely, if the likelihood of future loans is too low, the two parties will primarily rely on contractual mechanisms.

There are several ways lenders may work to better align borrowers' interests to their own. A first mechanism we consider is CEO entrenchment. Entrenched CEOs have their wealth more closely tied to their firm's survival, making them more sensitive to low-outcome states of the world and increasing their costs of bearing downside risk. To entrench the manager, either the bank or the firm may propose to elect the CEO as the Chairman of the Board, adopt a poison pill provision, or stagger the board of directors, among other things. In any case, the entrenched CEO has a more concave utility function, at least in the lower states of the world, which provides her with risk incentives more in line with those of the lenders.

A second instance in which borrowers' and lenders' incentives are likely to be more closely aligned is when the lenders are directly represented on the borrower's board of directors (i.e., when one or more of the borrower's board members is an employee of the lending entity). By having affiliates within the borrower's board of directors, lenders have direct representation through formal voting power, and may further have access to inside information which may not be accessible (or known) otherwise, easing their monitoring role. In either situation, the chances of the borrower engaging in investment projects and activities potentially harmful to the lenders are abated.

Third, borrowers can adjust their mangers' risk preferences through compensation. A condensed indicator of a manager's risk-taking incentives is given by the sensitivity of their

[56] The fact that specific corporate governance structures allow borrowers to achieve more favorable contractual outcomes has been documented, among others, by Ashbaugh-Skaife et al. (2006) and Chava et al. (2010). Also, loans repeatedly taken over time from the same lender (i.e., relationship loans) are characterized by lower interest spreads and lower collateral requirements (Bharath et al., 2009), as discussed in greater detail later.

wealth to stock volatility (*vega*). Therefore, by decreasing the risk-taking component of managers' compensation (i.e., decreasing vega), borrowers can decrease the probability of expropriation due to the misalignment of their payoff functions. However, borrowers with higher vega are also more likely to borrow from debtholders in the future, because their utility is increasing in all forms of risk, including leverage risk (Coles et al., 2006). So by allowing the manager to have higher vega, banks may increase the likelihood of future repeated borrowing, in turn benefiting the banks' future returns. As such, the overall effect of equity incentives on bank preferences is ambiguous.

Finally, besides aligning their payoff functions to that of the debtholders', borrowers can signal to banks their commitment to borrow from them in the future by reducing their disclosure levels and increasing the information asymmetry with other capital providers. According to classical results of relationship lending models (e.g., Sharpe, 1990; Rajan, 1992), the increased opacity provides the existing lender with an information advantage over its competitors and helps keep the borrower captive. The information advantage is especially valuable in contests when the costs of the general contractual mechanisms are non-negligible. So changes in disclosure practices and increases in the information asymmetry with other sources of financing can work as a non-contractual lever through which banks obtain additional protection from expropriation risk.

Capturing the strength of the borrower-lender relationship over time is admittedly a difficult task and one of the most delicate points of our empirical estimation strategy. We want a measure that is able to capture the likelihood of future business opportunities because this is a necessary condition for our theoretical framework to hold. To compute such a measure, we refer to existing studies analyzing relationships between banks and borrowing firms. To start, the work of Sharpe (1990), Rajan (1992), and Hauswald and Marquez (2003) show that borrowers which repeatedly borrow from a single or a few banks face non-negligible hold-up costs and are held captive. Accordingly, we determine how many lenders each borrower interacts with for the average duration of their loans and compute an indicator of how competitive the loan market is for each borrower. Within the given time window, if the borrower interacts with only one lender, we consider that borrower-lender relation to be similar to a monopoly with high probability of repeated borrowing in the future; conversely, if the borrower contracts with a different bank each time, then we consider the borrower-lender relation weak, since the borrower does not seem to suffer from hold-up problems with any one lender.

Even though the above measure has appealing properties, it does not have memory of the identity of each lender over time, which is important as our framework involves a repeated game equilibrium. So we then use the models developed within the relationship lending studies (e.g., Bharath et al., 2009) and classify each loan as relationship or non-relationship based on the number of borrower-lender interactions: the higher the proportion of relationship loans, the more exposed the borrower is to a lender. Even though such measure is backward looking, Bharath et al. (2007) show that banks enter into relationship loans as this increases the likelihood of future lending from the same borrower. In other words, relationship lending is persistent over time, suggesting that if a borrower has been funded mainly through relationship loans, it is likely to continue into the future. While no measure is perfect, our measures complement each other and their plurality relaxes potential measurement error concerns.

Using a large panel of data on both borrower and lender information, we find initial evidence consistent with the above theoretical framework on the use of non-contractual mechanisms and how it changes over time. Specifically, we find that, as the intensity of the borrower-lender relation becomes stronger and the likelihood of repeated future financing increases, borrowers are more likely to adopt corporate governance structures characteristic of managerial entrenchment, appoint bank-related members to their board of directors, increase the convexity of their manager compensation packages, and increase the information asymmetry with other capital providers. Moreover, we find that relationship lending and borrower governance are not only associated in terms of levels, but also that borrowers *change* their corporate governance structures when the relation with their bank becomes stronger. As such, the evidence does not seem to simply be the result of endogenous matching (i.e., firms with particular corporate governance structures interacting more with specific lenders).

The present study makes several contributions to the existing literature. First, it sheds light on the existence of an unexplored class of non-contractual governance mechanisms that borrowers can use to reduce the agency cost of debt. Much of the extant literature relies on the fact that banks select their borrowers *given* their pre-existing corporate governance structure and set contracts contingent upon it, finding evidence of an association between borrowers' corporate governance and contractual outputs, such as the interest rate or the restrictions used in financial contracts (e.g., Ashbaugh-Skaife et al., 2006; Li et al., 2013). Building on these findings, we document that borrowers *adapt* their corporate governance structure as their reliance to one or a few lenders evolves over time. In other words, we find evidence consistent with the view that repeated activity with the same lender leads borrowers to modify their corporate governance structures to better align their payoff functions with those of the lenders.

We motivate the higher costs of adjusting borrowers' corporate governance structure with the increased likelihood of future business opportunities for lenders and the more favorable financing terms for borrowers documented by previous relationship lending studies (e.g., Bharath et al., 2007; Bharath et al., 2009). This leads to a second contribution of the paper. Prior relationship lending studies generally highlight how relationship-based loans can be a cheaper source of financing, particularly for opaque firms. The counterpart of the lower cost of funding is what is broadly referred to as the "hold-up problem": borrowing firms are kept captive since the cost of switching capital providers is too high. It remains unclear, however, what these costs precisely are in actuality. Finding that banks influence firms' corporate governance structure over time provides a more concrete definition of the costs incurred by shareholders of firms that enter into relationship agreements: loss of shareholder power through changes in corporate governance structure.

The third contribution speaks to recent studies investigating lender responses to covenant violations. Banks are usually thought to be silent providers of capital, unless covenants are violated and control over firm activities is formally passed to banks (e.g., Nini et al., 2012). In those cases, firms have been shown to reduce their capital expenditure and acquisitions, increase managerial turnover, and decrease leverage and shareholders payments. Although covenant violation studies provide great internal validity due to their clean research design, the generalizability of their results may be compromised by the particular conditions in which firms operate when covenants are broken. By investigating how borrowers adapt their corporate governance structures to their bank exposure, we provide complementary evidence on how lenders carry out their monitoring activity, unconditional of the transfer of formal control rights.[57]

[57] Contractual and non-contractual mechanisms are fundamentally different. While contractual mechanisms are state-contingent and based on the transfer of formal control rights (i.e., they derive their power from legally binding provisions), non-contractual mechanisms are less direct, self-enforcing equilibrium outcomes. In particular, borrowers can use non-contractual levers to signal their willingness to align their interests upfront in exchange for more convenient financing. From the opposite perspective, lenders are willing to provide cheaper debt terms in exchange for the decreased costs of monitoring and lessened risk of expropriation.

Finally, our study contributes to the literature concerning the optimality of corporate governance structures. Although some governance structures may appear detrimental for shareholder value, ex ante, these mechanisms can be optimal for the firm given their expected costs and benefits. Armstrong et al. (2010) expand on this point, stating that “only after conditioning on relevant economic characteristics of the firm, its operating and information environment, and its use of complementary and substitute governance mechanisms, can one begin to make statements about whether certain governance structures are ‘good’ or ‘bad.’” Our work is consistent with this view: structures usually associated with lower shareholder value (e.g., those consistent with CEO entrenchment) are supported in our framework by the advantages of receiving more favorable and likely more stable financing.

The remainder of the paper proceeds as follows. Section 2 discusses the literature review and outlines our main hypotheses. Section 3 and 4 illustrate our research design and sample, respectively, while Section 5 reports the estimation results. Finally Section 6 concludes.

2. Prior literature and hypotheses development

Much of prior banking and debt contracting literature discusses either the effect of firm governance on cost of debt (e.g., Ashbaugh-Skaife et al., 2006) or the impact of bank debt on firm strategy following a covenant violation (e.g., Nini et al., 2012). In the former case, the focus is on how existing borrower governance structures can address agency conflicts and lead to different financing costs. In the latter case, when a firm breaches a covenant, the contracting bank has the right to demand immediate repayment, providing strong bargaining power in the renegotiation process. The breaching firm is then likely to accept many of the conditions proposed by the bank to avoid early payments of its debt which could lead to default. This consequence combined with the relatively high frequency of covenant violations leads prior work to conclude that covenant violations “are ideal events for studying the influence of creditors on corporate governance” (Nini et al., 2012).

While Nini et al. (2012) take an important first step in considering the actions creditors take prior to borrower financial distress, covenant violations still represent a particular state realization in a similar fashion. This leaves the question of how banks impact firms prior to any violation or default unexplored. In other words, if covenant violations are early signs of default, firms that breach covenants are more likely to approach bankruptcy, and thus more in need of immediate action to "stop the bleeding" and restore their profitability levels.[58] In this case, debtholders and equityholders have a large overlapping interest in avoiding actual default state realizations. As a result, the actions taken by debtholders are likely to benefit shareholders as well. Supporting this notion, Nini et al. (2012) present a graphical illustration of stock prices around covenant violations, depicting that violating firms, on average, experience a 20% drop in stock price 12 months prior to the violation and subsequently recover part of the lost value in the following two years.

Absent covenant violations, little is known about how borrowers and lenders interact over time, as much of the extant literature treats borrowers' corporate structure as a given element upon which financing is contracted (e.g., Ashbaugh-Skaife et al., 2006; Chava et al., 2009). Dass and Massa (2011) take a step in this direction, examining possible interactions between bank lending activity and borrower characteristics. They provide evidence that banks may play a monitoring role in guarding against general managerial misbehavior, aiding debtholders and shareholders alike. However, beyond the agency problems between managers and shareholders that Dass and Massa (2011) examine, agency conflicts also arise between shareholders and debtholders (e.g., Jensen and Meckling, 1976). Hence, banks will try not only to minimize managerial misbehavior, but also to minimize the risk of being expropriated by the managers to the benefit of shareholders.[59]

Agency concerns between borrowers and lenders are usually addressed through the use of contingency provisions, such as covenants or collateral requirements. These provisions are either a necessary condition for loan execution or are a way borrowers can commit to not misbehave in the future, allowing lenders to decrease the required interest rate (e.g., Dichev and Skinner, 2002; Jiménez et al., 2006; Chava et al., 2010). The *contractual mechanisms* are relatively easy to implement although their use comes with a cost for managers, given the potentially high penalty (loss of control rights over the firm or some of its assets) faced when contingent provisions are not met.[60] Moreover, given the incomplete nature of financial

[58] Dichev and Skinner (2002) and subsequent studies note that, although generally breaching firms do not always reach financial distress, they all report significant performance decreasing patterns. Chava and Roberts (2008), Nini et al. (2009), and Nini et al. (2012) provide evidence that actions subsequent to covenant violations are primarily attempts to restore firm liquidity to ex-ante profitability levels.

[59] Typical mechanisms through which such expropriation happens are asset substitution (i.e., the borrower uses the funds to engage in high variance-high return investment projects, which benefit shareholders only, as debtholders always receive a capped return) or claim dilution (i.e., the borrower contracts new debt with other debt providers with equal or higher priority). See Smith and Warner (1979) for further reference.

[60] Although traditionally thought as inexpensive, recent evidence points out that the set up costs of contingency provisions are material (De Franco et al., 2013).

contracts (e.g., Aghion and Bolton, 1992), contingent provisions are unlikely to provide perfect hedging against manager opportunism, so borrowers can find ways to expropriate lenders while remaining in compliance with the provision requirements.

Another way lenders can reduce the risk of expropriation is by aligning borrowers' interests with their own. For instance, increasing mangers' sensitivity to downside risk better aligns borrower and lender payoff functions, in turn decreasing the expropriation risk. Contrasting the former case, these *non-contractual mechanisms* are likely to provide lenders more comprehensive protection against expropriation (manager interests become less aligned with those of shareholders and move closer to those of lenders) and, in return, lower borrowers' cost of funding by minimizing the agency cost of debt. However, the cost of increasing the concavity of manager's payoff function is likely to be greater than simply adjusting debt contracts, raising the question of why lenders and borrowers use non-contractual mechanisms.

One way to think of contractual vs. non-contractual mechanisms is in terms of variable vs. fixed investments. If contracting parties do not perceive a high likelihood of repeated activity over time, the "easy fix" provided by contingent provisions can accommodate their needs, such that alignment mechanisms need not be used. This is likely the case with *arm's-length lending*. However, when contracting parties expect to engage in repeated future borrowings, non-contractual mechanisms become affordable because their initial costs can be amortized over each additional loan drawn in the future and can be used to better address agency conflicts. For non-contractual mechanisms, in a similar fashion to their contractual counterparts, lower risk of expropriation translates into lower interest rates, which provide borrowers the incentives to accept the use of non-contractual actions. Accordingly, non-contractual mechanisms are likely to be used when there is a reasonable chance that parties engage in *relationship-based lending*.

The above framework is in line with the results of previous studies on relationship lending, namely the lower interest rates and the reduced usage of contingent provisions (e.g., Bharath et al., 2009; Schenone, 2010), and suggests that shareholders may face costs of this type of financing in the form of increased managerial risk aversion. As far as how such costs manifest in actuality, we examine four methods through which borrowers and lenders can better align their interests based on the extant agency literature: managerial entrenchment, composition of the firm's board of directors, CEO compensation structure, and borrower disclosure policy. We refer to the generality of these non-contracting mechanisms as "corporate governance levers" and analyze them in detail below.

With reference to the first lever, managerial entrenchment has generally been considered value reducing for shareholders because it allows managers to extract higher personal rents at the shareholders' expense (e.g., Core et al., 1999). In contrast, for debtholder incentives, prior studies on bond covenants find that managerial entrenchment "can both aggravate and ameliorate bondholder agency risk because entrenched managers sometimes resist shareholder opportunism" (Chava et al., 2010). While in arm's-length transactions, the costs of manager opportunism may outweigh those of shareholder opportunism, when lending is repeated over time (i.e., relationship lending), manager opportunism may be less of a concern because misbehavior is restrained by the threat of terminating the relationship with the bank (i.e., the "hold up" problem discussed in prior literature). Accordingly, we expect that borrowers are more likely to entrench their managers when they form relationship lending ties with their lenders. This leads to our first hypothesis.

H1: After entering relationship lending agreements, borrowers are more likely to employ governance structures positively associated with managerial entrenchment.

The second lever that we consider is the composition of a borrower's board of directors. Specifically, having a bank employee on the borrower's board is a direct way for banks to monitor borrowing companies, as bank "interlocks" present a clear information channel between the bank and the firm. While most studies concerning interlocks examine board member connections between firms, few focus on the effects of having a bank representative on a borrower's board. Among the few studies, Kroszner and Strahan (2001) find that commercial bankers enter a borrower's board to improve their monitoring activity, but usually do so for large and safe firms (i.e., firms with low risk of bankruptcy). Güner et al. (2008) further find that when banks join a borrower's board of directors, the borrower receives financing that favors the banks more so than the borrowers themselves. Jointly considered, these documented relations suggest that having an interlocked director on the borrower's board can prove to be a net-beneficial project for banks. As such, we expect the potential for future streams of income to provide relationship lenders with sufficient incentives to place one of their own employees on the borrower's board. In other words, the net benefits of creating a firm-bank interlock are increasing in the intensity of the relationship lending. This forms our second hypothesis.

H2: After entering relationship lending agreements, borrowers are more likely to have a bank employee elected to their board of directors.

In a closely related research area, existing literature considers relations between CEO compensation and debt. John and John (1993) formally derive a negative relation between a manager's pay-performance sensitivity and firm leverage. Ortiz-Molina (2007) empirically tests and finds this negative relation as well. Turning to equity incentives, Brockman et al. (2010) find that firms with large equity incentives have shorter-term and more expensive debt financing; however, studies looking at the relation between risk-taking incentives and leverage find a significant positive relation (e.g., Coles et al., 2006; Armstrong and Vashishtha, 2012). Coles et al. (2006) suggest that managers with high risk-taking incentives become less risk averse towards different types of risk, including financial risk. Accordingly, bank inclinations for equity incentives are ambiguous, as they generally prefer managers take on less risk or have low vega, but can also benefit from the borrower having an increased reliance on leverage stemming from high vega. The latter case takes on particular importance in a relationship-based lending context because a greater demand for leverage improves the bank's probability of obtaining future loan opportunities. Given the opposing viewpoints, we do not make a signed prediction in our third hypothesis.

H3: After entering relationship lending agreements, borrowers change CEO vega.

Finally, we investigate whether bank presence affects firm disclosure policy. Hauswald and Marquez (2003) postulate that a relationship lender's profits are a decreasing function of the borrower's public information quality. In this sense, relationship lenders have incentives to suppress their borrowers' disclosure levels. Vashishtha (2013) finds evidence suggesting that when banks are granted formal control over a firm following a covenant breach, the firm lowers its disclosure level. Shareholders are then compensated for the decrease in information through the banks' monitoring activity. If this is true, however, banks seeking future transactions may offer their monitoring activities for lower disclosure levels well before any covenant violations.

Moreover, by lowering their disclosure level, borrowers can increase banks' information monopoly as a commitment mechanism in exchange for a decreased cost debt. We formulate our last hypothesis accordingly.

H4: After entering relationship lending agreements, borrowers decrease their disclosure levels.

Although the intuition here remains similar to that of Vashishtha (2013), tension remains in that this effect may be attenuated by a self-selection process. That is, firms that take on relationship loans are usually those that are the most opaque to begin with (i.e., those with the lowest pre-existing levels of disclosure). As a result, it might be difficult for these firms to decrease their disclosure levels any further. We attempt to address this issue in our research design.

3. Research design

To isolate the effects of bank influence over firms' corporate governance structures, we exploit panel data on borrowers and lenders, and estimate whether having tighter relationships with one or a few banks leads to a change in the firm's corporate governance structure over time. Operationally, we regress each of our corporate governance levers on measures of firm-bank relationship strength and controls:

$$lever_{it} = \alpha + \beta RelStrength_{it} + \boldsymbol{\delta Controls_{it}} + FirmFE_i + \varepsilon_{it}, \qquad (1)$$

where *i* denotes firms, *t* denotes years, *lever* represents each of the corporate governance variables we examine, *Controls* is a vector of control variables specific to the lever at hand, and *FirmFE* is a set of firm fixed effects. Our primary coefficient of interest is β. Positive values of β provide evidence of bank influences on borrowers' corporate governance structures and verify our hypotheses (with the exception of H3, for which the direction of the relation is not clear ex ante).

Although demanding in terms of cross-sectional variation, using fixed effects in our estimation strategy is important for several reasons. First, it allows us to measure how *changes* in borrowing firms' corporate governance structure relate to *changes* in its banking activity. In other words, any evidence of a relation between borrowers' corporate governance and borrowing activity (i.e., significant β coefficient) is likely due to how the firm-bank relation evolves over time rather than to how different borrowers initially set up their relation with the lenders. In addition, this strategy eases some concerns about omitted variable bias. In the above estimation framework, each firm has its own intercept which can accommodate its initial corporate governance structure without affecting our coefficient of interest. For instance, consider a situation in which family firms are more likely to both have a staggered board *and* have tight relations with a bank. Using firm fixed effects lets β capture only the situation in which those firms are destaggered (or subsequently re-staggered) in conjunction with a change in the bank relationship strength measure.

4. Data and variable measurement

4.1. Sample

We create our sample by first gathering data for all borrowing firms that appear in the intersection of Compustat, CRSP, and DealScan databases for at least one year after 1995, the initial year with the necessary DealScan information. This provides us with a beginning sample of approximately 82,000 firm-year observations. We then merge information on borrowing firms' boards of directors and other governance characteristics contained in Risk Metrics. Given the sparse coverage of the latter dataset, we experience a significant drop in the sample down to 11,477 observations. Finally, to include information on executives' equity incentives, we add ExecuComp compensation data and obtain a final sample of 10,904 firm-year observations. To maximize the statistical power of our analyses, in testing each prediction we include all available information required specifically for that prediction. For example, to test our fourth hypothesis (disclosure), we do not need information pertaining to firm directors, and so do not exclude observations missing director information. This allows us to use a larger number of observations. In this sense, the 10,904 firm-year observations represent a lower bound of our sample size, rather than the final number of observations used in each test. Nonetheless, given that our aim is to explore banks' influence over firms' corporate governance, we require that all firms included in any of our analyses to have at least one observation in DealScan, Compustat, and CRSP between 1995 and 2012. This requirement allows us to distinguish between firms which are covered by DealScan but report few or no loans in our sample period from firms that are simply not within the coverage range of DealScan. Appendix B summarizes our sampling strategy.

4.2. Variable measurement

4.2.1. Relationship lending measures

The majority of relationship lending studies define borrower-lender relations on the basis of the existing loan contracts (e.g., Bharath et al., 2009). This is a natural choice if the outcome variable of interest is defined at the contract level (for instance, the effect of relationship lending on the interest spread or on the number of covenants in each contract). However, we aim to measure the effects of relationship lending on borrowers' corporate governance, which is observed at the firm-year level. Accordingly, we need to measure relationships and relationship strength for each borrower-year observation in our sample. We thus map lending information on the firm-year dimension in two main ways. The first is based on the notion of loan market concentration. For each time window, we look at how concentrated the loan market is for each borrower following the logic that if borrowers can approach different lead banks over a certain time window, they are unlikely to depend heavily on specific lenders. To proxy for market concentration we use the Herfindahl–Hirschman Index (HHI).[61] The second construct, shaped from existing works about relationship lending, looks into how many repeated loans contracts (RLCs) each borrower has with the same lead bank over each time window. We use RLCs as the starting point for this construct as their definition is standard and widely accepted in the relationship lending literature (e.g., Bharath et al., 2009; Schenone, 2010).

A more detailed description of how we compute HHI and RLCs is contained in Appendix C, while we provide the main intuition here. HHI is indicative of how "intense" the relation between a borrower and a specific lender is compared to the relation the borrower has with the banking system in general. Operationally, we compute the HHI of each borrower's lending market as follows:

$$HHIamt_h = \frac{\sum_l \left[AmtLoans_{lby}^h\right]^2}{\left[\sum_l AmtLoans_{lby}^h\right]^2} \text{, and}$$

[61] The use of the Herfindahl–Hirschman Index is not new to the banking literature. For instance, Sufi (2007) uses the index to study the concentration of syndicated loan structure for each loan facility. We similarly apply the intuition to measure level of concentration outside, rather than inside, each loan.

$$HHItimes_h = \frac{\sum_l \left[NrLoans_{lby}^h\right]^2}{\left[\sum_l NrLoans_{lby}^h\right]^2},$$

where h is the length of the rolling time window (equal to three years for the primary measure, and five years for robustness[62]), l, b, and y stand for lender, borrower, and year, respectively, and *AmtLoans* (*NrLoans*) is the dollar amount (number) of loans each borrower has in a given year with each lender over the period h. Large values of HHI indicate a strong relation, while low values indicate that the borrower has access to a "competitive" lending market (i.e., it is unlikely that any bank exerts a relatively significant influence over the borrower's corporate governance structure). As with the RLCs, more detailed information on the computation of the HHIs is contained in Appendix B. To minimize measurement error concerns, we also compute the strength of borrower-lender relations taking the highest loan market share among the time period considered (variables *TopShamt_h* and *TopShtimes_h*).

The HHI method has the appealing advantage of capturing the opportunity set of each firm within the banking system, providing a proxy of intense relationships close to the notion of "monopoly" and "hold-up" problems typically encountered in the extant relationship lending literature (e.g., Sharpe, 1990; Rajan, 1992). Also, the proxies account for the number of lead banks from which each borrower contracts, and hence need no further adjustments for the dispersion of lending sources.[63] The main drawback arises from the lack of identification of a specific lender. For example, if a firm contracts only once every two years, but each time with a different bank, the firm will be considered as having a strong relationship even though all the lending banks are different. We focus more on this aspect of relationship lending in our next construct.

For the second construct, we follow Bharath et al. (2009) and look at the number of times each borrower borrows from the same lead bank over a three-year window. From this, we compute two RLC-based metrics. The first measure is the ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower has over the same time period. The second measure is analogous to the first one, but uses the

[62] Relationship lending studies generally use a five-year window to compute their measure as this corresponds to the average loan duration in the DealScan database (e.g., Bharath et al., 2007, note 13). In our case, the average duration is 4 years. Moreover, as Roberts and Sufi (2009) show, almost 90% of contracts are renegotiated before their originally stated maturity. Consistent with our hypotheses (which requires banks to have bargaining power), we use a three-year window for our primary measure, but retain the five-year period to assess the robustness of our results.

[63] See Appendix C for details on cases of loan facilities with multiple lead banks.

count of repeated loans instead of the dollar amount.[64] We name the two variables *RelAmtRLCh* and *RelTimesRCLh*, respectively, where *h* denotes the length of the rolling time window. To better accommodate the measures to our research question, we scale each variable by the number of lead banks since the influence that each lender is likely to exercise over the borrower is a decreasing function of the number of other banks from which the borrower can access for financing.[65] In our tests using the unscaled proxies for relationship lending activity, we separately control for the total number of lead banks that loan to the borrower within the time window *h* (*NRBanksh*), and expect a negative relation between this variable and our corporate governance levers.

A simple example helps clarify our variable construction for the five-year window. Consider two firms, A and B. Firm A contracts an initial loan with Bank 1 in 2000 and subsequently a second and third in 2002, and a fourth in 2004. In 2004, it also borrows from another bank, Bank 2. In 2005 Firm A contracts no new loans, but starting from 2006 onward, it borrows from different lead banks. Firm B behaves in the same way as Firm A, but it continues contracting from the same bank until 2008. Figure 1, Panel A summarizes the borrowing behavior of the firm, and it classifies each loan as a RLC following the strategy illustrated above. It also provides the value of each of the relationship measures and the concentration indices computed. Panel B provides a graphical representation of the values contained in Panel A (the lines represent our measures and the bars the value of loans contracted in each year).

In 2000, Firm A and Bank 1 initiate a loan arrangement for the first time, so it is unlikely that Bank 1 exerts significant influence over Firm A's governance structure yet. Accordingly, all relationship lending measures are set to zero. However, in 2002 and in 2004, Firm A borrows again (twice in 2002 and once more in 2004) from the same bank. During those years, Firm A may experience hold-up problems[66], providing the lending bank (Bank 1) greater bargaining power. Therefore, to lower its monitoring costs and to secure future streams of income, it is in these years that Bank 1 may propose changes to Firm A's corporate governance. Then to maintain cheaper interest rates from Bank 1, Firm A accepts the proposals so long as the costs of the changes do not outweigh the benefits from the lower interest rates. Accordingly, in years

[64] For further details on the computation of the relationship lending measures, see Appendix B and Bharath et al. (2009), pages 1152–1154.

[65] As previously discussed, HHI does not need such an adjustment as it is already a function of the number of lead banks by construction.

[66] For reference, see Sharpe (1990) and Hauswald and Marquez (2003).

2002-2007, all our measures report a high strength firm-bank relationship, particularly after the fourth loan in 2004. After 2007, because the firm begins contracting with other banks for its funding needs, all three measures progressively move to zero. The HHI follows a slightly different premise because it looks at the number of banks involved in the lending process. So long as firm A continues borrowing solely from Bank 1, the HHI is set to one and it decays as Firm A starts borrowing from other lenders. Notably, while the relationship measures based on RLCs are zero in the final years, the HHI measures continue to be positive to reflect the underlying lending activity.

Figure 2 depicts the borrowing activity of the second example firm, Firm B. Firm B borrows from the same lead bank just as in the case of Firm A. However, in contrast to Firm A, it repeatedly borrows from Bank 3 in 2006 and 2008, while from 2009 onwards, it borrows from different lead banks. In this case, Firm B does not immediately pass from relationship to non-relationship lending, but instead moves from one relationship to another, albeit less intense, relationship. This gradual change in the firm's financing is captured in our measures, since they slowly decrease and eventually converge to zero in 2014 (assuming no further RLCs after 2012) rather than immediately decreasing to zero in 2010 (i.e., five years after the final RLC). Given that RLCs are also contracted after 2004, for Firm B, all variables (including the HHIs) commove in a similar way, in contrast to the case of Firm A. From the example it is clear that the first construct (HHI) better captures borrower-lender relationship intensity *across* all banks, while the second (RLC) better captures specific transactions with a specific lender. Using both sets of measures provides us a more comprehensive understanding of the borrower-lender relationship.

4.2.2. Dependent variables

Our first analysis focuses on the relation between borrower-bank relationships and managerial entrenchment at the borrowing firm. We identify managerial entrenchment using multiple proxies standard in the extant literature, namely CEO-Chairman duality (*ischair*), staggered board structure (*cboard*), and the presence of poison pills (*ppill*). Given these proxies, we consider an entrenched CEO to be one who is also the Chairman of the Board, has a staggered board, and is protected by a poison pill provision.

Our second hypothesis concerns the number of borrower-bank interlocked directors. We define interlocked directors as those board members whose primary employer is a lender to the firm at any point in time in our sample period. This definition differs from the traditional definition as it pertains to interrelations between borrowers and lenders as opposed to between two general firms. That is, rather than examining whether two firms have employees on each other's boards, we look at banks that have employees on a borrower's board. We create two variables to capture the interlock relationship: *NumInterlocks* and *PercentInterlocks*. *Numinterlocks* is the count of lender interlocks on a borrower's board. *PercentInterlocks* is the percentage of a borrower's board that consists of interlocks from lenders. Both variables are formed at the borrower-year level.

Our next analysis investigates potential influences of strong bank relationships over time on managerial equity incentives. We measure manager risk-taking incentives as the sensitivity of the manager's portfolio value to stock return volatility (vega), computed following Core and Guay (2002). Larger values of vega represent larger risk-taking incentives for executives (e.g., Coles et al., 2006). To better isolate the effect of bank relations on equity incentives, we use the value of the vega component contained in new issuances of stock options (*lnewvega*) as our primary measure of equity incentives. Specifically, we investigate whether *lnewvega* varies as a function of the firm-bank relationship strength, contingent on the existing value of the executive's vega and other controls. Looking only at the new issuances' vega allows us to ease concerns that firms with strong bank relations are naturally characterized by higher levels of vega to begin with, since the manager's total portfolio vega likely takes time to respond to changes in the relationship with the bank. Nevertheless, we also use total vega (*lvega*) instead of *lnewvega* and replicate our analyses for robustness. Consistent with existing studies, we construct both measures of vega using their (one plus) natural logarithmic transformations to accommodate distributional issues (e.g., Armstrong and Vashishtha, 2012).

Finally, to study the relation between firm-bank relationships and borrower disclosure policy, we use borrowers' bid-ask spreads to proxy for information asymmetry, on the assumption that firms disclosing less have greater information asymmetry and are therefore characterized by larger bid-ask spreads. Following Daske et al. (2008), we define bid-ask spread as the difference between the bid and ask price divided by the midpoint and measured at the end of each trading day. Again, to correct for skewness, we measure information asymmetry as (one plus) the natural logarithm of the spread: *abas.*

4.3. Control variables

To partial out the effects of other variables affecting our corporate governance levers, we include in our modeling a vector of control variables taken from existing literature. For each lever regression, we control for a standard set of variables: size, growth, leverage, and profitability. It is particularly important that we control for firm leverage given that we try to capture bank influence with our relationship lending variables, and this influence heavily depends on the sources of financing a firm has available to it. Put differently, the more places from which a firm can seek competitive financing, the fewer opportunities available for any one lender to “hold up” the firm. Since the intensity of bank financing is captured by our relationship lending variables, including leverage in our specifications primarily controls for additional sources of debt, such as public debt or other non-bank financing. As each lever is analyzed separately, they all utilize additional controls particular to the individual levers themselves. All control variables are defined in Appendix A, and we focus on the sources for the lever-specific control variables here.

As described above, we proxy for our first lever, managerial entrenchment, with different proxies taken from extant literature: CEO-Chair duality, staggered board, and poison pills. Given the interrelatedness between the set of variables, we apply a general set of controls for all three model specifications. Beyond the standard controls discussed above, we follow prior studies on the determinants of our entrenchment variables and additionally control for lagged profitability, R&D expenditures, CEO age, CEO tenure, CEO total compensation, proportions of independent directors on the board, and institutional ownership (e.g., Mallette and Fowler, 1992; Heron and Lie, 2006; Linck et al., 2008; Dey et al., 2011; Cremers et al., 2013). In general, the key controls for this lever focus on other governance mechanisms, such as board and ownership structure.

In terms of our second lever, changes in firm-bank interlocks, the existing literature utilizes controls that focus on the ability of borrowing firms to make debt payments and settle existing debt (e.g., Kroszner and Strahan, 2001; Güner et al., 2008). In particular, we include controls for total cash flow, board size, percentage of independent directors, mean director tenure, stock return volatility, PP&E, and short-term debt. We continue to include the standard controls for firm size, leverage, profitability, and growth here as well as in the tests for the remaining levers.

With reference to our third lever, executives’ equity incentives, we add more specific controls usually included in managerial incentives studies. A first relevant aspect we need to account for is related to firm and market volatility, as the measured effect on a manager portfolio's sensitivity may be driven by the firm business model or by market forces, rather than by equity incentives. Accordingly, we include the standard deviation of firm stock returns (*stkvol*), the standard deviation of the market (*mtkvol*), and a measure of idiosyncratic risk to which the firm is exposed (*idiovol*). Moreover, given that the equity incentives with which the manager is provided simultaneously impact other compensation characteristics, we also include the sensitivity of the manager's portfolio to stock price (*ldelta*), together with a measure of annual firm returns (*ret*), the cash compensation of the manager (*comp*), and the prior-period level of vega (*lvega*). Other remaining control variables include previous losses (*loss*) and firm cash holdings (*cash*).

Finally, we partial out the effect of other firm and market characteristics that may have an impact on firms' information asymmetry (bid-ask spread). Specifically, we control for the main firm dimensions (size, leverage, profitability, and growth), firm and market volatility (*stkvol* and *mktvol*, respectively), and trading activity (*lmvolume*). Regarding trading activity, we include it as a control because greater trade activity generally exhibits lower information asymmetry. As with the tests of equity incentives, residual controls include previous losses (*loss*) and firm cash holdings (*cash*).

4.4. Descriptive statistics

Table 1 presents descriptive statistics for our corporate governance levers (Panel A), our key independent variables of interest (Panel B), and our remaining control variables (Panel C). Of note, the sample firms have approximately $75.6 million worth of cumulated relationship loans within a three-year time span on average (mean $e^{lnAmtRLC3y}$), which corresponds to about 18% of their loan funding per lead lender. Given that, on average, during the three years each borrower has three lenders, and RLCs amount to about 54% of their financing. Viewing lending relationships from the lens of loan concentration, we find that, within a three-year time span, the average borrower in our sample has a loan amount concentration value of 59.3% (mean *HHIAmt3y*) and that about 63% of its loans are contracted with the same lead lender.

Table 2 presents pairwise correlation coefficients among our relationship lending variables and our dependent variables. Among the relationship lending variables, correlation coefficients are generally significant and positive, and are negatively correlated with the number of lead banks as expected. Given these negative correlations and that we want to disentangle the effect of general lending from the one of relationship lending, we control for *NRBanksh* in all our tests examining the relation between the simple count of relationship loans (*lnAmtRLCh*) and our various levers. In addition, our primary RLC-based variable, *RelAmtRLCh*, is scaled by the number of lead banks, while our Herfindahl-Hirschman measures already take the opportunity set of lenders into account in their construction. We find that our result interpretations remain qualitatively similar across all our specifications.

5. Estimation results

Given the multiple levers, the multiple measures of borrower-lender relationship, and the different time windows considered, we only report our main set of results and comment on deviations from them as different measures or time periods are considered for parsimony. A first noteworthy comment concerns a general trend we note in using our different proxies among all levers. When we compute our relationship-strength measure using loan amounts, they tend to be stronger compared to the case when we use the number of times borrowers interacted with each lender, especially for the first two levers. The trend does not seem to be driven by measurement error, as within each group of measures (amounts vs. times), we use several proxies. The most likely explanation seems to be that the bargaining power and the interest in actively monitoring the borrower are a function of the stake each lender has invested in the borrower more so than the simple count of loans between the lender and the borrower. In other words, banks which grant larger loans monitor the borrower more closely, and firms which borrow considerable amounts are more exposed to bank influence. The proxies we report for the borrower-lender relationship are then: (i) the natural logarithm of RLCs (*lnAmtRLC3y*), together with the number of lead banks with which the firm in the time period considered (*NrBanks3y*); (ii) the ratio of RLCs to the total dollar amount of loans, deflated by the number of lead banks (*RelAmtRLC3y*); (iii) the HHI computed over the amount of loans in the three-year window (*HHIamt3y*); and finally, (iv) the highest fraction of loans with a single bank among all lenders in the period considered (*TopShamt3y*). All estimation results include a constant which is not reported for brevity, and standard errors are clustered by borrower.[67]

5.1. Lever 1: managerial entrenchment

[67] All results are robust to two-way clustering by borrower and year as well.

Table 3 reports the estimates for the first lever we investigate, managerial entrenchment. Specifically, it reports the results of a linear probability model with one of three dependent variables: an indicator taking the value of one when the CEO is also the Chairman of the Board (Panel A), an indicator of whether the board is staggered (Panel B), or an indicator for the presence of a poison pill provision (Panel C). As discussed above, we perceive the presence of any of the three variables to be positively related to managerial entrenchment, in line with the extant literature (e.g., Larcker et al., 2011). Per H1, we predict a positive coefficient for all our measures of banking relationships, along with a negative relationship for the *NRBanks3y* control variable. For all poison pill and staggered board specifications, we find results consistent with this prediction, as the probability of managerial entrenchment increases with the strength of a firm's banking relationship. However, the CEO-Chair duality results are insignificant.

We consider whether the lack of a relation results from a lack of power or if any effect is subsumed by the controls we include. To do so, we rerun the regression, but remove ExecuComp-based controls (i.e., *ceoage*, *tenure*, and *logtdc1*), as requiring these variables decrease our sample size significantly, and use firm-years with at least one loan in the time window to focus on observations with active borrowing. The results of this new specification are significant and in the predicted directions. Still, the results may simply arise because we no longer control for the ExecuComp-based variables. We attempt to ease this concern by using the smaller sample with all the required information, but excluding the ExecuComp controls from the regression. In this specification, the relationship variable coefficients are insignificant, suggesting that the removal of the controls is not driving the results, and instead, the increase in power does.

Averaging across the three relationship measures (*RelAmtRLC3y*, *HHIamt3y*, and *TopShamt3y*), a one standard deviation change in our relationship measure increases the probability that the CEO becomes Chairman of the Board by about 6%, that the board becomes staggered by about 2%, and that the firm adopts poison pills provisions by about 4%. Although non-negligible, the economic impact of repeatedly borrowing from the same or few banks is somewhat modest, which is consistent with our intuition that using those levers is more costly than using contingent provisions in debt contracts. In total, the entrenchment results are largely consistent with H1. That is, the results support the notion that managers at borrowing firms become more entrenched as the firm increases its relationship intensity with its lenders. So among the various ways a manager can become more protected from turnover, we find that relationship lenders can impact the governance structure through elections of CEOs as Chairmen and through the employment of staggered boards and poison pills.

5.2. Lever 2: firm-bank interlocking directors

Table 4 reports the estimation results for the firm-bank interlocks lever. Following our second hypothesis that the number and/or percentage of firm-bank interlocking directors increases with the strength of the firm-bank relationship, we expect to find positive coefficients on our relationship strength variables. We find mixed results, with a significant and positive coefficient consistent with H2 in the concentration-based specifications, but insignificant coefficients for the RLC-based specifications.[68] One potential explanation for the lack of results in the RLC specifications is that the firm-bank interlocks are bank specific, such that other lenders do not have a preference or have a negative preference for electing another bank's employee to the board of directors. In this case, a general index measuring how the borrower is exposed to one or a few lenders (HHIs) rather than repeated borrowings from the same lender (RLCs) may better capture this effect. Economically, we find that a one standard deviation in HHI is associated with a 2.3% change in the variation of the interlocks percentage. Overall, the evidence provides initial support for the idea that when firms build relationships with one or a few specific banks, those firms increase the presence of interlocking directors on their boards.

5.3. Lever 3: CEO equity incentives

Our third hypothesis aims to explore whether, after entering into close relationships with banks, borrowing firms adjust their CEO compensation structure to motivate the manager to take on more or less risk. When a CEO takes less risk than shareholders perceive to be optimal, the CEO's compensation structure may be adjusted using new stock option grants so that the convexity of the CEO's payoff function (i.e., the CEO's portfolio vega in this case) is increased (e.g., Guay, 1999; Armstrong and Vashishtha, 2012). However, if banks have control over the compensation committee or if shareholders hope to receive even lower interest rates from the

[68] As in the case of CEO duality, we also repeat the analysis constraining the sample to firm-years that contracted at least one loan. As expected, results are stronger (both in terms of magnitude and in a statistical sense), but continue to hold only for HHIs.

banks, the compensation committee may look to decrease the CEO's vega so that she is less incentivized to take on risk, which in turn pushes the manager's payoff structure to be more congruent with that of the lenders. In contrast, as discussed in the theoretical framework, previous studies find a positive relation between leverage and vega, motivating the results in terms of managers' increased appetite for many types of risk, including leverage risk (e.g., Coles et al. 2006). If higher vega increases the probability of future lending activity, banks may actually benefit from higher vega, and results should point in the opposite direction.

Table 5 presents the results from estimating *lnewvega* as a function of our relationship variables. Interestingly, we find significant, positive coefficients for all our relationship intensity variables, suggesting that firms increase risk-taking incentives, via increases in vega, when they enter into more stringent banking relationships. Results are obtained using the sensitivity of executives' portfolio to stock volatility embedded in the new option granted to managers, as opposed to the vega component of all the options in mangers' portfolios. This procedure seems more appropriate given that our intent is to measure changes in executives' compensation incentives, rather than levels. Still, using *lvega* yields qualitatively similar results, although there is a general decrease in significance likely due to the greater persistence of the measure and the presence of fixed effects in our estimation framework.[69]

The coefficient on leverage, on the other hand, is negative and significant, in contrast with the positive relation documented by other studies (e.g., Coles et al., 2006). There are two possible explanations for the difference in sign. The first is that the consolidated measure of leverage used by previous studies does not differentiate among different debt components (relationship and non-relationship debt) with opposite effects on risk-taking incentives. While relationship lenders may allow higher risk-taking incentives to increase future lending activity, non-relationship lenders may be averse to increase future lending because of claim dilution concerns and use negative covenants to prevent it. Empirically, this would translate into a negative relation between non-relationship leverage and vega. The second explanation concerns our dependent variable, which uses the vega component derived from new options granted, as opposed to previous studies using the total vega. Our results using total vega report a positive, although insignificant, coefficient on leverage, which reconciles our evidence with previous studies, although does not rule out the first explanation.

[69] In this case, consistent with many studies measuring managerial incentives with vega, we use a less conservative approach and switch to four-digit SIC industry fixed effects rather than firm fixed effects.

As in the prior analyses, the economic impact of having relationship lending on the granting of new options is modest but significant: a 10% increase in our Herfindahl-Hirschman measure (*HHIAmt3y*) corresponds to approximately a 1% change in the vega component of new options granted. Similar or stronger results hold with our other measures of relationship strength (*lnAmtRlC3y* and *RelAmtRLC3y*). Overall, the effect is consistent with the view that, when managers act under the influence of (or in a tight relationship with) a principal that is more risk averse (e.g., banks), shareholders increase equity incentives to motivate the manager to take on risk, but do not issue equity incentives on average when managers are free to look for alternative sources of funding. Banks likely allow for this because of the increased probability of future business opportunities with the same borrower. Alternatively, these results may suggest that shareholders retain control over the compensation committee, and thus managerial compensation, even as the firm's banking relationships grow stronger. So rather than relinquishing control over compensation, shareholders appear to actually increase their impact on manager compensation, potentially to counteract the costs of the other levers of relationship banking.

5.4. Lever 4: information asymmetry

Our final lever focuses on the effects that a more concentrated relation with one or a few banks may have on firm disclosure levels due to the information rents the banks can extract in relationship lending arrangements. To test our final hypothesis, we regress a proxy for information asymmetry, the bid-ask spread of the borrowers' stocks, on our primary independent variables and the previously discussed controls. As proposed in H4, we expect disclosure to decrease, and thus information asymmetry to increase with relationship lending (i.e., $\beta > 0$). Consistent with our expectations, in Table 6 we report positive and significant relations between information asymmetry (*abas*) and our measures of firm-bank relationship strength. Specifically, a 10% increase in *HHIAmt3y* is related to an increase in the bid-ask spread of about 2%. Similar results hold for our other specifications. As in the other analyses, the coefficient on leverage is negative, which may again be due to its separation from the relationship lending effect. In other words, while firms that commit to repeatedly borrow from the same lender become more opaque (positive *HHIAmt3y*, *lnAmtRLC3y*, and *RelAmtRLC3y* coefficients), firms with higher proportions of public or arm's-length transactions have incentives to increase their transparency to attract outside capital (negative *lev1* coefficient).

These results are consistent with theoretical models suggesting that banks benefit from the information rents they have over their borrowers (e.g., Sharpe, 1990; Hauswald and Marquez, 2003). That is, firms who decide to borrow from the same bank, perhaps due to lower interest rates (e.g., Petersen and Rajan, 1994; Bharath et al., 2009), experience an increase in information asymmetry, while firms who attract additional sources of funding increase their level of disclosure (negative *NRBanks3y* coefficient). These results are further in line with prior studies studying disclosure behaviors of firms around covenant violations, which represent state-contingent shifts of control rights from borrowers to banks, as opposed to an influence over time (e.g., Vashishtha, 2013). In conjunction with our results for the other levers, these findings provide evidence of the specific types of costs that firms and their shareholders face when they enter into relationship loan agreements with banks.

6. Conclusion

In this work, we collect evidence aiming to answer the question of what costs shareholders face when a borrower enters into a bank relationship. It is well known that banks generally exert an important monitoring role on borrowing firms (e.g., Diamond, 1984; Diamond, 1991). However, the way banks operationalize their monitoring activities is not completely understood yet. We examine whether banks attempt to align borrower incentives with their own by altering debtor corporate governance through four primary levers derived from the extant literature: managerial entrenchment, composition of the board of directors, CEO compensation structure, and firm disclosure policy. For each lever, we investigate changes over time at firms with strong lender relationships relative to those of firms without such relationships.

In line with our theoretical expectations, we find a positive association between managerial entrenchment and the strength of bank-borrower relationships and a positive relation for the presence of bank interlocks among borrowers' boards of directors. We also find that firms involved in more intense banking relationships tend to increase the sensitivity of their executives' compensation to stock volatility (vega). These firms further exhibit increases in information asymmetry, potentially to protect their principal lender's information advantage. Overall, our results shed new light on extra-contractual costs of relationship lending and ways through which lenders have a say on borrowers' corporate governance.

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Chapter 3

Debt contracting and risk taking incentives, joint work with Christopher S. Armstrong and David Tsui

1. Introduction

A large set of corporate finance studies argues that differences between shareholders' and creditors' payoffs gives rise to an agency conflict whereby managers—acting on behalf of shareholders—have incentives to expropriate creditors' wealth through asset substitution and claim dilution (Jensen and Meckling, 1976; Myers, 1977; Smith and Warner, 1979).[70] Anticipating these incentives, creditors are expected to price-protect their claims by charging a higher interest rate.[71] Borrowers can attempt to alleviate these agency problems through a variety of nonpecuniary contractual mechanisms including debt covenants, which transfer certain control rights to creditors in the event they are violated. Given the large potential losses that borrowers incur when covenants are violated, debt covenants can serve as an important mechanism to alleviate agency problems between shareholders and creditors.

Several papers relate the presence and violation of covenants with borrowers' current and future levels of investment and risk (Chava and Roberts, 2008; Nini et al., 2009; Demiroglu and James, 2010; Nini et al., 2012). These papers generally find that riskier borrowers are more likely to have covenants—as well as covenants that are "tighter," or closer to violation—and that borrowers' future investments are decreasing in the presence and tightness of covenants and following covenant violations. One limitation of these studies is that they examine either a limited set of covenants (most notably capital expenditure covenants) or rely on empirical measures that aggregate different types of covenants (e.g., the "covenant intensity index" proposed by Bradley and Roberts, 2004). In both cases, the research design implicitly treats covenants, particularly financial covenants, as homogenous and abstracts away

[70] "Asset substitution" refers to the set of actions that shareholders can take to increase the risk profile of the firm's investments after the debt contract is signed and which are not included in the pricing of the debt. Examples include issuing bonds with the stated intent to finance low-risk investment projects (e.g., acquire a new piece of machinery to increase the existing production capacity), but using the funds to instead finance high-risk investments (e.g., open new business lines or penetrate foreign markets). "Claim dilution" refers to any adverse effects that new debt contracts have on the payoff of existing claims. For example, the effect of a new senior claim on the value of an existing junior or subordinated claim. For further reference, see Jensen and Meckling (1976) and Smith and Warner (1979).

[71] In extreme cases, creditors can withhold financing, resulting in credit rationing, whereby positive net present value (NPV) projects go unfunded (Stiglitz and Weiss, 1981).

from potentially important differences in these contractual provisions. Similarly, analytical studies tend to view covenants as a generic (noisy) signal about the borrower's financial health (e.g., Rajan and Winton, 1995; Aghion and Bolton, 1992). However, this uniform treatment in both empirical and theoretical studies is at odds with recent studies that document significant heterogeneity in the features of debt covenants (e.g., Demerjian, 2011; Christensen and Nikolaev, 2012). These studies suggest that different types of covenants are designed to fulfill different objectives.[72]

We develop a framework in which different contractual provisions can provide managers with differential risk-taking incentives. For example, borrowers with covenants that primarily restrict the amount of investment (e.g., capital expenditure covenants) are not necessarily constrained by a project's risk. In contrast, borrowers with covenants that are directly tied to the profitability of investment (e.g., interest coverage covenants) may be less willing to take additional risk that also increases the likelihood of the loss of control rights.[73]

Using a comprehensive set of debt contracts, we find that managers' responses to "punitive" covenants that threaten the loss of control rights depend on the *type* of covenant. In particular, capital covenants, which constrain the level of investment, and dividend restrictions, which increase the availability of funding, are both positively associated with future operating risk. In contrast, performance covenants, which depend on the outcome of investments, and "sweeps," which increase the cost of funding, are both associated with a decrease in future operating risk. Interestingly, performance pricing provisions, which can be viewed as a type of "non-punitive" covenant, are also associated with lower future operating risk, regardless of the underlying measure (i.e., regardless of whether the provision is based on the borrower's capital or operating performance).

We also examine the relationship between covenants and risk-taking incentives through the lens of the two primary—though not necessarily mutually exclusive—contracting frameworks that offer alternative explanations for the observed heterogeneity in debt contracts and covenants: adverse selection and moral hazard. Although both have been examined in prior studies, ours is the first to jointly study these explanations in the context of debt covenants.[74] The primary distinction between adverse

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[72] Skinner (2011, 208) stresses the importance of understanding both the extent of and the reason(s) for this heterogeneity in debt contracts in the following passage: "While particular papers focus on specific aspects of debt agreements, such as various types of accounting-based debt covenants and the form of performance pricing provisions, restrictions on capital expenditures, collateral requirements, etc., we still do not know very much about how these various features fit together, including whether they act as substitutes or complements."

[73] As we discuss in more detail in later sections, the idea that covenants tied to profitability may curtail risk-taking has an analog in the ongoing debate in the banking literature regarding leverage and capital ratios within the Basel framework.

[74] Several studies attempt to distinguish between adverse selection and moral hazard outside in the general context of debt contracts, but not with respect to debt covenants in particular. For example, Krishnaswami et al. (1999) study how moral hazard and adverse selection affect the choice of whether to issue public or private debt.

selection and moral hazard relates to the *timing* of the private information. In the case of adverse selection, borrowers possess private information *before* negotiating the debt contract and therefore differ *ex ante* according to the "type" (i.e., the nature of their private information). As a way to elicit this information, the lender offers the borrower an array (or "menu") of contracts from which to choose. Different borrowers will be better off with different types of debt contracts, and their rational choices should reveal some or all of their private information to the lender. In the case of moral hazard, lenders are fully informed about the actions that borrowers may take when the contract is negotiated. However, because they cannot perfectly observe the borrower's actions (and cannot completely contract over these actions) *after* the contract is negotiated, the borrower acquires an *ex post* information advantage after the contract is negotiated. Different contractual features (e.g., different types of covenants) provide a way to alleviate the conflicts of interest (i.e., agency problems) that arise between the borrower and lender.[75]

Accordingly, we study the relation between various debt contract provisions and borrowers' risk profiles both across economic states and over time to shed light on the relative importance of adverse selection and moral hazard. Evidence of a relation between contractual features and the borrower's risk at the inception of the debt contract is consistent with adverse selection whereby borrowers endogenously select from a "menu of contracts" offered by lenders. A relation between covenants and risk *conditional* on the borrower's performance after the contract inception or a stronger relation over time are both symptomatic of moral hazard, whereby features of debt contracts influence managers' risk-taking incentives. For example, if covenants influence managers' incentives, these effects should be strongest when the covenants are most binding and most likely to be breached (e.g., following poor performance). In contrast, if covenants simply reveal a borrower's "type" or innate preferences but do not affect risk-taking incentives, the relationship between covenant structure and risk should not depend on changes in the borrower's financial health or other events subsequent to the contract's inception.

Consistent with the presence of adverse selection in debt contracting, we find evidence of a relationship between borrowers' risk profiles and debt contract provisions at the inception of the contract. When we examine the relationship between covenant type and borrowers' risk *conditional* on borrowers' performance after the contract is negotiated, we find that this relationship is primarily attributable to borrowers with poor performance. Moreover, we find that the magnitude of the relation

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Berndt and Gupta (2009) consider both moral hazard and adverse selection as reasons why banks sell their loans, but they do not evaluate the relative importance of the two explanations.

[75] Similar conclusions can be reached using models based on an incomplete contracting framework (Aghion and Bolton, 1992). These models assume that although neither party has private information, it is either infeasible or prohibitively costly to write a "complete" contract that covers all relevant contingencies—both foreseen and unforeseen.

between covenants and borrowers' risk increases over the term of the debt contract. The results from these *conditional* tests suggest that moral hazard also contributes to the *unconditional* associations that we document at the contracts' inception (i.e., the provisions included in the debt contract influence managers' incentives).

The finding that specific covenants are associated with increases in borrowers' operating risk raises the question of why lenders would use such provisions, as they should be averse to any incremental borrower risk that is not priced in the debt contract. One explanation relies on distinguishing between the different *types* of risks that lenders attempt to hedge when they lend to borrowers in the face of incomplete information. Lenders ultimately seek to avoid default, which is more likely not only when borrowers undertake more risky projects (i.e., increase operating risk), but also when they adopt a riskier capital structure (i.e., increase financial risk), which increases the likelihood of default.[76] If different types of covenants provide managers with incentives to take different types of risk (i.e., operating versus financial), lenders will face a trade-off in terms of the type of risk they hold. For example, by constraining the *amount* rather than the *riskiness* of a borrower's investments, capital covenants (e.g., a debt-to-total assets constraint) may lead to both increased operating risk and reduced financial risk. Therefore, the choice to use one type of covenant rather than others may ultimately depend on the type of risk that lenders seek to curtail. Certain lenders may specialize in holding particular types of risk and will therefore attempt to minimize their exposure to other types of risk.[77] Our evidence is consistent with this "trade-off" explanation: covenants that are positively (negatively) related to operating risk are negatively (positively) related to financial risk and leverage, suggesting that different types of covenants provide incentives to take different types of risk.

Our study makes several contributions to the debt contracting and risk-taking literatures. First, we contribute to the literature on the design of debt contracts and debt covenants. Most debt contracting studies assume—either explicitly or implicitly—that all covenants have a similar effect in alleviating agency problems. We show that the effect of covenants on borrowers' risk-taking is more nuanced and depends on the *type* of covenant: different types of covenants have opposing albeit theoretically consistent relationships with different types of risk. This is important given that little is known about the purposes of the different types of contractual provisions contained in debt contracts (Skinner, 2011).

We also contribute to the literature that examines the effects of debt covenants on borrowers' decisions, which includes studies that examine the consequences of covenant violations. Considering

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[76] This distinction between operating and financing risk is prevalent in corporate finance. A common example is the price of a firm's systematic risk (market beta), which is used by both researchers and practitioners either as a combined operating and financing risk measure (levered beta) or net of the firm's capital structure (unlevered beta).

[77] For example, Schrand and Unal (1998) argue that thrifts specialize in holding credit risk and find that these lenders attempt to increase credit risk and reduce interest rate risk in their loan portfolios.

the initial contract design highlights how these studies are all *conditional* in the sense that they implicitly rely on events that occur subsequent to the contract negotiation (e.g., deterioration in the borrower's financial health). As previously noted, these studies all relate to a moral hazard problem between the borrower and lender. We extend this literature by acknowledging that there may be differences in borrowers' types—as revealed by their choice of the initial terms of the debt contract—and using this information to construct more powerful tests of the effects of debt contracts' incentives.

Second, we show that the provisions of an important class of contracts can influence managers' risk-taking decisions in much the same way as other, more visible contracts (e.g., incentive-compensation contracts). Unlike most prior debt contracting studies that implicitly abstract away from the CEO (and other senior executives) and focus largely, if not exclusively, on shareholder-creditor conflicts, we explicitly consider how features of firms' debt contracts interact with other sources of managerial incentives—most notably their equity incentives (i.e., equity portfolio *Delta* and *Vega*). Although prior studies typically acknowledge that debt contracts and other governance mechanisms can also influence managers' risk-taking decisions, these other important mechanisms are given only cursory consideration in the research design. In contrast, we examine the effect of debt contracts on managers' risk-taking incentives with a more comprehensive research design that also considers the effect of firms' incentive-compensation policies and other governance mechanisms.

Finally, our study contributes to recent broader debate about how to effectively monitor and curb risk-taking in the face of incentives for risk-shifting and asset substitution. We examine whether contractual constraints along one dimension (i.e., the level of investment) influence project selection along a different dimension (i.e., the risk of the investment). In other words, even if managers comply with restrictions on the level of investment, they may still engage in asset substitution by selecting projects that are riskier per unit of investment.[78]

The remainder of the paper proceeds as follows. Section 2 reviews the prior literature on how firms respond to debt covenants and presents our hypotheses. Section 3 describes our research design. Section 4 describes our data and variable measurement. Section 5 presents our results and Section 6 concludes.

2. Background and Hypothesis Development

Covenants are a contractual mechanism that can reduce agency conflicts between borrowers and lenders: by committing to transfer control rights in some states of the world, borrowers can commit to

[78] See, for example, "US banks take on more risk as new rules bite" by Tracy Alloway, *The Financial Times*, January 16, 2014.

not expropriate lenders' wealth (Smith and Warner, 1979). Two ways that borrowers can expropriate lenders' wealth are *asset substitution*, whereby borrowers invest in riskier projects than lenders anticipated and are therefore not adequately reflected in the cost of debt (Jensen and Meckling, 1976), and *claim dilution*, whereby borrowers issue additional debt with equal or greater seniority, reducing the likelihood that lenders recover their investment (Myers, 1977). Covenants can also be viewed as early indicators of potential future default, or "trip wires" (Dichev and Skinner, 2002) that allow lenders to take actions to protect their investments before bankruptcy occurs. Studies on covenants usually distinguish—at least theoretically—between *negative* or *general covenants* (i.e., covenants that prevent borrowers from taking actions that could harm lenders, such as dividend payments or share repurchases), and *financial covenants*, which stipulate financial requirements that borrowers must maintain (e.g., a maximum debt-to-equity ratio).

Several recent studies examine the relation between firms' credit risk, debt covenants, and future investment policies. Nini et al. (2009) examine the link between various features of firms' debt contracts and their investment policy and find that firms with lower credit ratings are more likely to have covenants that restrict the level of future investment. They also find that after covenants are negotiated, borrowers decrease their level of future investment. Chava and Roberts (2008) and Nini et al. (2012) document similar results around covenant violations. Demiroglu and James (2010) find that riskier firms select tighter covenants and, after the inception of the contract, (i) have improvements in the accounting ratios on which the covenants are based, (ii) reduce their capex-to-assets ratio and debt issuance, and (iii) experience more growth.

The above studies look at the relation between covenants and level of investment, leaving potential shifts in the underlying risk of the investments (*operating risk*) unexplored.[79] Also, previous research generally treats covenants as a homogeneous class of information signals, although recent works point out how financial covenants are not a homogeneous class of provisions (Demerjian, 2011; Christensen and Nikolaev, 2012).[80] For instance, Christensen and Nikolaev (2012) divide financial covenants into two groups: *capital covenants*, which are based on the borrower's capital (i.e., balance sheet items) and designed to prevent borrowers' expropriation of lenders' capital, and *performance covenants*, which are defined in terms of current-period performance or efficiency ratios (i.e., a combination of balance sheet and income statement items) and designed primarily to act as 'trip wires' by signaling the borrower's financial state before the firm becomes insolvent (e.g., Dichev and Skinner,

[79] When these studies mention the borrowers' risk profile, they refer to the risk that the borrower enters into a default state. In this work, we are instead interested in analyzing how different types of covenants relate to *operating* risk, which does not need to coincide with default risk.

[80] Probably the most notable exception is the work of Smith and Warner (1979), who discuss different classes of covenants and the effect of each class on firm's value.

2002). These works illustrate how financial covenants are a collection of different sets of restrictions serving differing purposes.

We adopt this 'multi-faceted' view of debt covenants to examine how different types of provisions interact with managers' existing incentives to influence their risk-taking behavior. In particular, we expect certain types of covenants to be associated with greater risk-taking, either because managers with incentives to take more risk select certain types of covenants (*adverse selection*) or because some covenants provide managers with risk-taking incentives (*moral hazard*). Although our first set of tests focus on the relation between covenants and managerial risk-taking incentives, our later tests attempt to distinguish between adverse selection and moral hazard.

The banking industry provides an example that illustrates the intuition for why some types of covenants might actually *increase* borrowers' risk-taking incentives. In recent years, banks have faced more stringent regulatory requirements that are tied to certain financial ratios. Some of these ratios are based on banks' Risk-Weighted Assets (RWAs), which discount assets according to their riskiness, while other ratios are based on banks' assets without adjusting for risk. One example of the latter is the leverage ratio, which is calculated as Tier 1 capital scaled by adjusted bank assets. The leverage ratio is intended to "restrict the build-up of leverage in the banking sector" and "reinforce the risk-based requirements with a simple, non-risk-based 'backstop' measure" (Bank for International Settings, 2013).[81] The recently revised Basel III standards still include a mandated leverage ratio. Although regulators are attracted to this ratio because "it ignores the perceived riskiness of assets and instead measures capital against total securities and loans on balance sheets," practitioners argue that failing to risk-adjust assets constrains banks' investments by increasing the opportunity cost of safe (or lower-yielding) investments and instead "creates a preference for higher-yielding assets," which tend to be riskier.[82] In other words, because the leverage ratio does not account for difference in the riskiness of banks' assets, it constrains the total *amount* of banks' investments but does not constrain their *risk*.[83]

Banks' regulatory ratios are similar to debt covenants in that both delineate thresholds which, if violated, can entail serious consequences (e.g., the loss of certain control rights). From this perspective, banks' leverage ratio requirements are essentially capital covenants that constrain banks' equity-to-total assets. Thus, debt contracts that include capital covenants may produce risk-taking incentives similar to those encountered in the banking industry. In other words, borrowing firms with capital covenants are

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[81] Broadly speaking, Tier 1 capital is the sum of a bank's equity and reserves less its intangible assets and adjusted assets is total assets less intangible assets.

[82] "US banks take on more risk as new rules bite" by Tracy Alloway, *The Financial Times*, January 16, 2014.

[83] Researchers at the World Bank have expressed similar concerns, noting that "the leverage ratio […] and the absence of risk-based capital requirements […] may thus encourage banks to build up relatively riskier balance sheets or expand their off-balance-sheet activity."

"investment-constrained." Assuming that more profitable projects carry more risk, the manager can both comply with the investment constraint and increase expected profitability by choosing riskier projects. In other words, firms with capital covenants bear a higher cost of choosing relatively safe investments, because they must forego riskier investments that are expected to be more profitable.

In contrast, performance covenants do not directly restrict the total *amount* of investment, but are instead tied to the selected projects' returns, which are unlikely to be entirely under the borrower's control. Similar to how risk-weighted capital ratios make it more costly for banks to select riskier projects, performance covenants make it more costly for borrowers to select projects with more risk. In other words, debt with performance covenants may give managers incentives to avoid riskier projects—especially if the performance covenants are "tight." Therefore, capital and performance covenants are likely to have opposing effects on managers' risk-taking incentives. Specifically, we make the following predictions:

H1: Performance covenants reduce managerial operating risk-taking.

H2: Capital covenants increase managerial operating risk-taking.

In addition, debt contracts often include negative (or "general") covenants as well as performance pricing ("PP") provisions, both of which can potentially affect managers' risk-taking incentives. Negative covenants either place restrictions on the disposal of the borrower's assets or require that borrower use the proceeds from specific activities to pay down outstanding debt. One common negative covenant is a dividend restriction, which prevents the borrower from distributing cash to its shareholders (rather than debtholders). By restricting cash outflows, dividend restrictions implicitly increase the amount of cash available for managers to invest in new projects or reduce the marginal cost of financing (e.g., Myers and Majluf, 1984), which may encourage managers to "gamble more" and increase operating risk.

Sweep provisions, such as asset sale or debt issuance sweeps, are also common types of general covenants. These provisions require that a portion of the cash obtained from certain transactions (e.g., asset sales or debt issuances) be used to repay existing debt. Accordingly, sweep provisions *increase* the marginal cost of funding new projects since every time managers want to raise funds for new investment (e.g., by issuing new debt or liquidating assets), they need to borrow more than the cost of the new investment since part of the new funding will be used to pay off the sweep.[84] Note that unlike capital covenants, sweeps do not *explicitly* constrain the amount (or level) of investment, but instead make investment relatively more costly. These considerations lead to our third hypothesis:

[84] For example, if a debt sweep requires using 20% of new loan proceeds to repay outstanding debt, a firm will need to borrow \$125 to finance a project that costs \$100 (i.e., \$125 = \$100/(1-.20)).

H3: Dividend restrictions (sweep covenants) increase (decrease) managerial operating risk-taking.

The final set of debt contractual provisions that we consider is performance pricing provisions, which provide "for changes in interest rates over the life of the debt contract based on measures of performance (typically accounting measures or debt ratings)" (Armstrong et al., 2010, 218). Performance pricing provisions typically reduce borrowers' cost of financing if their future performance improves.[85] Conceptually, these provisions are different from covenants as incentive mechanism. In particular, covenants primarily serve as a "punishment" or disincentive since they impose some cost if they are violated (e.g., the loss of control rights), but yield no "reward" or benefit for compliance. In contrast, performance pricing provisions do not threaten loss of control rights if they are not met, but instead provide a benefit if the borrower's performance improves. Because performance pricing provisions increase the cost of financing rather than constraining the amount of investment, we expect these provisions to provide risk-taking incentives that are similar to those provided by sweeps. This leads us to our final hypothesis:

H4: Performance pricing provisions decrease managerial operating risk-taking.

3. Research design

Based on our discussion in the previous section, we expect to observe differential relationships between various debt contractual provisions and firm risk. Our primary empirical specification for documenting evidence of these relationships is the following reduced form model:

$$Risk_{t+1} = \boldsymbol{\alpha} Contract\ Provisions_t + \boldsymbol{\beta} Controls_{t-1} + \gamma Risk_{t-1} + \varepsilon_t \quad (1)$$

where *Risk* is a measure of firm risk and *Contract Provisions* is a vector containing performance pricing provisions, covenants, and other loan-specific characteristics. We group contractual provisions according to our discussion above: dividend restrictions, capital covenants, sweeps, performance covenants, and performance pricing provisions. We use the count of each type of provision contained in each debt contract in our main specifications and an indicator that takes the value of one if the contract contains the provision and zero otherwise in robustness tests. We also include other contractual features, such as interest spread and loan maturity, as well as the lagged dependent variable, to control for the

[85] PP provisions can either decrease or increase the cost of debt conditional on subsequent events. However, roughly 75% of the performance pricing provisions examined by Asquith, Beatty, and Weber (2005) are interest rate decreasing (Table 1 Panel D).

risk characteristics that lenders were aware of at the contract negotiation.[86] Our remaining control variables are described in the Appendix. We measure the dependent variable in the year following the contract negotiation (i.e., time *t*+1), characteristics of the debt contract in the year the contract is negotiated (i.e., time *t*), and other control variables in the year prior to the contract negotiation (i.e., time *t*-1).

Eq. (1) models the *unconditional* relation between contract characteristics and risk. Any such relation could be attributable to either adverse selection (i.e., managers selecting contracts based on their private information about future risk) or moral hazard (i.e., debt contracts altering managers' incentives *after* the contract is negotiated). If debt contracts are designed to constrain risk-taking, there should be no relationship between covenant structure and risk at the time the contract is signed after controlling for the determinants of the contract design. Moreover, any agency problems that exist at the inception of the debt contract should relate solely to adverse selection.[87] However, as time elapses after the contract is signed, lenders' inability to contract over the complete set of borrowers' potential actions (and states of the world) may give rise to moral hazard. In other words, because debt contracts are incomplete, subsequent events can interact with the various features of the contract (e.g., debt covenants) and produce different risk-taking incentives than existed at the inception of the debt contract.

To empirically distinguish between adverse selection and moral hazard, we estimate Eq. (1) when subsequent events may have altered managers' incentives. In particular, we partition our sample according to borrowers' performance (return on assets) after the debt contract is in place and estimate Eq. (1) for each subsample. A stronger relation between risk and contract provisions when borrowers' performance deteriorates is consistent with borrowers taking more risk when debt covenants are more likely to form binding constraints, and also suggests that adverse selection alone is not sufficient to explain an *unconditional* relation between covenants and risk. We also examine whether the relation changes over time by estimating the relation between covenants and risk measured contemporaneous with the debt contract (i.e., time *t*) one year after the debt contract (i.e., time *t*+1), and two years after the debt contract (i.e., time *t*+2). An increasing relationship between contract provisions and risk over time would also suggest that adverse selection does not fully explain any observed relation.

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[86] The inclusion of the lagged dependent variable helps us both to capture the incremental effect of the new contractual feature on firm risk and to limit omitted variable bias, given that existing risk is considered when a loan contract is signed. A potential problem with the inclusion of the lagged dependent variable among the covariates is that the OLS estimator may be inconsistent in presence of time-invariant regressors (e.g., industry fixed effects, Arellano and Bond, 1991). To ensure our results do not depend on inclusion of the lagged dependent variable as a control, we also estimate our models without the lagged dependent variable and obtain similar results (untabulated).

[87] This argument is similar to the one advanced by Demsetz and Lehn (1985) in the context of CEO incentive-compensation contracts. Demsetz and Lehn argue that if CEO contracts are designed to provide them with incentives to maximize expected firm value, then there should be no empirical relationship between CEO incentives and firm value after controlling for the determinants of the contract.

4. Variable measurement and sample selection

4.1. Operating risk

We examine several different measures of operating risk. Our first measure is the borrower's CAPM market beta. Because we want to capture operating rather than financial risk, we un-lever the CAPM beta and use the resulting unlevered beta to measure operating risk.[88] Our second proxy for operating risk is R&D expense, which is considered to be a form of risky investment. Our third proxy is the standard deviation of quarterly cash flows computed during the fiscal year. More volatile cash flows can be symptomatic of more uncertain, and therefore risky, projects. Finally, we conduct a factor analysis on these three measures and take the first factor from this analysis as a measure of operating risk.

4.2. Financial risk

Lenders are unlikely to deliberately use contract provisions that encourage risk-taking—either by attracting more risk-tolerant managers (i.e., adverse selection) or incentivizing managers to take more risk (i.e., moral hazard). Two potential explanations for why dividend restrictions and capital covenants are used if they are, in fact, associated with higher operating risk are as follows. First, different types of covenants may protect lenders from certain types of risk. For example, dividend restrictions may provide incentives to invest in risky projects that increase operating risk, but they may also discourage financial risk by preventing the borrower from paying cash to shareholders (i.e., preventing increases in leverage). This explanation suggests that provisions that encourage operating risk should have an opposing effect on financial risk. Therefore, lenders can use different types of covenants to either encourage or discourage—and therefore manage—specific types of risk (i.e., operating or financial).

Second, the costs of tailoring debt contracts to individual borrowers may outweigh the potential benefits. De Franco et al. (2013) provide some evidence that supports this explanation by showing that covenants tend to be standardized (or "sticky") across underwriters and within industries (i.e., lenders

[88] Specifically, we calculate unlevered beta as the firm's market beta divided by one plus the firm's debt-to-equity ratio.

do not tailor contracts to specific borrowers). This suggests that borrowers may be able to capture "information rents" because lenders cannot perfectly ascertain their "type" (i.e., adverse selection).[89]

Similar to our operating risk measures, we also examine several alternative measures of financial risk. Our first measure is the portion of the borrower's market beta attributable to leverage, calculated as the difference between levered and unlevered beta. Our second and third measures are the debt-to-total assets and equity-to-total assets ratios.[90] As with our operating risk proxies, we also extract the common element of our three measures of financial risk using the first factor from a factor analysis.

4.3. Debt contract provisions

We group debt contract provisions into five sets that correspond to our hypotheses: sweep provisions, dividend restrictions, capital covenants, performance covenants, and performance pricing provisions. The first two provisions represent general covenants. Capital and performance covenants partition financial covenants into provisions that are based only on balance sheet items (capital covenants) and those that also include income statement items (performance covenants). We identify capital and performance covenants based on Christensen and Nikolaev's (2012) classification. We also include capital expenditure covenants, which are important in our setting, among capital covenants.[91]

4.4. Equity incentives and other control variables

In our research setting, it is important to also consider the effect of managerial equity incentives, which are another important source of risk-taking incentives. We therefore include the sensitivity of managers' equity portfolios to changes in stock price and changes in stock return volatility (i.e., delta and vega, respectively). Prior literature finds that equity incentives provide managers with risk-taking incentives (e.g., Guay, 1999; Coles et al., 2006; Armstrong and Vashishtha 2012). Therefore, it is important to control for the effects of equity compensation contracts when evaluating the effect of debt

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[89] It is not costless for the lender to elicit a borrower's private information. The typical solution to an adverse selection problem entails some of the contracts providing certain types of borrowers with so-called "information rents."

[90] The equity-to-assets ratio is not simply one minus the debt-to-assets ratio because our definition of debt only includes the firm's current and long-term debt (i.e., we exclude liabilities such as short-term payables and deferred taxes).

[91] Specifically, capital covenants include covenants based on quick and current ratio, debt-to-equity ratio, loan-to-value ratio, the ratio of debt to tangible net worth, leverage and senior leverage ratio, net worth requirements, and the total amount of capex. Performance covenants include covenants based on cash interest and debt service coverage ratio, level of EBITDA, coverage ratio, interest coverage ratio, the ratio of debt to EBITDA, and the ratio of senior debt to EBITDA.

contract provisions on risk. However, including these equity incentive measures reduces our sample size substantially due to lack of overlap between our various datasets, most notably Dealscan and Execucomp. We therefore present results both with and without these equity incentive measures and examine whether our coefficients of interest differ the two samples.

4.5. Sample selection

We use Dealscan, provided by Thomson Reuters, to collect data on private debt contracts, including the number and type of covenants, performance pricing provisions, and all of the other contract level variables. Dealscan provides detailed information on negative and financial covenants, performance pricing provisions, and other contract specific variables including loan interest spread, maturity, and amount. We retrieve financial and accounting information on borrowing firms from Compustat and merge this data with Dealscan using the linking table provided by Chava and Roberts (2008). Finally, we obtain stock return data from CRSP and equity incentive data from Execucomp and Equilar. Table 1 provides descriptive statistics for the main variables in our analysis. The average contract has approximately three performance pricing provisions, two performance covenants, and less than one capital covenant. Roughly 44% and 77% of contracts have a sweep and a dividend restriction, respectively. Table 2 provides univariate correlations between our operating and financial risk measures and contract provisions.

5. Results

5.1. Main results

Table 3 presents results from estimating Eq. (1) with operating risk measures. Columns 1 through 4 are estimated without managerial equity incentives (i.e., *Delta* and *Vega*) and the remaining columns (i.e., 5-8) include them. Consistent with our predictions related to capital covenants and dividend restrictions, we find a positive and significant relation between both types of provisions and future operating risk. In particular, in column 1 we find estimated coefficients of 0.016 and 0.033 for capital covenants and dividend restrictions, respectively (t-statistics of 2.67 and 3.54, respectively). We also find a negative and significant relation between performance pricing provisions and future operating risk (i.e., coefficient of -0.006 in column 1, t-statistic of -4.12). However, our findings related to performance covenants are less conclusive. We find a negative relation between these covenants and future R&D expenditures (coefficient of -0.006 in column 3, t-statistic of -3.96), but no significant relation with our other measures of operating risk.[92] Overall, the results in Table 3 are consistent with our prediction that covenants differ in their effect on risk-taking incentives. We find that some debt contract provisions—capital covenants and dividend restrictions in particular—are systematically related to higher levels of subsequent operating risk, while other debt contract features (i.e., sweeps, performance pricing provisions, and to some extent performance covenants) are systematically related to lower levels of future operating risk.

Table 4 reports results after partitioning the sample based on borrowers' future financial performance. Columns 1 through 4 report results for the subsample of borrowers that are in the "good state," which we define as above-median performance. Columns 5 through 8 report results for the subsample of borrowers that are in the "bad state," which we define as below-median performance. We generally find that the results in Table 3 are more pronounced for the subsample of borrowers that experience relatively poor subsequent performance. These borrowers are more likely to have less—and perhaps even no—slack in their covenants which would, in turn, have the greatest potential to influence managers' incentives. For example, the magnitude of the coefficients on dividend restrictions, capital covenants, and performance pricing provisions are all significantly larger in column 5 than their counterparts in column 1. Overall, the results in Table 4 suggest that the relations that we document in Table 3 are not entirely attributable to adverse selection—covenants and other provisions also appear to influence managers' risk-taking incentives.

Table 5 presents results for operating risk measured over various horizons. Column 1 reports results for operating risk measured at time t (i.e., contemporaneous with the debt contract), column 2 reports results for time t+1 (i.e., the same specification as in Table 3), and column 3 reports results for time t+2. We find that the magnitude of the relations reported in Table 3 increase over time, although the differences are generally not statistically significant. For example, we find a coefficient of -0.015 for sweeps at time t+2 compared to a coefficient of -0.007 at time t. Overall, similar to Table 4, the results in Table 5 are consistent with moral hazard contributing to the relation between covenants and risk-taking that we document in Table 3.

Next, we estimate Eq. (1) using financial risk measures. Based on the discussion in Section 4.2, we expect to find relations that are opposite of those reported for operating risk in Table 3. In other words, if dividend restrictions and capital covenants increase operating risk by increasing the availability of funding and restricting the level of investment, they should also reduce borrowers' financial risk.[93] Similarly, we expect sweep provisions and performance covenants to exhibit a positive relation with

[92] Results (untabulated) are similar if we exclude the lagged value of the dependent variable as a regressor.

[93] We expect dividend restrictions to have such an effect so long as borrowers do not use all of the retained funds to invest in new projects. In this case, we should observe no change in the borrower's financial position.

financial risk. Table 6 reports results that, although not always statistically significant, are generally consistent with our predictions. In particular, we find positive and significant relations between sweeps and financial risk and negative and significant relations between capital covenants and financial risk (e.g., in column 1 we find t-statistics of 8.99 and -3.90 for sweeps and capital covenants, respectively). We also find mostly positive relations between performance covenants and financial risk, although these effects are not always significant (particularly in the subsample where we control for managers' equity incentives).

Collectively, the results in Table 3 and 6 suggest that sweep provisions and performance covenants may be more effective in mitigating asset substitution since these provisions are negatively related to future operating risk. Conversely, capital covenants and dividend restrictions may be more effective at curtailing claim dilution and limiting risks related to leverage since these provisions are associated with the same or lower levels of unexpected future financial risk. Also, our results suggest that there is not a single "optimal" type of debt covenant, but rather that different types of covenants and contract provisions encourage and discourage different types of risk.

5.2. Equity incentives and debt contract provisions

Thus far, we have generally assumed that managers of borrowing firms act on behalf of shareholders and have abstracted away from any conflicts of interest (or agency problems) that may exist between these two parties. However, one common view in the agency literature is that managers have a substantial portion of their monetary and human capital tied to the value of their firm and therefore act more risk-averse than diversified shareholders, which gives rise to risk-related agency problems. One way to mitigate these agency conflicts is to provide managers with convex (equity-based) compensation contracts (e.g., stock options that provide vega) to increase their incentives to take risk.

If boards, acting on behalf of shareholders, attempt to influence managers' risk-taking incentives through compensation contracts, then they should adjust these contracts as managers' incentives change. This intuition applied to our research setting suggests that shareholders should adjust the level of managers' risk-taking incentives after the firm enters in to a new debt contract. If boards are aware of how debt provisions influence managerial risk-taking incentives, we expect them to increase managers' vega when the firm signs a "risk-decreasing" debt contract (i.e., a contract with performance covenants, sweeps, or performance pricing provisions) and, conversely, decrease vega when the firm signs a "risk-increasing" debt contract (i.e., a contract with either capital covenants or dividend restrictions).[94]

We test this prediction by examining the relation between managers' vega and the presence of "risk-increasing" and "risk-decreasing" provisions in the debt contract. Specifically, we regress *Vega* in the year the contract is signed onto the number of risk-increasing and risk-decreasing provisions contained in the contract.[95] Table 7 reports the results of this analysis and shows that risk-increasing provisions (i.e., dividend restrictions and capital covenants) are negatively related to *Vega* while risk-decreasing provisions (i.e., performance covenants, sweeps, and performance pricing provisions) are positively related to *Vega*. These results are consistent with the view that boards (and shareholders) are aware of the differential risk-taking incentives provided by various debt contract provisions and managers' structure equity incentives in response.

6. Conclusion

We study whether the structure of debt contracts influences managers' risk-taking incentives and, in turn, influences their risk-taking decisions. It is frequently argued that the differential payoffs of shareholders and creditors gives rise to an agency conflict whereby managers—acting on behalf of shareholders—have incentives to expropriate creditors' wealth through asset substitution, debt overhang, and claim dilution (e.g., Jensen and Meckling, 1976). Although debt covenants are often characterized as a contractual mechanism to mitigate these problems (Smith and Warner, 1979), there is little empirical evidence that speaks to how covenants achieve this goal. Debt contracts include a wide array of covenants and pricing provisions which should not only have a *direct* influence on managers' risk-taking incentives, but also an *indirect* influence through their interaction with other sources of managerial risk-taking incentives (e.g., managers' equity portfolio incentives).

We find that managers tend to systematically increase their firm's operating risk when faced with covenants that depend on the level of future investment but do not depend on future performance (i.e., capital covenants) and covenants that increase the availability of funding (dividend restrictions). Conversely, we find that managers tend to decrease the level of future operating risk when control transfer rights depend on future performance (performance covenants) and when funding is more costly (sweep provisions). We also find that covenants that exhibit a positive association with future operating

[94] Brockman et al. (2010) examine a similar question, namely, do managers' equity incentives appear to influence debt contract design? They find a negative (positive) relation between managers' vega and loan maturity (spread), consistent with lenders mitigating risk-related agency costs through debt contract design.

[95] In untabulated analysis that is similar to Eq. (1), we also use *Vega* in *t*+1 and control for past *Vega*. We find qualitatively similar results.

risk tend to exhibit a negative association with future financial risk, which is consistent with covenants inducing a tradeoff between different types of risk. Finally, we find that when the cost of funding depends on borrowers' future performance (performance pricing provisions), managers tend to decrease operating risk without any associated increase in financial risk. Collectively, our results suggest that both adverse selection and moral hazard contribute to the overall relations that we document between debt contractual provisions and the various types of risk. Overall, our study enhances our understanding of how an important type of corporate contract—namely, debt contracts—both directly and indirectly influences managers' risk-taking incentives. Our study also contributes to the growing literature that seeks to understand the economic function of debt contract provisions in general, and debt covenants in particular.

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Appendix

Appendix to Chapter 1

Appendix A – Stylized model

The entrepreneur (borrower) faces an investment opportunity I which might return R with probability π and 0 with provability $(1-\pi)$. The entrepreneur has no initial funds and needs to borrow I from a bank. Both lender and borrower are risk neutral. There are three types of borrowers in the economy: a, b, and c. The project payoff is not different across borrower types but the probability π of receiving the positive outcome R is. Specifically, $\pi = p_i$, $i \in \{a,b,c\}$ where $p_a > p_b > p_c$. Define R_L as the return paid to lenders which equals to $R - R_B$. Lenders are going to invest if

$$E\left[R_L\right] \geq I$$
$$R_L \geq \frac{I}{p_i},\ i \in \{a,b,c\}$$

Suppose lenders can always separate borrowers a from c but can separate b from c only if information is perfectly symmetric. If all borrowers are creditworthy, i.e., $E[R] \geq I \ \forall \ i \in \{a,b,c\}$, all borrowers are financed regardless of the information asymmetry between borrowers and lenders. Suppose now that the type c borrower is not creditworthy, i.e., $R < I / p_c$. Note that this implies that borrower of type c have incentives to invest in negative expected NPV projects, for example, as a result of shareholders-manager agency conflicts (the same project might have negative NPV for the shareholders but positive NPV for the manager) or the result of managerial overconfidence.

Symmetric information

Lenders will only finance type a and b borrowers. Define L the amount of lending granted by lenders, NPL the expected non-performing loans, i.e., those loans which are not paid back by borrowers, $sNPL$ the ratio of non-performing loans on loans. L is going to be equal to $L^{SI} = l_a + l_b$, where $l_i = I \times n_i$ is the amount of loans granted to type i borrowers and n_i is the number of borrower i in the economy. Moreover,

$$NPL^{SI} = (1 - p_a)\, l_a + (1 - p_b)\, l_b$$

$$\begin{aligned} sNPL^{SI} &= \frac{(1 - p_a)\, l_a + (1 - p_b)\, l_b}{l_a + l_b} \\ &= 1 - \frac{p_a l_a + p_b l_b}{l_a + l_b} \end{aligned}$$

Asymmetric information

Lenders cannot distinguish all borrower types. Again, they can distinguish type *a* from type *c* but cannot separate among type *b* and *c* since too similar. They have a prior about the distribution of type *c* borrowers in the economy which equals $(1 - \gamma)$. Then, investors will always finance borrowers of type *a* and are going to finance borrowers *b* and *c* if $\gamma > \gamma^*$, where

$$\gamma^* (p_b R - I) + (1 - \gamma^*)(p_c R - I) = 0$$

If $\gamma \geq \gamma^*$, we then have that

$$L^{AI_a} = l_a + l_b + l_c$$

$$NPL^{AI_a} = (1 - p_a)\, l_a + (1 - p_b)\, l_b + (1 - p_c)\, l_c$$

$$sNPL^{AI_a} = 1 - \frac{p_a l_a + p_b l_b + p_c l_c}{l_a + l_b + l_c}$$

If $\gamma < \gamma^*$, we then have that

$$\begin{aligned} L^{AI_b} &= l_a \\ NPL^{AI_b} &= (1 - p_a)\, l_a \\ sNPL^{AI_b} &= 1 - p_a \end{aligned}$$

Trivially, for $l_i \in \mathrm{R}^+$, $i \in \{a,b,c\}$,

$$sNPL^{AI_b} < sNPL^{SI} < sNPL^{AI_a}$$

Given that γ is non-observable, by looking at the change in *sNPL* alone it is not possible to directly infer whether information asymmetry increased or decreased. However, assuming that $\gamma \geq \gamma^*$, information asymmetry and non-performing loans are positively related. Such assumption seems reasonable given that, even if justified by agency conflicts or managerial overconfidence, type *c* borrowers are unlikely to invest in 'too negative' NPV projects. This limits either the probability of success p_c or the difference between R and I to be too low. Under this assumption, the following statement holds true:

Lemma 1. *An increase (decrease) in information asymmetry leads to an increase (decrease) in the fraction of non-performing loans.*

(The proof trivially follows the above discussion).

To test the soundness of the prior assumption, I use the simple model above to derive an alternative way to infer the level of information asymmetry from observable contractual characteristics. To do that, assume debt markets are competitive and that money have no time-value (i.e., risk free rate is set to zero). In case all borrowers are creditworthy, all borrowers are priced according to lenders' zero profit condition, although the interest rate charged depends on the information available to lenders. Under symmetric information, each borrower is priced according to her type

$$E\left[R_L\right] = I$$
$$R_L = \frac{I}{p_i},\ i \in \{a, b, c\}$$
$$R_B = R - \frac{I}{p_i},\ i \in \{a, b, c\}$$

and the interest rate required by lenders is equal to

$$r_i = \frac{R_L - I}{I} = \frac{(1 - p_i)}{p_i},\ i \in \{a, b, c\}$$

We would then observe as many interest rates as borrower types. Under information asymmetry however, lenders cannot observe borrower types b and c, so that they use an average price given by $m \equiv \gamma p_b + (1 - \gamma) p_c$. In this case,

$$r_i = \begin{cases} \frac{(1-p_a)}{p_a} \text{ if } i \in \{a\} \\ \frac{(1-m)}{m} \text{ if } i \in \{b, c\} \end{cases}$$

and we observe only two interest rates. In case type c borrowers are not creditworthy, they will not be financed when information between borrowers and lenders is symmetric. Then, only two interest rates will be observable. When information is asymmetric, if $\gamma \geq \gamma^*$, we would still observe two interest rate (the same as in the latter case) and, if $\gamma < \gamma^*$, we would only observe one interest rate equal to $(1 - p_a) / p_a$. This simple illustration allows me to derive two testable predictions to infer the degree of information asymmetry summarized in the following lemmas.

Lemma 2. *The dispersion in the observed interest rates is (weakly) negatively associated with the information asymmetry between borrowers and lenders.*

(The proof trivially follows the above discussion).

Lemma 3. *The economic rents that bad-type borrowers can extract from good-type borrowers are (weakly) increasing in the information asymmetry between borrowers and lenders.*

Define type *a* and *b* borrowers as 'good type' and type *c* borrowers as 'bad type'. Assume all borrowers are creditworthy. Then, under *symmetric information*, there is no rent extraction since each borrower is priced according to the probability of success so that

$$R^{SI}_{B_a} > R^{SI}_{B_b} > R^{SI}_{B_c}$$

Under information asymmetry, type *c* borrowers are able to extract an economic rent from type *b* borrowers given that

$$R^{SI}_{B_b} > \underbrace{R - \frac{I}{m}}_{R^{AI}_{B_{b,c}}} > R^{SI}_{B_c}$$

If type *c* borrowers are not creditworthy, the results are unchanged except when $\gamma < \gamma^*$. In this case, only type *a* borrowers would be financed and no rent extraction would be observed.

Appendix B – Variable definition

Variable	Definition	Database / Source
FV Distance	An index measuring the difference of each domestic GAAP from fair value accounting	Ball et al. (2013), Bae et al. (2008)
Expert Bank	An indicator that equals one if the bank is more likely to have superior abilities in interpreting IFRS. A bank is deemed to possess superior abilities if its Size is above the sample median and it belongs to a group.	Bankscope
NPL	Bank non-performing loans over total loans	Bankscope
NCO	Net amount of loans actually charged off scaled by bank's total loan	Bankscope
Capitalization	The bank equity scaled by its total assets	Bankscope
Loan Loss Prov	The bank loan loss provisions over total loans	Bankscope
NrBanks	The number of banks in each year for each country in the sample	Bankscope
Gross Profit	The bank profit before taxes and loan loss provisions over lagged total assets	Bankscope
Total Loans	The bank total loans over total assets	Bankscope
Size	The natural logarithm of bank's total assets	Bankscope
New Loans	The percentage of new loans contracted by the bank	Bankscope
Liquidity	The ratio of bank liquid assets to liabilities	Bankscope
non-Interest Income	The ratio of bank non-interest income to total income	Bankscope
% IFRSLoans (Nr)	The number of loans that the bank lends to borrowers applying IFRS over the total number of loans	Bankscope, DealScan and Worldscope
% IFRSLoans (Amt)	The total dollar amount value of loans that the bank lends to borrowers applying IFRS over the total number of loans	Bankscope, Dealscan, and Worldscope
Private Debt Importance	The importance of a country's private long-term debt financing market	Bushman and Piotroski (2006)
Secured	A dummy variable assuming the value 1 if the loan is secured and 0 otherwise	DealScan
Revolver	A dummy variable indicating whether the loan is a revolving line	DealScan
IstInv	A dummy variable taking the value of one if the loan's type is term loan B, C, or D (institutional term loans) and zero otherwise	DealScan
RelLoan	A dummy variable that takes the value 1 if the lead arrangers had been a lead arranger of the borrower's previous loans over the five-year period prior to the current loan (Bharath et al. 2009)	DealScan
PP	An indicator variable for performance pricing provision	DealScan

Dispersion	Either the standard deviation or coefficient of variation (standard deviation / mean) of loan spread computed at each industry-country-year-loan type	DealScan
Allindrawn	The loan spread, equal to the amount paid by the borrower in basis points over LIBOR for each dollar drawn down, including eventual annual fees	DealScan
LoanSize	The natural amount of the loan granted	DealScan
Maturity	The natural logarithm of the months before loan's maturity	DealScan
NrFinCov	The number of financial covenants included in the loan agreement	DealScan
NrGC	The number of general covenants in the loan contract including dividend restrictions, equity issuance sweeps, debt issuance sweeps, asset sales sweeps, and insurance proceeds sweeps	DealScan
NrLend	The number of lenders participating in the contract	DealScan
Market Integration	The level of a country's capital market integration	Hail and Leuz (2006)
Civil Law	The country legal origin	La Porta et al. (1998)
GDP in US$	The country GDP in trillions of US dollars	The World Bank
Rule of Law	The country rule of law indicating the perceptions of the extent to which agents have confidence in and abide by the rules of society	The World Bank
Lending Risk Premium	Banks' risk premium on lending measured as the interest rate charged by banks on loans to private sector customers minus the "risk free" treasury bill interest rate at which short-term government securities are issued or traded in the market	The World Bank
S&P Equity Index ch	S&P Global Equity Indices measure the U.S. dollar price change in the stock markets covered by the S&P/IFCI and S&P/Frontier BMI country indices.	The World Bank
GDP Growth	The % growth and level of a country GDP	The World Bank
Credit Rights Strength	The strength of a country's creditor protection	The World Bank
Equity Mkt Importance	The total market capitalization of listed companies of each country over the country GDP.	The World Bank
USGAAP	A dummy variable that takes the value of 1 if a non-US firm applies USGAAP in its reporting system (Daske et al. 2008)	Worldscope
Change in Assets	The change in firms' demeaned assets between 2004 and 2005 at the country level	Worldscope
Zscore	Altman's Z-score (Altman 1968) computed as: $1.2*Z_1 + 1.4*Z_2 + 3.3*Z_3 + 0.6*Z_4 + 0.9*Z_5$, where Z_1 is firm's working capital over total assets, Z_2 are retained earnings over total assets, Z_3 is operating profit over total assets, Z_4 is firm's market capitalization over total liabilities, and Z_5 are firm's sales over total assets.	Worldscope
LagLoss	Dummy variable that takes the value one if a firm reported a loss in the previous reporting period	Worldscope

Leverage	Firm's long-term debt over firm's total asset	Worldscope
MtB	Firm's market value over firm's equity value	Worldscope
ROA	Firm's operating profit scaled by total assets	Worldscope
Size	Natural logarithm of firm's total assets	Worldscope
Oscore	Ohlson score (Ohlson 1980) computed as: -1.32 + 0.407*O_1 + 6.03*O_2 + 1.43*O_3 + 0.076*O_4 + 1.72*O_5 + 0.521*O_6, where O_1 is the natural logarithm of firm's total assets, O_2 is the ratio between firm's liabilities and assets, O_3 is working capital over total assets, O_4 are firm's current liabilities over current assets, O_5 is a dummy variable which takes the value 1 if firm's total liabilities are greater than total assets, and O_6 is the change in firm's net income over the sum of the absolute values of firm's current and lagged net income. The index is multiplied by (-1) for comparability reasons.	Worldscope
Tangibility	Ratio of total net PPE over total assets	Worldscope

Appendix to Chapter 2

Appendix A – Variable Definitions

Relationship variables

HHIAmt_h	Herfindahl-Hirschman index computed using the borrower's loan amounts granted by each lead bank over the prior *h* years.
lnAmtRLCh	Natural logarithm of the amount ($/000) of all relationship loans each borrower has with the same lender over time period *h*.
*TopShamt*_h	The highest proportion of loan amounts that the borrower contracted with a lead lender over the over the prior *h* years.
RelAmtRLCh	The ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower had over time period *h*, scaled by the total number of lead banks borrowed from over time period *h*.

Dependent variables

ischair	Indicator variable that equals one if the CEO is also the Chairman of the Board and equals zero otherwise.
cboard	Indicator variable that equals one if the board of directors is staggered and equals zero otherwise.
ppill	Indicator variable that equals one if the firm has a poison pill provision and equals zero otherwise.
numinterlocks	The number of firm-bank interlocking directors. A director is a firm-bank interlock if she is employed by a bank that made a loan to the firm at any point in the sample period.
percentinterlocks	The number of firm-bank interlocking directors divided by the total number of firm directors. A director is a firm-bank interlock if she is employed by a bank that made a loan to the firm at any point in the sample period.
lnewvega	Natural logarithm of the vega component of new stock option issuances.
lvega	Natural logarithm of the vega component of all stock options in the manager's portfolio.
abas	Natural logarithm of the difference between the bid and ask price divided by the midpoint and measured at the end of each trading day.

Control variables

NrBanksh	Total number of lead banks borrowed from over time period *h*.
size	Natural logarithm of firm market value of equity.
mb	Ratio of market value of equity to book value of equity.
lev1	Ratio of liabilities to assets.
roa	Earnings before extraordinary items scaled by beginning of period assets.
bhari	Industry adjusted buy-and-hold return over year *t*.

bhari_lag1	Industry adjusted buy-and-hold return over year *t-1*.
ceoage	Age of the CEO in years.
rdtoassets	Research and development expense scaled by assets.
percentindep	Percentage of a firm's board of directors consisting of independent directors.
tenure	CEO tenure in months.
logtdc1	Total CEO compensation as calculated by ExecuComp.
pctinstit	Percentage of shares held by institutional investors.
cft	Total cash flows calculated as the sum of earnings before extraordinary items and depreciation.
numdirectors	Number of directors on the board of directors.
meandirtenure	Average director tenure on the board of directors.
totalvol	Natural logarithm of the standard deviation of monthly stock returns over year *t*.
ppeg	Gross PP&E scaled by assets.
pctstdebt	Ratio of short-term debt to total debt.
ldelta	Natural logarithm of the delta component of all stock options in the manager's portfolio.
comp	Cash compensation of the manager.
stkvol	Annualized firm stock volatility.
mktvol	Annualized market volatility.
idiovol	Idiosyncratic component of stock volatility.
loss	Indicator variable that equals one if the firm reported a loss over the year and equals zero otherwise.
cash	Firm cash and cash equivalents scaled by total assets.
ret	Buy-and-hold return over year *t*.
lmvolume	Average of monthly trade volume over year *t*.

Appendix B – Sample Construction

Database and Sample Breakdown	Change	Total
Compustat (>=1990)		151,181
CRSP (>=1995)	-47,375	103,806
DealScan firms for all sample years	-21,704	82,102
Risk Metrics director data	-62,804	19,298
Risk Metrics governance data	-7,821	11,477
ExecuComp equity incentives data	-573	10,904

Appendix C – Construction of relationship strength variables using DealScan

We start the construction of our dataset by identifying, for each loan facility, lead banks on the premise that lead banks are the parties which interact the most with the borrower. In the identification process, we follow Bharath et al. (2009) and consider as lead banks all those who are: (i) single banks accorded the role of lead arranger credit, or (ii) retaining a significant share of the loan (greater than 25%) under the role of agent, administrative agent, arranger, or lead bank; or (iii) single banks (i.e., in non-syndicated loans). With this classification system, for our sample period we are able to identify a lead bank for about 95% of facilities. We then merge the DealScan dataset with borrower-level information taken from Compustat, CRSP, ExecuComp, and RiskMetrics using the link table provided by Chava and Roberts (2008) and proceed to compute the number of loans contracted over five years. As customary in relationship lending studies, we examine a five-year window as this is the average maturity of loans in DealScan;[96] however, Roberts and Sufi (2009) show how 90% of financial contracts are renegotiated prior to their stated maturity. Therefore, we consider the five-year window as an upper bound rather that the average duration of each contract. This point is particularly relevant given our research question, which aims to capture the time period when banks have the largest bargaining power over their borrowers, which is likely to be during the renegotiation process. That being said, we use three years as the average period to examine loan contracts with repeated lead lenders and retain the five-year data for robustness.[97] We then compute the number of times and the total dollar amount each borrower contracts with the same lead bank in the time window and use this information to classify each loan contract as a relationship lending contract (RLC) or a non-RLC. Given that each loan contract can have multiple lead lenders, to classify a contract as RLC, we require that the borrower contracts with at least one lead bank in the time-window considered.

To map the information from the loan level to the borrower-year level, we take the maximum number of RLCs in each year to be our indicator of how each borrower is exposed to the influence of a specific bank. For example, if a borrower contracts twice with Deutsche

[96] e.g., see Bharath et al. (2007).

[97] Relationship lending studies investigating contractual-outcome effects usually look at the past five years, excluding the year in which the contract is signed. However, our case is different since we aim to investigate potential effects banks (through contractual power) may have on borrowers. Therefore, we assume a more "forward-looking" perspective and include the present and the past years as the relevant time window. So for example, a three-year window consists of the current year plus the prior two years.

Bank between 2000 and 2005 and six times with Bank of America over the same time period, we take the number of repeated loans with Bank of America as the indicator of repeated loans for the borrower in 2005. We finally compute both the relative amount (*RelAmtRLC_h*) and number (*RelTimesRLC_h*) of RLC contracts over total loans for each given time period as suggested by Bharath et al. (2009) and illustrated in section 3.2 and scale them by the number of lead banks contracted with over the time period because, given our research question, the influence that each lender is likely to exercise over the borrower is a decreasing function of the other banks involved in financing.

As an alternative way to look at firm-bank relationship strength, we also use a market concentration measure: the Herfindahl–Hirschman Index (HHI). To compute HHI, we first compute the "loan market share" each lender has in each time window. For instance, in the previous example, Deutsche Bank has a loan market share of 2/(2+6) = 25% while Bank of America of 6/(2+6) = 75%. We proceed in a similar way with loan dollar amounts. Being aggregate statistics, the HHI measures are already computed at the borrower-year level and provide a different, yet interesting way to measure the strength of firm dependence on the banking system. To create the index, we need to consider that each loan can have more than one lead lender. For example, suppose borrower A has three loans over the *h*-year window, the first two syndicated with all banks and the third with only Banks 1 and 2. To compute the HHI, we consider each loan tranche with a specific lead lender separately. This way, Banks 1 and 2 appear in all three loans, while Bank 3 appears only in the first two loans. Accordingly, *HHItimes_h* = $(Bank_1Share)^2 + (Bank_2Share)^2 + (Bank_3Share)^2 = (3/8)^2 + (3/8)^2 + (2/8)^2 = 0.34$. This accounts for the fact that, although the borrower seems to be borrowing from the same three subjects (hence HHI should be close to 33%), the first two subjects have more lending activity with the borrower.

Appendix to Chapter 3

Appendix A – Variable Definitions

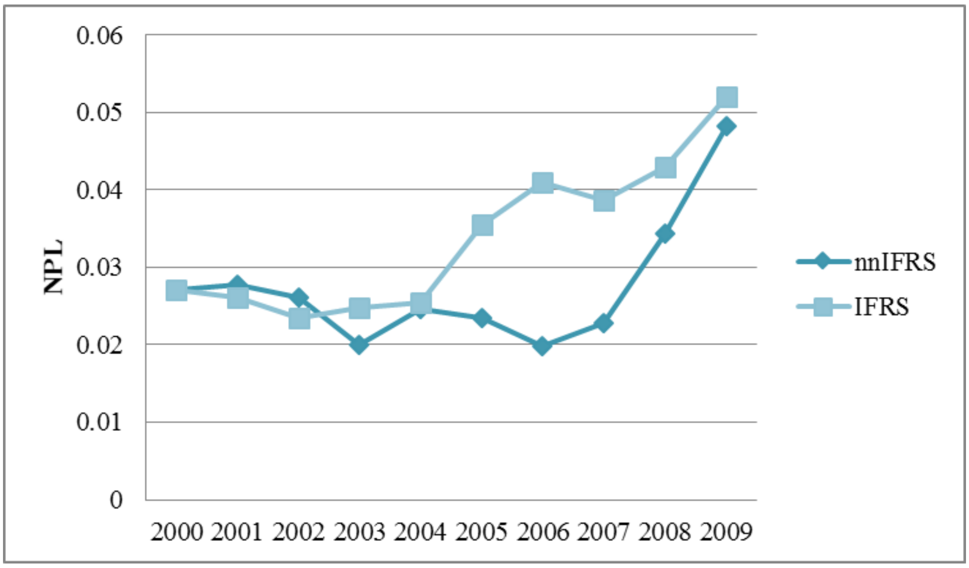
Book-to-market	Book value of total assets divided by total debt plus market value of equity
Capex	Capital expenditures scaled by lagged total assets
Capital covenants	Number of capital expenditure covenants plus number of capital covenants computed following Christensen and Nikolaev (2012), which include the quick and current ratios, debt-to-equity ratio, loan-to-value ratio, the ratio of debt to tangible net worth, leverage and senior leverage ratio, and net worth requirements
Cash flow to sales	Operating cash flow scaled by sales
Debt/at	Current debt plus long-term debt scaled by total assets
Delta	Log of 1 plus the sensitivity of manager wealth to a one percent change in the firm's stock price
Dividend restriction	Indicator variable equal to one if the contract contains a dividend restriction
Equity/at	Book value of equity scaled by total assets
FinRisk	The first component of a principal component factor analysis on leverage, debt/at, and equity/at
Leverage	Long-term debt divided by long-term debt plus market value of equity
Loan maturity	Logarithm of the loan maturity expressed in months
Loan spread	All-in-Drawn-Spread measure reported by Dealscan, which equals to the cost for the borrower over LIBOR for each dollar drawn down (spread and annual fees).
OpRisk	The first component of a principal-component factor analysis on firm's unlevered beta, R&D, and the quarterly standard deviation of cash flows
Performance covenants	Number of performance covenants computed according to Christensen and Nikolaev (2012) which include cash interest and debt service coverage ratio, level of EBITDA, coverage ratio, interest coverage ratio, the ratio of debt to EBITDA, and the ratio of senior debt to EBITDA
Performance pricing	Number of performance pricing provisions contained in the debt contract
R&D	R&D expense scaled by lagged total assets
Return on assets	Income before extraordinary items scaled by average total assets
Sales growth	Percentage change in sales from the prior year
Sd_cf	Standard deviation of quarterly cash flows
Size	Log of market capitalization
Stock volatility	Annualized standard deviation of daily stock return over the prior year

Sweep	Number of sweep provisions contained in the debt contract
Ubeta	Market beta divided by 1 plus total debt divided by market value of equity
Vega	Log of 1 plus the sensitivity of manager wealth to a one percentage point change in the firm's stock volatility
Z-score	Altman's Z-score index, computed as (3.3*pretax income + sales + 0.25*retained earnings + 0.5*working capital)/total assets

Figures and Tables

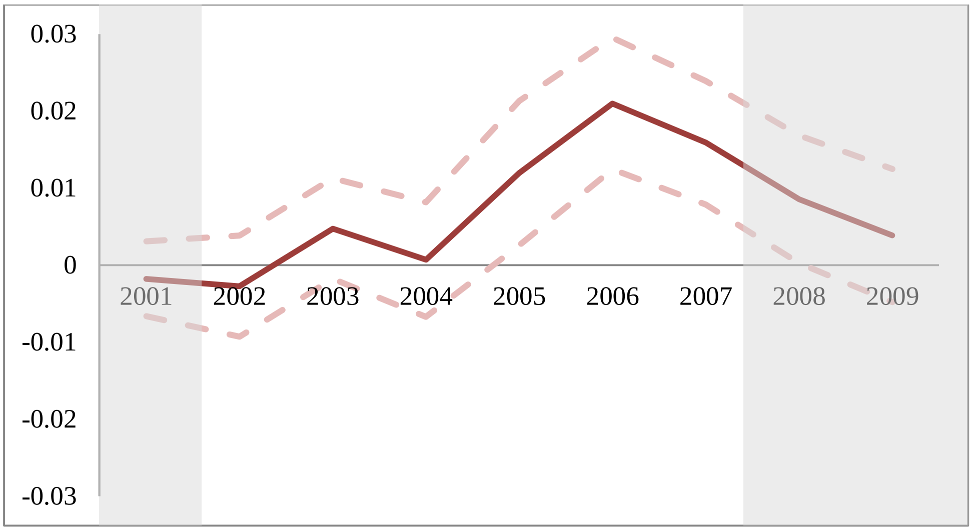
Figures and Tables of Chapter 1

Figure 1: Average NPL values for IFRS and non-IFRS countries



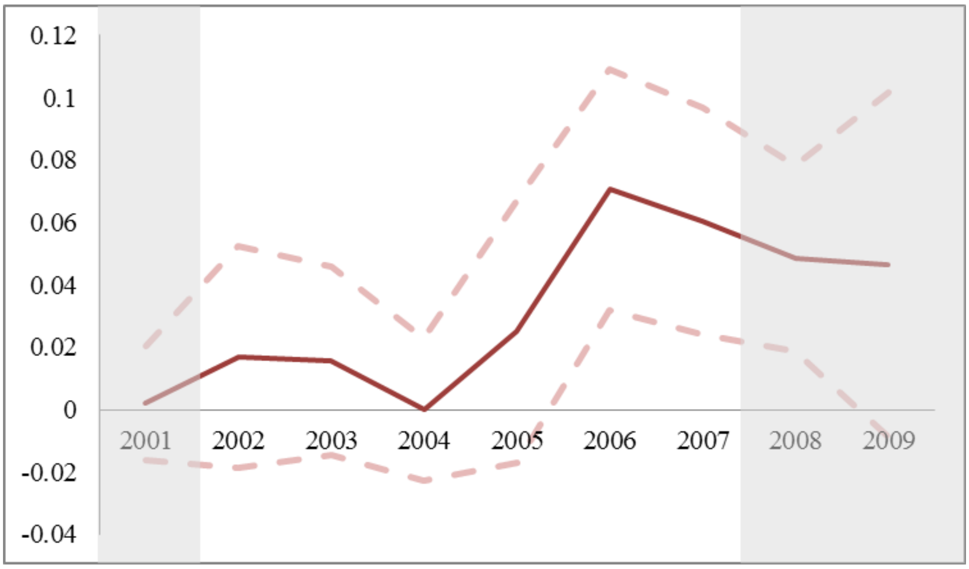
This figure plots the average percentage of non-performing loans (*NPL*) per year, divided between the treatment group (banks in IFRS countries) and control group (banks in non-IFRS countries). From the figure, it is possible to note that before 2005 (the year of IFRS adoption) the two sets of countries had similar trends in the percentage of NPLs.

Figure 2: Timing of observed changes in *NPL* among the treatment and control groups



This figure plots the yearly differences in *NPL* between the two sets of countries, that is, the interacted year coefficients from the regression $NPL_{bt} = \beta_0 + \beta_1 IFRS_b + \beta_2 year_t + \Sigma_t\ \beta_t\ IFRS_b \times year_t + \varepsilon_{bt}$. From the figure, it is possible to note that the adoption year is the first year in which the two countries start to report significant differences (the dotted lines represent confidence intervals). In 2003, the two sets of countries also report slightly different values, although the difference is not statistically significant.

Figure 3: Timing of observed changes in *NPL* and *FV Distance*



This figure plots the yearly differences in *NPL* as a function of the adopting countries' local GAAP use of FV, that is, the interacted year coefficients from the regression $NPL_{bt} = \beta_0 + \beta_1 FV\ Distance_b + \beta_2 year_t + \Sigma_t\ \beta_t\ FV\ Distance_b \times year_t + \varepsilon_{bt}$. From the figure, it is possible to see that the difference in *NPL* slightly decreases after 2005 but remains significant over the period considered.

Table 1 – Sample selection

The table reports the main steps for the sample selection process for the NPL (bank-level; Panel A) and mispricing (loan-level; Panel B) sample, dividing between IFRS and non-IFRS countries.

Panel A: NPL sample

Initial sample	82,972
less banks with total assets < $1 bil or without unconsolidated financial statements information available, non-subsequent or doubtful+ observations	71,601
Final sample	**11,371**
of which from IFRS countries (treated sample)	4,563
of which from non-IFRS countries (control sample)	6,808

+ Banks with negative, zero or missing values for total assets or gross loans

Panel B: Mispricing sample

Borrowing firms accounting information (Worldscope)	36,869
of which from IFRS countries*	15,607
of which from non-IFRS countries (excluding US)*	17,380
of which from non-IFRS countries (US only)*	3,882
Loan contracts (Dealscan)	29,202
of which from IFRS countries	7,734
of which from non-IFRS countries (excluding US)	8,605
of which from non-IFRS countries (US only)	12,863
Merged successfully (Final sample)+	**26,616**
of which from IFRS countries	4,216
of which from non-IFRS countries (excluding US)	6,846
of which from non-IFRS countries (US only)	15,554

* Excluding financial institutions and government entities

+ Excluding non-subsequent or borrowers with negative, zero or missing values for total assets

Table 2 – Sample composition by country and year

The table reports the number of observations by country (Panel A) and year (Panel B) for the NPL (bank-level) and mispricing (loan-level) sample.

Panel A: Sample composition by country

IFRS country sample

	NPL		Mispricing	
Country Name	**Freq.**	**%**	**Freq.**	**%**
Australia	160	1.4	674	2.5
Austria	-	-	21	0.1
Belgium	2	0.0	53	0.2
Denmark	117	1.0	39	0.1
Finland	35	0.3	49	0.2
France	805	7.1	644	2.4
Germany	46	0.4	331	1.2
Greece	35	0.3	95	0.4
Hong Kong	92	0.8	191	0.7
Ireland	59	0.5	59	0.2
Italy	1,712	15.1	210	0.8
Netherlands	1	-	189	0.7
Norway	203	1.8	93	0.3
Philippines	52	0.5	84	0.3
Portugal	121	1.1	-	-
South Africa	48	0.4	33	0.1
Spain	254	2.2	213	0.8
Sweden	149	1.3	80	0.3
Switzerland	330	2.9	96	0.4
United Kingdom	342	3.0	1,062	4.0
Total	**4,563**	**40.1**	**4,216**	**15.8**

non-IFRS country sample

	NPL		Mispricing	
Country Name	**Freq.**	**%**	**Freq.**	**%**
Brazil	398	3.5	70	0.3
Canada	39	0.3	999	3.8
Chile	-	-	42	0.2
India	528	4.6	301	1.1
Indonesia	-	-	98	0.4
Japan	309	2.7	3,310	12.4
Korea (South)	-	-	303	1.1
Mexico	93	0.8	82	0.3
Russia	-	-	95	0.4
Taiwan	9	0.1	1,329	5.0
Thailand	8	0.1	217	0.8
United States	5,424	47.7	15,554	58.4
Total	**6,808**	**59.9**	**22,400**	**84.2**

Panel B: Sample composition by year

NPL

Year	**non-IFRS**	**IFRS**
2000	520	287
2001	560	301
2002	565	330
2003	599	395
2004	682	390
2005	718	336
2006	732	445
2007	779	588
2008	811	716
2009	842	775
Total	**6,808**	**4,563**
Total (2002-2007)	**4,075**	**2,484**

Mispricing

Year	**non-IFRS**	**IFRS**
2000	2,310	344
2001	2,420	347
2002	2,493	342
2003	2,355	337
2004	2,565	424
2005	2,546	524
2006	2,428	498
2007	2,196	493
2008	1,702	479
2009	1,385	428
Total	**22,400**	**4,216**
Total (2002-2007)	**14,583**	**2,618**

Table 3 – Descriptive statistics and unconditional DID analysis

The table reports descriptive statistics (Panel A and B) and unconditional DID analysis (Panel C) of the main variables of interest. Panel A reports the main bank and macroeconomic characteristics while Panel B reports the borrower and loan characteristics. All variables are computed between 2002 and 2007 and are defined in the Appendix. In the mispricing sample, all voluntary IFRS adopters, as well as borrowers that still report local GAAP after 2005 in IFRS countries, have been excluded from the analyses. Panel A and B test the difference between IFRS and non-IFRS countries. T-statistics are provided together with their significant level. Panel C reports t- or F-statistics in parenthesis and excludes the US for reasons discussed in the text. Standard errors are clustered at the country level. ***, **, and * denote respectively significance at the .01, .05, and .1 level.

Panel A : Descriptive statistics – NPL sample

	IFRS						non-IFRS						
	N	**Mean**	**SD**	**p25**	**p50**	**p75**	**N**	**Mean**	**SD**	**p25**	**p50**	**p75**	**t-stat**
Bank characteristics													
Size	2,002	8.82	1.30	7.77	8.56	9.60	3,600	8.33	1.22	7.37	7.95	9.02	4.17 ***
NCO	779	0.00	0.01	0.00	0.00	0.00	3,038	0.01	0.01	0.00	0.00	0.01	-1.75 *
Capitalization	2,002	0.08	0.06	0.05	0.07	0.10	3,600	0.10	0.06	0.07	0.09	0.11	-2.94 **
Loan Loss Prov	1,821	0.00	0.01	0.00	0.00	0.00	3,574	0.00	0.01	0.00	0.00	0.00	-1.07
Gross Profit	1,821	0.02	0.01	0.01	0.01	0.02	3,574	0.02	0.02	0.01	0.02	0.03	-5.78 ***
Macroeconomic characteristics													
GDP Growth	2,002	2.19	1.40	1.68	2.29	3.09	3,595	3.16	1.82	1.79	2.79	3.35	-1.38
GDP (current US$)	2,002	1.39	0.84	0.41	1.52	2.13	3,595	10.59	4.61	10.98	12.28	13.86	-4.40 ***
Equity Mkt Importance	2,002	9.97	8.15	4.55	7.57	11.50	3,595	11.76	2.91	10.11	12.96	13.78	-0.64

Panel B : Descriptive statistics – Mispricing sample

	IFRS						non-IFRS						
	N	**Mean**	**SD**	**p25**	**p50**	**p75**	**N**	**Mean**	**SD**	**p25**	**p50**	**p75**	**t-stat**
Borrower characteristics													
Size	1,067	14.62	1.80	13.31	14.49	15.84	10,220	14.09	2.07	12.72	13.97	15.41	1.48
Leverage	1,067	0.24	0.18	0.10	0.22	0.34	10,211	0.27	0.22	0.10	0.24	0.39	-1.71 *
MtB	953	2.23	0.89	1.81	2.05	2.44	9,339	2.36	1.08	1.79	2.07	2.58	-1.72 *
Tangibility	1,065	0.35	0.24	0.18	0.32	0.50	10,159	0.35	0.24	0.14	0.30	0.53	0.18
CR	1,058	1.21	0.69	0.85	1.08	1.42	10,160	1.84	1.41	1.04	1.48	2.18	-8.78 ***
Loan characteristics													
LoanSize	1,056	19.61	1.52	18.72	19.68	20.72	10,264	18.31	2.01	17.22	18.64	19.67	3.31 ***
Maturity	1,047	3.92	0.63	3.74	4.09	4.28	10,090	3.69	0.68	3.58	4.06	4.09	3.36 ***
Secured	1,067	0.16	0.37	0	0	0	10,272	0.54	0.50	0	1	1	-10.80 ***
RelLoan	1,067	0.50	0.50	0	0	1	10,272	0.43	0.50	0	0	1	2.39 **

Panel C: DID analysis of selected variables

Bank sample (NPL)

NPL		pre	post			
(# of obs 2,246)		(a)	(b)	(b) - (a)		
non-IFRS	(1)	0.103	0.075	-0.028	(-2.13)	**
IFRS	(2)	0.026	0.037	0.010	(4.34)	**
	(2) - (1)	-0.077	-0.039	**0.038**		
		(-6.94)	(4.94)		(2.73)	**
		***	**			

Loans		pre	post			
(# of obs 2,523)		(a)	(b)	(b) - (a)		
non-IFRS	(1)	0.457	0.511	0.054	(2.26)	**
IFRS	(2)	0.625	0.637	0.012	(0.75)	
	(2) - (1)	0.168	0.125	**-0.043**		
		(3.01)	(5.25)		(-1.55)	
		***	**			

Loan sample (Mispricing)

Zscore		pre	post			
(# of obs 5,284)		(a)	(b)	(b) - (a)		
non-IFRS	(1)	1.979	2.428	0.449	(3.79)	***
IFRS	(2)	2.488	2.784	0.296	(4.75)	**
	(2) - (1)	0.509	0.356	**-0.153**		
		(3.21)	(5.46)		(-0.85)	
		***	**			

-1×Oscore		pre	post			
(# of obs 5,752)		(a)	(b)	(b) - (a)		
non-IFRS	(1)	3.450	3.576	0.127	(0.75)	
IFRS	(2)	3.505	3.471	-0.034	(0.10)	
	(2) - (1)	0.055	-0.106	**-0.161**		
		(0.25)	(0.31)		(-0.80)	

ROA		pre	post			
(# of obs 5,995)		(a)	(b)	(b) - (a)		
non-IFRS	(1)	0.051	0.061	0.010	(1.41)	
IFRS	(2)	0.078	0.095	0.018	(20.38)	***
	(2) - (1)	0.027	0.035	**0.008**		
		(2.17)	(15.69)		(0.96)	
		**	***			

Allindrawn		pre	post			
(# of obs 2,162)		(a)	(b)	(b) - (a)		
non-IFRS	(1)	132.133	113.560	-18.573	(-1.06)	
IFRS	(2)	115.779	136.110	20.331	(2.72)	
	(2) - (1)	-16.354	22.550	**38.904**		
		(-0.74)	(0.83)		(1.82)	*

Table 4 – NPL: Cross-sectional analysis

The table reports the results from the following model:

$$LQI_{bt} = \alpha_0 + \alpha_1 FV\ Distance_c + \boldsymbol{\alpha_c} \mathbf{CountrCNTR} + \boldsymbol{\alpha_b} \mathbf{BankCNTR} + year_t + \varepsilon_{bt}$$

for bank *b*, country *c*, and time *t*, where *LQI* is either the bank's NPLs over total loans (*NPL*) or the (net) loan amount actually charged off, scaled by total loans (*NCO*), and *FV Distance* is an index measuring the extent to which each country's set of local GAAP rules relies on historical cost as opposed to FV accounting. This index, suggested by Ball et al. (2013), assigns a score to each country in terms of the number of provisions contained in their accounting rules that are related to the use of FV. The index is computed following Ball et al. (2013) and using data from Bae et al. (2008). The higher the index, the more a country's accounting system differs from FV. *CountrCNTR* is a vector of country-level control variables which includes: the country legal origin (*Civil Law*), the strength of a country's creditor protection (*Credit Rights Strength*), the importance of a country's private long-term debt financing market (*Private Debt Importance, NrBank*), the level of a country's capital market integration (*Market Integration*), the growth and level of a country GDP (*GDP Growth* and *GDP in US$*), the relevance of a country equity market both in terms of market value of listed companies over GDP and dollar price change in the stock markets measured by S&P (*Equity Mkt Importance* and *S&P Equity Index ch*), a country rule of law indicating the perceptions of the extent to which agents have confidence in and abide by the rules of society (*Rule of Law*), and banks' risk premium on lending measured as the interest rate charged by banks on loans to private sector customers minus the treasury bill interest rate at which short-term government securities are issued or traded in the market (*Lending Risk Premium*). *BankCNTR* is a vector of bank-level controls which includes: the natural logarithm of bank's total assets (*Size*), the bank equity scaled by its total assets (*Capitalization*), bank total loans over total assets (*Total Loans*), the percentage of new loans contracted by banks (*New Loans*), bank loan loss provisions over total loans (*Loan Loss Prov*), bank profit before taxes and loan loss provisions over lagged total assets (*Gross Profit*), the ratio of non-interest income to total income (*non-Interest Income*), the ratio of liquid assets to liabilities (*Liquidity*). Model (1) and (2) report year-country average value of the dependent variables (*mnNPL*, *mnNCO*) and country-level regressors, while the remaining models report bank-year observations. Standard errors are clustered at the country level. ***, **, and * denote respectively significance at the .01, .05, and .1 level. T-statistics are in parenthesis. All models have been estimated over the period 2000-2004. Constant terms are included in the models and not reported to save space. The coefficients are multiplied by 100 to ease the exposition.

VARIABLES	(1) mnNPL	(2) mnNCO	(3) NPL	(4) NCO
FV Distance	**-6.108****	**1.242**	**-9.929*****	**-2.953****
	(-3.01)	**(0.76)**	**(-3.20)**	**(-2.31)**
Civil Law	4.290***	-0.245	9.153***	2.355**
	(3.69)	(-0.24)	(3.03)	(2.37)
Credit Rights Strength	0.723**	0.191	1.020*	-0.082
	(2.19)	(1.48)	(2.13)	(-0.86)
Private Debt Importance	2.448*	0.748	3.039**	0.319
	(2.16)	(1.69)	(2.52)	(1.24)
Market Integration	1.923	1.054	-0.493	-0.448
	(1.27)	(1.66)	(-0.22)	(-0.71)
GDP Growth	0.010	-0.026	0.225	0.063
	(0.04)	(-0.32)	(1.37)	(1.24)
GDP in USD	-0.283	0.378***	0.193	0.207***
	(-0.96)	(4.73)	(0.53)	(3.57)
Equity Mkt Importance	-0.057	-0.014	-0.166	0.049
	(-1.19)	(-0.51)	(-1.43)	(1.46)
S&P Equity Index ch	-0.009	-0.003	-0.003	-0.003
	(-0.70)	(-0.24)	(-0.30)	(-1.22)
…	…	…	…	…

Continued

Continued

…	…	…	…	…
Rule of Law	-1.209	-0.933*	2.145	0.805
	(-1.12)	(-1.90)	(1.13)	(1.77)
Lending Risk Premium	0.259***	0.027	0.297***	0.047***
	(5.69)	(1.62)	(4.55)	(5.50)
NrBanks	0.005	-0.009***	-0.000	-0.003
	(0.72)	(-5.60)	(-0.04)	(-1.54)
Size			-0.146	0.005
			(-1.04)	(0.44)
Capitalization			0.697	0.967
			(0.33)	(1.77)
Total Loans			-1.685	-1.227***
			(-1.33)	(-4.99)
New Loans			0.574	-0.032
			(1.50)	(-0.19)
Loan Loss Prov			89.984	120.268***
			(1.65)	(27.98)
Gross Profit			-4.918	1.113
			(-0.82)	(0.39)
non-Interest Income			-1.023	0.365***
			(-1.16)	(4.06)
Liquidity			1.156**	0.142
			(2.86)	(0.91)
Listed			-0.143	0.238
			(-0.17)	(0.75)
Year fixed effects	Yes	Yes	Yes	Yes
Bank specialization fixed effects	No	No	Yes	Yes
Observations	65	46	3,452	2,619
R-squared	0.664	0.610	0.460	0.694

Table 5 – NPL: DID estimator

The table reports the results from the following model:

$$LQI_{bt} = \beta_0 + \beta_1 IFRS_b + \beta_2 Post_t + \beta_3 IFRS_b \times Post_t + \boldsymbol{\beta_c CountrCNTR} + \boldsymbol{\beta_b BankCNTR} + \varepsilon_{bt}$$

for bank *b*, country *c*, and time *t*, where *LQI* is either the bank's NPLs over total loans (*NPL*) or the (net) loan amount actually charged off, scaled by total loans (*NCO*), *Post* is an indicator variable that equals one if the year is 2005 or later, *IFRS* is an indicator that equals one if the country adopted IFRS and *IFRS × Post* is a dummy variable for IFRS countries after IFRS adoption. *CountrCNTR* is a vector of country-level control variables which includes: *Credit Rights Strength*, *Private Debt Importance*, *NrBanks*, *Market Integration*, *GDP Growth* and *GDP in US$*, *Equity Mkt Importance* and *S&P Equity Index ch*, and *Rule of Law*. *BankCNTR* is a vector of bank-level controls which includes: *Capitalization*, *Total Loans*, *New Loans*, *Loan Loss Prov*, *Gross Profit*, *non-Interest Income*, and *Liquidity*. All variables are defined in the Appendix. All banks accounting measures are based on unconsolidated financial statements prepared according to local GAAP. Standard errors are clustered at the country level. ***, **, and * denote respectively significance at the .01, .05, and .1 level. T-statistics are in parenthesis. Constant terms and controls are included in the models as indicated and not reported to save space. The coefficients are multiplied by 100 to ease the exposition.

VARIABLES	(1) NPL	(2) NPL	(3) NPL	(4) NPL	(5) NPL	(6) NPL	(7) NCO
IFRS	-5.584**					-6.568**	-1.220***
	(-2.15)					(-2.66)	(-5.25)
Post	-3.405***					-4.493***	-1.067***
	(-8.11)					(-5.79)	(-2.97)
IFRS x Post	**3.527*** **	**2.360*** **	**2.181*** **	**1.049** **	**2.043*** **	**4.902*** **	**0.940** **
	(7.05)	**(4.93)**	**(4.84)**	**(2.51)**	**(5.11)**	**(5.36)**	**(2.29)**
Lending Risk Premium				0.152*			
				(2.12)			
FWRisk					0.107		
					(0.28)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank specialization fixed effects	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes	Yes	No	No
Bank fixed effects	No	No	Yes	No	No	No	No
Country fixed effects	No	Yes	No	Yes	Yes	No	No
Period	2002-07	2002-07	2002-07	2002-07	2002-07	2000-09	2000-09
Sample	No US	All	No US	No US	No US	No US	No US
Observations	2,073	3,272	2,073	1,235	755	3,579	1,332
R-squared	0.453	0.552	0.923	0.544	0.483	0.411	0.452

Table 6 – Use of fair value and NPL

The table reports the results from the following model:

$NPL_{bt} = \beta_0 + \beta_1 Post_t + \beta_2 FV\ Distance_c + \beta_3 FV\ Distance{\times}Post_{tc} + \boldsymbol{\beta_c CountrCNTR} + \boldsymbol{\beta_b BankCNTR} + \varepsilon_{bt}$

for bank *b*, country *c*, and time *t*. *NPL* is the bank's NPLs over total loans, *Post* is an indicator variable that equals one if the year is 2005 or later, *FV Distance* is an index measuring the extent to which each country's set of local GAAP rules relies on historical cost as opposed to FV accounting. The higher the index, the more a country's accounting system differs from FV. Model (4) to (6) replace FV Distance with the average change in firms' assets between 2004 and 2005 at the country level. *CountrCNTR* is a vector of country-level control variables which includes: *Credit Rights Strength*, *Private Debt Importance*, *NrBanks*, *Market Integration*, *GDP Growth* and *GDP in US$*, *Equity Mkt Importance* and *S&P Equity Index ch*, and *Rule of Law*. *BankCNTR* is a vector of bank-level controls which includes: *Capitalization*, *Total Loans*, *New Loans*, *Loan Loss Prov*, *Gross Profit*, *non-Interest Income*, and *Liquidity*. All variables are defined in the Appendix. All banks accounting measures are based on unconsolidated financial statements prepared according to local GAAP. Standard errors are clustered at the country level. ***, **, and * denote respectively significance at the .01, .05, and .1 level. T-statistics are in parenthesis. Constant terms and controls are included in the models as indicated and not reported to save space. The coefficients are multiplied by 100 to ease the exposition.

VARIABLES	(1) NPL	(2) NPL	(3) NPL	(4) NPL	(5) NPL	(6) NPL
Post	-3.692***	-2.488***	-1.652	-7.558**	-5.748*	-3.323*
	(-9.57)	(-4.97)	(-1.67)	(-2.78)	(-2.18)	(-2.00)
FV Distance	10.148**	14.630	5.484			
	(2.88)	(1.64)	(1.11)			
FV Dist x Post	**4.725*** **	**2.494** **	**0.921**			
	(10.79)	**(2.39)**	**(0.62)**			
Change in Assets				-11.918**	-9.023*	-8.172***
				(-3.20)	(-2.06)	(-5.32)
Ch in Assets x Post				**8.682** **	**6.827**	**4.517***
				(2.44)	**(1.89)**	**(2.03)**
Country controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	No	Yes	Yes	No	Yes	Yes
Bank specialization fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Period	2002-07	2002-07	2000-09	2002-07	2002-07	2000-09
Sample	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS
Observations	930	833	1,307	925	833	1,306
R-squared	0.243	0.322	0.242	0.246	0.325	0.270

Table 7 – Mispricing

The table reports the results from the following model run within each quartile:

$$Allindrawn_{ft} = \beta_0 + \beta_1 IFRS_f + \beta_2 Post_t + \beta_3 IFRS_f \times Post_t + \boldsymbol{\beta_b FirmCNTR} + \boldsymbol{\beta_f LoanCNTR_{ft}} + \boldsymbol{\beta_c CountryCNTR_{ft}}$$

for loan facility *f*, borrower *b*, country *c*, and time *t*, where *Allindrawn* is the interest spread at the contract level, *Post* is an indicator variable that equals one if the year is 2005 or later, and *IFRS* is an indicator variable that equals one if the borrower uses IFRS. *FirmCNTR* is a vector of control variables measured at the borrower-level and includes *Leverage, Size, ROA, Tangibility, CR, MtB, USGAAP, Zscore, Oscore,* and *LagLoss*. *LoanCNTR* is a vector of loan-level control variables which includes *LoanSize*, *Maturity*, *Secured*, *IstInv*, *Revolver*, *NrGC*, *NrFinCov*, *PP*, *RelLoan,* and *NrLend*. *CountrCNTR* is a vector of country-level control variables which includes: *Credit Rights Strength*, *Private Debt Importance*, *Market Integration*, *GDP Growth* and *GDP in US$*, *Equity Mkt Importance* and *S&P Equity Index ch*, and *Rule of Law*. All variables are defined in the Appendix. Quartiles are formed according to future values of borrowers' *Zscore*, *Oscore* and *ROA* (lower quartiles correspond to underperforming borrowers). At the bottom of each set of quartile regressions, the significance of the hedged portfolio (quartile 4 – quartile 1) is tested. Standard errors are clustered at the country level. ***, **, and * denote respectively significance at the .01, .05, and .1 level. T-statistics are in parenthesis. Constant terms and controls are included in the models as indicated and not reported to save space.

Dependent variable	Allindrawn											
Sorting variable	**Zscore$_{t+1}$**				**Oscore$_{t+1}$**				**ROA$_{t+1}$**			
	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Quartile 1	Quartile 2	Quartile 3	Quartile 4
IFRS	-34.550	-21.193	-15.142	-20.271	-50.966	-35.906*	-1.870	2.540	-3.523	17.196	-43.120*	-4.059
	(-0.98)	(-0.93)	(-0.91)	(-1.06)	(-1.65)	(-1.82)	(-0.11)	(0.15)	(-0.12)	(0.71)	(-2.00)	(-0.28)
Post	-24.210**	-2.385	-27.806***	-6.948**	-26.667***	-14.245**	-11.557***	-3.396	-42.497***	-11.170	-10.499**	-7.133**
	(-2.54)	(-0.27)	(-7.04)	(-2.41)	(-3.31)	(-2.58)	(-2.96)	(-0.78)	(-4.92)	(-1.50)	(-2.53)	(-2.07)
IFRS x Post	**-13.945**	**17.157**	**32.758*** **	**71.554*** **	**21.012**	**16.198**	**30.755*** *	**48.691*** **	**6.282**	**27.047**	**27.384*** *	**51.672*** **
	(-0.50)	**(1.57)**	**(3.07)**	**(6.58)**	**(1.17)**	**(1.03)**	**(2.54)**	**(5.97)**	**(0.34)**	**(1.36)**	**(2.28)**	**(6.39)**
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,384	2,828	3,141	3,957	3,321	3,174	3,369	3,555	3,025	2,700	3,224	3,656
R-squared	0.440	0.518	0.518	0.539	0.393	0.512	0.500	0.550	0.426	0.509	0.550	0.603
Difference post×IFRS$_{quartile4}$ – post×IFRS$_{quartile1}$				85.499 ***				27.679				45.39 **
			Chi2 =	12			Chi2 =	1.87			Chi2 =	6.49
			Sig =	0.000			Sig =	0.172			Sig =	0.011

Table 8 – Lending to IFRS borrowers

The table reports the results from the following model:

$NPL_{bt} = \beta_0 + \beta_1 IFRSLoans_{bt} + \boldsymbol{\beta_c CountrCNTR} + \boldsymbol{\beta_b BankCNTR} + \varepsilon_{bt}$

for bank *b*, country *c*, and time *t*, where *NPL* is the bank's NPLs over total loans and *IFRSLoans* is either the number (*% IFRSLoans (Nr)*) or dollar amount (*% IFRSLoans ($ Amt)*) of loans each bank lends to borrowers applying IFRS in year *t* over the total number (amount) of all bank loans in the same year. *CountrCNTR* is a vector of country-level control variables which includes: *Credit Rights Strength, Private Debt Importance, Market Integration, GDP Growth* and *GDP in US$*, *Equity Mkt Importance* and *S&P Equity Index ch*, and *Rule of Law*. *BankCNTR* is a vector of bank-level controls which includes: *Capitalization*, *Total Loans*, *New Loans*, *Loan Loss Prov*, *Gross Profit*, *non-Interest Income*, and *Liquidity*. All variables are defined in the Appendix. All banks accounting measures are based on unconsolidated financial statements prepared according to local GAAP. Standard errors are clustered at the country level. ***, **, and * denote respectively significance at the .01, .05, and .1 level. T-statistics are in parenthesis. Constant terms and controls are included in the models as indicated and not reported to save space.

VARIABLES	(1) NPL	(2) NPL	(3) NPL	(4) NPL
% IFRSLoans ($ Amt)	**0.026*** **	**0.043*** **		
	(2.85)	**(5.54)**		
% IFRSLoans (Nr)			**0.050**	**0.069** **
			(1.42)	**(2.45)**
Country controls	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Bank specialization fixed effects	Yes	Yes	Yes	Yes
Period	2002-07	2000-09	2002-07	2000-09
Sample	IFRS	IFRS	IFRS	IFRS
Observations	203	379	347	611
R-squared	0.552	0.561	0.557	0.505

Table 9 – Banks knowledge of IFRS

The table reports the results from the following model:

$$NPL_{bt} = \beta_0 + \beta_1 Post_t + \beta_2 Expert\ Bank_b + \beta_3 Post_t \times Expert_b + \boldsymbol{\beta_c CountrCNTR} + \boldsymbol{\beta_b BankCNTR} + \varepsilon_{bt}$$

for bank *b*, country *c*, and time *t*, where *NPL* is the bank's NPLs over total loans, *Post* is an indicator variable that equals one if the year is 2005 or later, *Expert Bank* is an indicator that equals one if the bank is more likely to have superior abilities in interpreting IFRS. A bank is deemed to have superior abilities if its *Size* is above the sample median and it belongs to a group of banks. *CountrCNTR* is a vector of country-level control variables which includes: *Credit Rights Strength*, *Private Debt Importance*, *Market Integration*, *GDP Growth* and *GDP in US$*, *Equity Mkt Importance* and *S&P Equity Index ch*, and *Rule of Law*. *BankCNTR* is a vector of bank-level controls which includes: *Capitalization*, *Total Loans*, *New Loans*, *Loan Loss Prov*, *Gross Profit*, *non-Interest Income*, and *Liquidity*. All variables are defined in the Appendix. All banks accounting measures are based on unconsolidated financial statements prepared according to local GAAP. Standard errors are clustered at the country level. ***, **, and * denote respectively significance at the .01, .05, and .1 level. T-statistics are in parenthesis. Constant terms and controls are included in the models as indicated and not reported to save space. The coefficients are multiplied by 100 to ease the exposition.

VARIABLES	(1) NPL	(2) NPL	(3) NPL
Post	0.338		0.347
	(0.68)		(0.63)
Expert Bank	0.602**		0.345
	(2.57)		(1.35)
Post x Expert	**-1.345****	**-1.163***	**-1.124***
	(-2.16)	**(-1.90)**	**(-2.06)**
Country controls	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes
Country fixed effects	No	Yes	No
Year fixed effects	No	Yes	No
Bank specialization fixed effects	Yes	Yes	Yes
Period	2002-07	2002-07	2000-09
Sample	IFRS	IFRS	IFRS
Observations	1,391	1,391	2,428
R-squared	0.276	0.344	0.253

Table 10 – Interest rate dispersion

The table reports the results from the following model:

$$Dispersion_{tci} = \beta_0 + \beta_1 IND_b + \beta_2 Post_t + \beta_3 IND_b \times Post_t + AvgRate_{tci} + \boldsymbol{\beta_c CountrCNTR} + \varepsilon_{bt}$$

for year *t*, country *c*, and industry *i*, where *Dispersion* is the industry–country–year standard deviation of interest rates (SD). The SD is either unconditional or conditional on other loan characteristics (*LoanSize*, *Maturity*, *Secured*, *IstInv*, *Revolver*, *NrGC*, *NrFinCov*, *PP*, *RelLoan*, and *NrLend*). In the latter case, the standard deviation is computed over the residuals from a regression of interest rates on the recalled loan characteristics. *IND* is an indicator variable taking the value of one for listed firms in IFRS-adopting countries (Models 1–6) or equal to *FV Distance* (Models 7–8), and *Post* is an indicator variable that equals one if the year is 2005 or later. Models 1–6 include both private (control group) and listed firms (treatment group) among IFRS countries, while Model 7–8 include only listed firms among IFRS countries. *AvgRate* is the average industry–country–year interest rate applied. *CountrCNTR* is a vector of country-level control variables which includes: *Credit Rights Strength, Private Debt Importance*, *Market Integration, GDP Growth* and *GDP in US$*, *Equity Mkt Importance* and *S&P Equity Index ch*, and *Rule of Law*. All variables are defined in the Appendix. Lower values of *Dispersion* indicate higher information asymmetry. Standard errors are clustered at the industry level (model 1 to 6) or at the country level (model 7-8). ***, **, and * denote respectively significance at the .01, .05, and .1 level. T-statistics are in parenthesis. Constant terms and controls are included in the models as indicated and not reported to save space.

VARIABLES	(1) Uncond SD	(2) Cond SD	(3) Cond SD	(4) Uncond SD	(5) Cond SD	(6) Cond SD	(7) Cond SD	(8) Cond SD
Post	0.462***	0.312***		0.479***	0.381***		0.303***	0.393***
	(4.92)	(3.28)		(5.36)	(4.28)		(3.09)	(5.83)
IFRS Firms	-0.056	0.001		0.001	0.018			
	(-0.69)	(0.02)		(0.02)	(0.30)			
IFRS x Post	**-0.245****	**-0.227****	**-0.219***	**-0.306*****	**-0.255*****	**-0.385*****		
	(-2.33)	**(-2.29)**	**(-1.80)**	**(-3.31)**	**(-2.94)**	**(-3.57)**		
FV Distance							-0.434	0.133
							(-1.19)	(0.61)
FV Dist x Post							**-0.311**	**-0.494*****
							(-1.17)	**(-2.93)**
Country controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	No	No	Yes	No	No
Period	2002-07	2002-07	2002-07	2000-09	2000-09	2000-09	2002-07	2000-09
Sample	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS
Control group	Private firms	Private firms	Private firms	Private firms	Private firms	Private firms	Public firms	Public firms
Observations	628	610	614	902	881	885	253	398
R-squared	0.518	0.501	0.653	0.457	0.421	0.586	0.560	0.446

Figures and Tables of Chapter 2

Figure 1 – Relationship lending contracts over time.

The figure shows how we compute our firm-bank relationship strength measures, depicting typical borrowing activity of a firm (‘*Firm A*’) in our sample over the years 2000-2012. Panel A reports the borrowing activity divided by relationship based contracts (RLC) and non-RLC, together with a computation of our RLC-based measures (*RelAmtRLC5y and RelTimesRLC5y*) and concentration indexes (*HHIamt5y* and *HHItimes5y*). Panel B offers a graphical representation of the content of Panel A, aggregated by firm-year (our unit of analysis). Bars represent aggregated loan dollar amounts (left y axis), while lines represent relationship measures (right y axis).

Panel A

Firm A								
year	**Loan facility ($/000)**		**Relat. Measures**		Lender	Cumulative	**Concentr Measures**	
	RLC	*non-RLC*	*RelAmtRLC5y*	*RelTimesRLC5y*	name	Lenders#	*HHIamt5y*	*HHItimes5y*
2000	-	500	0	0	1	1	1.00	1.00
2001	-	-	0	0		1	1.00	1.00
2002	500	-	0.71	0.67	1	1	1.00	1.00
2002	700	-	0.71	0.67	1	1	1.00	1.00
2003	-	-	0.71	0.67		1	1.00	1.00
2004	500	300	0.34	0.30	1,2	2	0.79	0.63
2005	-	-	0.43	0.38		2	0.75	0.63
2006	-	400	0.21	0.25	3	3	0.44	0.33
2006	-	300	0.16	0.19	4	4	0.44	0.33
2007	-	-	0.08	0.06		4	0.26	0.25
2008	-	-	0.08	0.06		4	0.26	0.25
2009	-	100	0.31	0.00	5	4	0.41	0.33
2010	-	400	0.00	0.00	6	4	0.29	0.25
2011	-	-	0.00	0.00		2	0.68	0.50
2012	-	200	0.00	0.00	7	3	0.43	0.33

Panel B

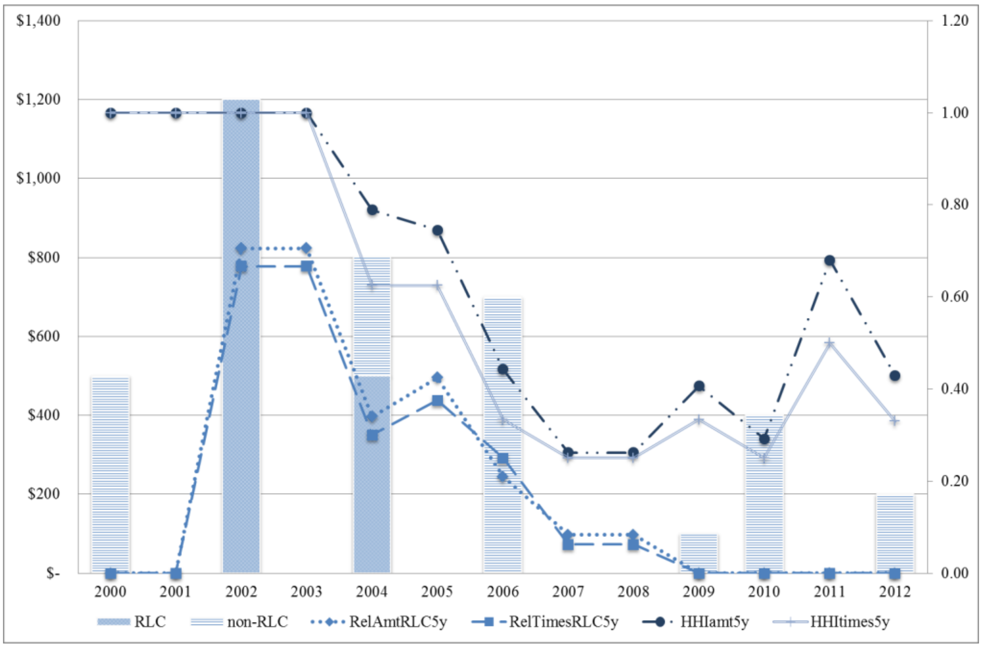


Figure 2 – Relationship lending contracts over time.

The figure shows how we compute our firm-bank relationship strength measures, depicting typical borrowing activity of a firm (‘*Firm B*’) in our sample over the years 2000-2012. Panel A reports the borrowing activity divided by relationship based contracts (RLC) and non-RLC, together with a computation of our RLC-based measures (*RelAmtRLC5y and RelTimesRLC5y*) and concentration indexes (*HHIamt5y* and *HHItimes5y*). Panel B offers a graphical representation of the content of Panel A, aggregated by firm-year (our unit of analysis). Bars represent aggregated loan dollar amounts (left y axis), while lines represent relationship measures (right y axis).

Panel A

Firm B

year	Loan facility ($/000)		Relat. Measures		Lender	Cumulative	Concentr Measures	
	RLC	*non-RLC*	*RelAmtRLC5y*	*RelTimesRLC5y*	name	Lenders#	*HHIamt5y*	*HHItimes5y*
2000	-	500	0	0	1	1	1.00	1.00
2001	-	-	0	0		1	1.00	1.00
2002	500	-	0.71	0.67	1	1	1.00	1.00
2002	700	-	0.71	0.67	1	1	1.00	1.00
2003	-	-	0.71	0.67		1	1.00	1.00
2004	500	300	0.34	0.30	1,2	2	0.63	0.79
2005	-	-	0.43	0.38		2	0.63	0.75
2006	-	400	0.21	0.25	3	3	0.33	0.44
2006	-	300	0.16	0.19	4	4	0.33	0.44
2007	-	-	0.08	0.06		4	0.25	0.26
2008	300	-	0.11	0.06	3	4	0.28	0.28
2009	-	100	0.09	0.08	5	3	0.38	0.44
2010	-	400	0.05	0.05	6	4	0.28	0.33
2011	-	-	0.13	0.11		3	0.33	0.41
2012	-	700	0.05	0.06	7	4	0.25	0.33

Panel B

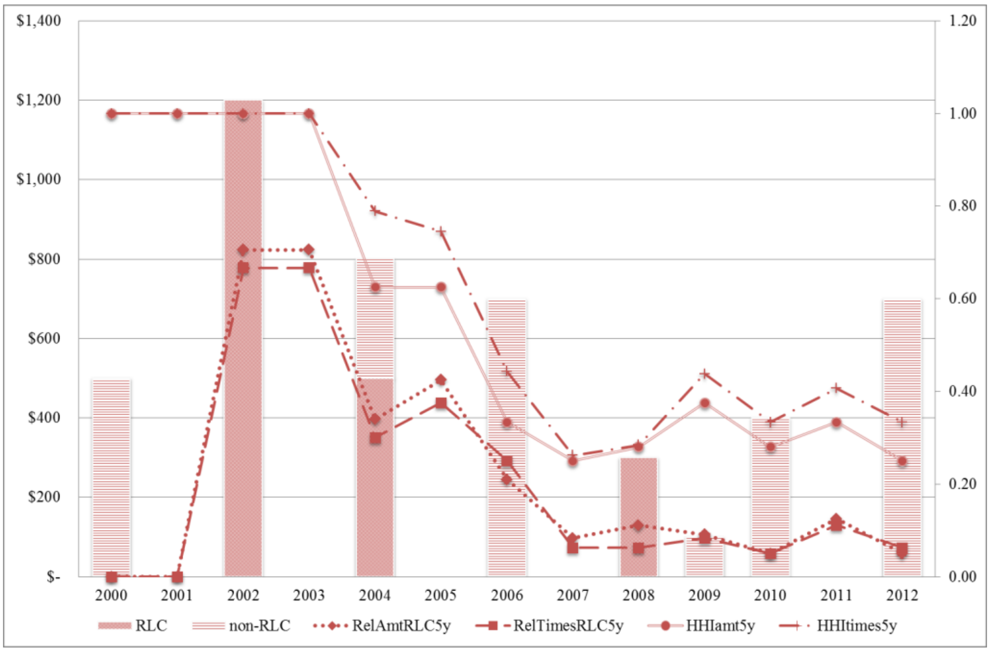


Table 1 – Descriptive statistics

The table presents descriptive statistics for our corporate governance levers (Panel A), the main independent (Panel B), and control variables (Panel C). All variables are defined in the appendix. All continous variables are winsorized at the .01 and .99 level, except stock returns.

Panel A - Dependent variables

Variables	N	Mean	St. Dev	p25	p50	p75
ischair	21,542	0.449	0.497	0	0	1
cboard	13,353	0.529	0.499	0	1	1
ppill	13,353	0.398	0.490	0	0	1
percentinterlocks	21,542	0.005	0.031	0	0	0
lnewvega	13,935	2.263	1.749	0	2.487	3.646
lvega	13,899	3.877	1.654	3.012	4.032	5.014
abas	21,504	-5.781	1.445	-6.944	-5.961	-4.515

Panel B - Main independent variables

Variables	N	Mean	St. Dev	p25	p50	p75
lnAmtRLC3y	58,024	11.234	9.415	0.000	16.213	19.673
NrBanks3y	58,024	3.186	4.392	1.000	2.000	3.000
RL4_3y	58,024	0.184	0.256	0.000	0.067	0.267
HHIamt3y	58,024	0.593	0.354	0.321	0.520	1.000
TopShamt3y	58,024	0.634	0.341	0.380	0.625	1.000

Panel C - Control variables

Variables	N	Mean	St. Dev	p25	p50	p75
size	21,542	7.601	1.566	6.509	7.476	8.585
mb	21,150	3.009	2.997	1.446	2.152	3.412
lev1	21,486	0.564	0.212	0.421	0.568	0.705
roa	21,542	0.050	0.092	0.016	0.048	0.092
bhari	21,542	-0.084	0.481	-0.300	-0.093	0.099
percentindep	21,542	0.693	0.175	0.583	0.727	0.833
ceoage	14,144	56.782	7.175	52.000	57.000	61.000
tenure	13,758	107.900	89.000	50.000	83.000	141.000
ldelta	13,464	5.545	1.485	4.593	5.521	6.486
comp	15,851	0.591	0.276	0.425	0.661	0.816
lmvolume	21,542	11.510	1.563	10.490	11.480	12.520
stkvol	16,925	0.028	0.013	0.019	0.025	0.034
mktvol	16,925	0.012	0.005	0.008	0.012	0.015

Table 2 – Carrelation matrix

The table presents pairwise correlation coefficients among different specifications of the main independent variables. The sample consists of 8,087 firm-year observations. Bold coefficients are significant at the .05 level or below.

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(l)	(m)
(a) ischair	1.00										
(b) cboard	**0.05**	1.00									
(c) ppill	**0.07**	**0.24**	1.00								
(d) percentinterlocs	**0.03**	-0.01	-0.01	1.00							
(e) lnewvega	**0.06**	0.01	**0.06**	**0.06**	1.00						
(f) abas	0.01	**0.10**	**0.24**	0.01	**-0.12**	1.00					
(g) lnAmtRLC3y	**0.06**	-0.01	0.01	**0.06**	**0.13**	-0.01	1.00				
(h) NrBanks3y	**0.04**	**-0.08**	**-0.09**	**0.14**	**0.14**	**-0.21**	**0.29**	1.00			
(i) RL4_3y	0.01	**0.02**	**0.06**	**-0.01**	**0.04**	**0.11**	**0.55**	**-0.21**	1.00		
(l) HHIamt3y	0.01	**0.06**	**0.11**	-0.01	**-0.02**	**0.20**	**-0.05**	**-0.42**	**0.42**	1.00	
(m) TopShamt3y	**0.02**	**0.06**	**0.11**	0.00	-0.01	**0.20**	**0.01**	**-0.38**	**0.41**	**0.99**	1.00

Table 3 – Relationship lending and managerial entrenchment

The table present the regression results for the following model:

$$lever_{it} = \alpha + \beta RelStrength_{it} + \boldsymbol{\delta Controls_{it}} + FirmFE_i + \varepsilon_{it}$$

where i denotes firms, t denotes years, lever represents either an indicator variable that equals one if the CEO is also the Chairman of the Board and zero otherwise (ischair), an indicator variable that equals one if the board of directors is staggered and zero otherwise (cboard), and an indicator variable that equals one if the firm has a poison pill provision and zero otherwise (ppill). lnAmtRLC3y is the natural logarithm of the amount ($/000) of all relationship loans each borrower has with the same lender over three years. NrBanksh is the total number of lead banks borrowed from over time period h. RelAmtRLC3y is the ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower had over three years, scaled by the total number of lead banks borrowed from over three years. HHIamt3y is the Herfindahl-Hirschman index computed using the borrower's loan amounts granted by each lead bank over the prior 3 years. TopShamt3y is the highest proportion of loans that the borrower contracted with a lead lender over the over the prior 3 years. All other variables are defined in the appendix. Standard errors are clustered at the borrower level. ***, **, and * denote respectively significance at the .1, .05, and .01 level. T-statistics are in parenthesis. Constant terms are included in the models and not reported to save space.

Panel A

VARIABLES	(1) ischair	(2) ischair	(3) ischair	(4) ischair	(1) ischair	(2) ischair	(3) ischair	(4) ischair
lnAmtRLC3y	**0.001**				**0.001***			
	(1.05)				**(1.69)**			
NrBanks3y	**0.002**				**-0.007***			
	(0.55)				**(-1.80)**			
RelAmtRLC3y		**-0.001**				**0.053*****		
		(-0.07)				**(2.83)**		
HHIamt3y			**-0.000**				**0.093*****	
			(-0.03)				**(3.93)**	
TopShamt3y				**0.000**				**0.110*****
				(0.03)				**(4.32)**
size	0.023*	0.024*	0.024*	0.024*	-0.003	-0.005	0.003	0.005
	(1.77)	(1.93)	(1.92)	(1.92)	(-0.24)	(-0.38)	(0.27)	(0.36)
mb	0.005*	0.005	0.005	0.005	0.001	0.001	-0.000	-0.001
	(1.68)	(1.58)	(1.57)	(1.57)	(0.31)	(0.34)	(-0.11)	(-0.17)
lev1	-0.061	-0.048	-0.048	-0.048	-0.088	-0.094	-0.048	-0.046
	(-0.87)	(-0.68)	(-0.69)	(-0.69)	(-1.17)	(-1.27)	(-0.64)	(-0.61)
roa	-0.088	-0.089	-0.089	-0.089	0.184**	0.187**	0.176*	0.174*
	(-1.04)	(-1.05)	(-1.05)	(-1.05)	(1.99)	(2.03)	(1.91)	(1.89)
bhari	-0.012	-0.012	-0.012	-0.012	-0.027**	-0.027**	-0.026**	-0.026**
	(-1.34)	(-1.34)	(-1.34)	(-1.34)	(-2.33)	(-2.33)	(-2.29)	(-2.30)
bhari_lag1	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001
	(-0.28)	(-0.26)	(-0.26)	(-0.26)	(-0.23)	(-0.21)	(-0.10)	(-0.09)
rdtoassets	-0.374	-0.368	-0.368	-0.368	-0.174	-0.167	-0.183	-0.192
	(-0.92)	(-0.91)	(-0.91)	(-0.91)	(-0.38)	(-0.36)	(-0.40)	(-0.42)
percentindep	-0.121**	-0.122**	-0.122**	-0.122**	-0.188***	-0.195***	-0.176***	-0.169***
	(-2.37)	(-2.38)	(-2.38)	(-2.37)	(-3.42)	(-3.59)	(-3.22)	(-3.07)
pctinstit	-0.182***	-0.183***	-0.183***	-0.183***	0.421***	0.424***	0.418***	0.415***
	(-4.80)	(-4.84)	(-4.84)	(-4.83)	(20.74)	(21.25)	(20.81)	(20.61)
logtdc1	-0.005	-0.004	-0.004	-0.004				
	(-0.60)	(-0.54)	(-0.54)	(-0.54)				
ceoage	0.012***	0.012***	0.012***	0.012***				
	(5.04)	(5.02)	(5.03)	(5.03)				
tenure	0.001***	0.001***	0.001***	0.001***				
	(5.52)	(5.52)	(5.52)	(5.52)				
Observations	12,830	12,830	12,830	12,830	15,009	15,009	15,009	15,009
R-squared	0.700	0.700	0.700	0.700	0.448	0.448	0.449	0.449

Table 3 – Relationship lending and managerial entrenchment

The table present the regression results for the following model:

$$lever_{it} = \alpha + \beta RelStrength_{it} + \boldsymbol{\delta Controls_{it}} + FirmFE_i + \varepsilon_{it}$$

where i denotes firms, t denotes years, lever represents either an indicator variable that equals one if the CEO is also the Chairman of the Board and zero otherwise (ischair), an indicator variable that equals one if the board of directors is staggered and zero otherwise (cboard), and an indicator variable that equals one if the firm has a poison pill provision and zero otherwise (ppill). lnAmtRLC3y is the natural logarithm of the amount ($/000) of all relationship loans each borrower has with the same lender over three years. NrBanksh is the total number of lead banks borrowed from over time period h. RelAmtRLC3y is the ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower had over three years, scaled by the total number of lead banks borrowed from over three years. HHIamt3y is the Herfindahl-Hirschman index computed using the borrower's loan amounts granted by each lead bank over the prior 3 years. TopShamt3y is the highest proportion of loans that the borrower contracted with a lead lender over the over the prior 3 years. All other variables are defined in the appendix. Standard errors are clustered at the borrower level. ***, **, and * denote respectively significance at the .1, .05, and .01 level. T-statistics are in parenthesis. Constant terms are included in the models and not reported to save space.

Panel B

	(1)	(2)	(3)	(4)
VARIABLES	cboard	cboard	cboard	cboard
lnAmtRLC3y	**0.002*** **			
	(4.06)			
NrBanks3y	**-0.011*** **			
	(-3.84)			
RelAmtRLC3y		**0.034*** **		
		(2.61)		
HHIamt3y			**0.031*** **	
			(3.37)	
TopShamt3y				**0.035*** **
				(3.80)
size	-0.002	-0.003	-0.002	-0.002
	(-0.17)	(-0.24)	(-0.15)	(-0.17)
mb	0.007**	0.007**	0.007**	0.007**
	(2.20)	(2.24)	(2.23)	(2.25)
lev1	-0.151***	-0.151***	-0.147***	-0.149***
	(-2.95)	(-2.97)	(-2.90)	(-2.95)
roa	-0.087*	-0.077	-0.079	-0.080
	(-1.70)	(-1.49)	(-1.52)	(-1.53)
bhari	-0.000	-0.001	-0.001	-0.001
	(-0.04)	(-0.07)	(-0.14)	(-0.15)
bhari_lag1	0.005	0.005	0.005	0.005
	(0.81)	(0.77)	(0.74)	(0.74)
rdtoassets	-0.007	-0.003	0.007	0.002
	(-0.03)	(-0.01)	(0.03)	(0.01)
percentindep	-0.235***	-0.252***	-0.250***	-0.247***
	(-4.65)	(-4.94)	(-4.90)	(-4.86)
pctinstit	0.017	0.015	0.015	0.015
	(0.47)	(0.43)	(0.40)	(0.40)
logtdc1	-0.010	-0.011	-0.011	-0.011
	(-1.34)	(-1.55)	(-1.47)	(-1.45)
ceoage	-0.001	-0.001	-0.001	-0.001
	(-0.53)	(-0.49)	(-0.52)	(-0.51)
tenure	-0.000	-0.000	-0.000	-0.000
	(-0.71)	(-0.76)	(-0.74)	(-0.74)
Observations	8,516	8,516	8,516	8,516
R-squared	0.872	0.871	0.871	0.871

Table 3 – Relationship lending and managerial entrenchment

The table present the regression results for the following model:

$$lever_{it} = \alpha + \beta RelStrength_{it} + \boldsymbol{\delta Controls_{it}} + FirmFE_i + \varepsilon_{it}$$

where i denotes firms, t denotes years, lever represents either an indicator variable that equals one if the CEO is also the Chairman of the Board and zero otherwise (ischair), an indicator variable that equals one if the board of directors is staggered and zero otherwise (cboard), and an indicator variable that equals one if the firm has a poison pill provision and zero otherwise (ppill). lnAmtRLC3y is the natural logarithm of the amount ($/000) of all relationship loans each borrower has with the same lender over three years. NrBanksh is the total number of lead banks borrowed from over time period h. RelAmtRLC3y is the ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower had over three years, scaled by the total number of lead banks borrowed from over three years. HHIamt3y is the Herfindahl-Hirschman index computed using the borrower's loan amounts granted by each lead bank over the prior 3 years. TopShamt3y is the highest proportion of loans that the borrower contracted with a lead lender over the over the prior 3 years. All other variables are defined in the appendix. Standard errors are clustered at the borrower level. ***, **, and * denote respectively significance at the .1, .05, and .01 level. T-statistics are in parenthesis. Constant terms are included in the models and not reported to save space.

Panel C

	(1)	(2)	(3)	(4)
VARIABLES	ppill	ppill	ppill	ppill
lnAmtRLC3y	**0.002*** **			
	(3.26)			
NrBanks3y	**-0.010** **			
	(-2.58)			
RelAmtRLC3y		**0.048** **		
		(2.21)		
HHIamt3y			**0.066*** **	
			(4.17)	
TopShamt3y				**0.075*** **
				(4.62)
size	-0.029*	-0.029*	-0.027*	-0.027*
	(-1.75)	(-1.76)	(-1.65)	(-1.67)
mb	0.008*	0.008*	0.008*	0.008*
	(1.71)	(1.72)	(1.70)	(1.72)
lev1	-0.118	-0.116	-0.113	-0.118
	(-1.26)	(-1.23)	(-1.21)	(-1.27)
roa	-0.014	-0.007	-0.015	-0.016
	(-0.13)	(-0.07)	(-0.14)	(-0.15)
bhari	0.005	0.005	0.004	0.004
	(0.41)	(0.40)	(0.32)	(0.30)
bhari_lag1	0.010	0.010	0.010	0.010
	(0.72)	(0.73)	(0.72)	(0.71)
rdtoassets	-0.519	-0.521	-0.519	-0.529
	(-0.83)	(-0.83)	(-0.83)	(-0.85)
percentindep	-0.348***	-0.362***	-0.354***	-0.350***
	(-4.81)	(-5.01)	(-4.92)	(-4.88)
pctinstit	-0.108*	-0.109*	-0.109*	-0.109*
	(-1.93)	(-1.94)	(-1.96)	(-1.96)
logtdc1	-0.026**	-0.028***	-0.026**	-0.026**
	(-2.53)	(-2.66)	(-2.54)	(-2.51)
ceoage	0.001	0.001	0.001	0.001
	(0.35)	(0.36)	(0.33)	(0.34)
tenure	-0.000**	-0.000**	-0.000**	-0.000**
	(-2.20)	(-2.23)	(-2.22)	(-2.22)
Observations	8,516	8,516	8,516	8,516
R-squared	0.681	0.680	0.682	0.682

Table 4 – Relationship lending and bank-firm interlocks

The table present the regression results for the following model:

$$lever_{it} = \alpha + \beta RelStrength_{it} + \boldsymbol{\delta Controls_{it}} + FirmFE_i + \varepsilon_{it}$$

where i denotes firms, t denotes years, and lever is either the number (# interlocks) or the proportion (% interlocks) of firm-bank interlocking directors. A director is a firm-bank interlock if she is employed by a bank that made a loan to the firm at any point in the sample period. lnAmtRLC3y is the natural logarithm of the amount ($/000) of all relationship loans each borrower has with the same lender over three years. NrBanksh is the total number of lead banks borrowed from over time period h. RelAmtRLC3y is the ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower had over three years, scaled by the total number of lead banks borrowed from over three years. HHIamt3y is the Herfindahl-Hirschman index computed using the borrower's loan amounts granted by each lead bank over the prior 3 years. TopShamt3y is the highest proportion of loans that the borrower contracted with a lead lender over the over the prior 3 years. All other variables are defined in the appendix. Standard errors are clustered at the borrower level. ***, **, and * denote respectively significance at the .1, .05, and .01 level. T-statistics are in parenthesis. Constant terms are included in the models and not reported to save space.

	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
VARIABLES	# interlocks				% interlocks			
lnAmtRLC3y	**0.000**				**0.000**			
	(1.17)				**(0.89)**			
NrBanks3y	**-0.007**				**-0.001**			
	(-1.63)				**(-1.63)**			
RelAmtRLC3y		**0.003**				**0.000**		
		(0.35)				**(0.22)**		
HHIamt3y			**0.021****				**0.002***	
			(2.39)				**(1.88)**	
TopShamt3y				**0.025*****				**0.002****
				(2.70)				**(2.19)**
size	-0.015	-0.018**	-0.017*	-0.017*	-0.001	-0.001*	-0.001	-0.001
	(-1.62)	(-2.02)	(-1.91)	(-1.91)	(-1.34)	(-1.69)	(-1.60)	(-1.59)
mb	0.004*	0.004*	0.004*	0.004*	0.000*	0.000*	0.000*	0.000*
	(1.65)	(1.81)	(1.75)	(1.75)	(1.71)	(1.88)	(1.82)	(1.81)
lev1	-0.010	-0.021	-0.018	-0.019	0.000	-0.001	-0.000	-0.000
	(-0.25)	(-0.50)	(-0.45)	(-0.46)	(0.09)	(-0.13)	(-0.09)	(-0.10)
roa	-0.002	0.005	0.003	0.003	-0.004	-0.004	-0.004	-0.004
	(-0.02)	(0.05)	(0.03)	(0.03)	(-0.35)	(-0.30)	(-0.31)	(-0.32)
bhari	-0.003	-0.003	-0.003	-0.003	-0.000	-0.000	-0.000	-0.000
	(-0.53)	(-0.55)	(-0.54)	(-0.54)	(-0.58)	(-0.60)	(-0.59)	(-0.59)
cft	0.010	0.014	0.012	0.012	0.005	0.006	0.005	0.005
	(0.11)	(0.15)	(0.13)	(0.14)	(0.52)	(0.55)	(0.54)	(0.54)
numdirectors	0.015***	0.015***	0.015***	0.015***	0.000	0.000	0.000	0.000
	(3.00)	(3.04)	(3.04)	(3.04)	(0.41)	(0.43)	(0.42)	(0.43)
meandirtenure	-0.001	-0.001	-0.001	-0.001	-0.000	-0.000	-0.000	-0.000
	(-0.32)	(-0.38)	(-0.30)	(-0.27)	(-0.60)	(-0.65)	(-0.58)	(-0.55)
totalvol	0.030	0.043	0.038	0.038	0.003	0.004	0.003	0.003
	(0.49)	(0.67)	(0.60)	(0.60)	(0.47)	(0.66)	(0.60)	(0.60)
pctstdebt	0.015	0.016	0.016	0.016	0.001	0.002	0.002	0.002
	(1.05)	(1.16)	(1.15)	(1.15)	(1.06)	(1.17)	(1.16)	(1.16)
Observations	16,449	16,449	16,449	16,449	16,449	16,449	16,449	16,449
R-squared	0.561	0.560	0.560	0.560	0.542	0.542	0.542	0.542

Table 5 – Relationship lending and managerial incentives

The table present the regression results for the following model:

$$lever_{it} = \alpha + \beta RelStrength_{it} + \boldsymbol{\delta Controls_{it}} + FirmFE_i + \varepsilon_{it}$$

where i denotes firms, t denotes years, and lever is the natural logarithm of the vega component (managers' sensitivity to stock volatility) of new stock option issuances (lnewvega). lnAmtRLC3y is the natural logarithm of the amount ($/000) of all relationship loans each borrower has with the same lender over three years. NrBanksh is the total number of lead banks borrowed from over time period h. RelAmtRLC3y is the ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower had over three years, scaled by the total number of lead banks borrowed from over three years. HHIamt3y is the Herfindahl-Hirschman index computed using the borrower's loan amounts granted by each lead bank over the prior 3 years. TopShamt3y is the highest proportion of loans that the borrower contracted with a lead lender over the over the prior 3 years. All other variables are defined in the appendix. Standard errors are clustered at the borrower level. ***, **, and * denote respectively significance at the .1, .05, and .01 level. T-statistics are in parenthesis. Constant terms are included in the models and not reported to save space.

VARIABLES	(1) lnewvega	(2) lnewvega	(3) lnewvega	(4) lnewvega
lnAmtRLC3y	**0.004****			
	(2.16)			
NrBanks3y	**-0.027***			
	(-1.68)			
RelAmtRLC3y		**0.147*****		
		(2.86)		
HHIamt3y			**0.096****	
			(2.41)	
TopShamt3y				**0.113*****
				(2.75)
Lvega	0.000	0.000	0.000	0.000
	(0.82)	(0.82)	(0.83)	(0.82)
ldelta	0.190***	0.190***	0.190***	0.190***
	(7.48)	(7.48)	(7.48)	(7.47)
comp	3.232***	3.229***	3.230***	3.231***
	(35.79)	(35.81)	(35.71)	(35.72)
stkvol	-51.788***	-52.485***	-52.586***	-52.513***
	(-7.34)	(-7.40)	(-7.41)	(-7.40)
mktvol	1.685	2.072	1.839	1.904
	(0.36)	(0.44)	(0.39)	(0.41)
idiovol	59.801***	60.585***	60.898***	60.788***
	(8.54)	(8.57)	(8.61)	(8.60)
size	-0.051	-0.053	-0.048	-0.049
	(-1.07)	(-1.13)	(-1.02)	(-1.03)
mb	0.025**	0.026**	0.026**	0.026**
	(2.25)	(2.31)	(2.28)	(2.29)
lev1	-0.923***	-0.939***	-0.923***	-0.931***
	(-4.07)	(-4.14)	(-4.08)	(-4.11)
roa	-0.058	-0.059	-0.048	-0.047
	(-0.22)	(-0.23)	(-0.19)	(-0.18)
loss	-0.040	-0.041	-0.038	-0.038
	(-0.88)	(-0.90)	(-0.84)	(-0.84)
cash	-0.393	-0.390	-0.385	-0.377
	(-1.61)	(-1.60)	(-1.59)	(-1.56)
ret	0.000	0.000	0.000	0.000
	(0.73)	(0.71)	(0.66)	(0.66)
Observations	11,187	11,187	11,187	11,187
R-squared	0.672	0.672	0.672	0.672

Table 6 – Relationship lending and information asymmetry

The table present the regression results for the following model:

$$lever_{it} = \alpha + \beta RelStrength_{it} + \boldsymbol{\delta Controls_{it}} + FirmFE_i + \varepsilon_{it}$$

where i denotes firms, t denotes years, and lever is the tatural logarithm of the difference between the bid and ask price divided by the midpoint and measured at the end of each trading day (abas). lnAmtRLC3y is the natural logarithm of the amount ($/000) of all relationship loans each borrower has with the same lender over three years. NrBanksh is the total number of lead banks borrowed from over time period h. RelAmtRLC3y is the ratio of the dollar amount of all repeated loans each borrower has with the same lender to the value of all the loans the borrower had over three years, scaled by the total number of lead banks borrowed from over three years. HHIamt3y is the Herfindahl-Hirschman index computed using the borrower's loan amounts granted by each lead bank over the prior 3 years. TopShamt3y is the highest proportion of loans that the borrower contracted with a lead lender over the over the prior 3 years. All other variables are defined in the appendix. Standard errors are clustered at the borrower level. ***, **, and * denote respectively significance at the .1, .05, and .01 level. T-statistics are in parenthesis. Constant terms are included in the models and not reported to save space.

VARIABLES	(1) abas	(2) abas	(3) abas	(4) abas
lnAmtRLC3y	**0.006*** **			
	(5.17)			
NrBanks3y	**-0.112*** **			
	(-12.21)			
RelAmtRLC3y		**0.162*** **		
		(4.55)		
HHIamt3y			**0.189*** **	
			(7.19)	
TopShamt3y				**0.202*** **
				(7.53)
lmvolume	-0.932***	-0.966***	-0.961***	-0.960***
	(-41.19)	(-42.00)	(-42.12)	(-42.09)
stkvol	35.517***	36.574***	36.388***	36.308***
	(23.73)	(23.83)	(23.84)	(23.83)
mktvol	12.750***	13.855***	13.784***	13.967***
	(6.08)	(6.54)	(6.53)	(6.63)
size	-0.357***	-0.368***	-0.364***	-0.365***
	(-11.57)	(-11.52)	(-11.48)	(-11.53)
mb	0.024***	0.028***	0.027***	0.027***
	(4.06)	(4.48)	(4.35)	(4.37)
lev1	-0.656***	-0.799***	-0.775***	-0.784***
	(-4.38)	(-5.24)	(-5.12)	(-5.17)
roa	0.345**	0.413**	0.413**	0.413**
	(2.15)	(2.52)	(2.53)	(2.54)
loss	-0.064**	-0.065**	-0.061**	-0.061**
	(-2.19)	(-2.19)	(-2.06)	(-2.06)
cash	-1.261***	-1.253***	-1.216***	-1.206***
	(-8.33)	(-8.13)	(-7.90)	(-7.84)
ret	-0.001***	-0.001***	-0.001***	-0.001***
	(-3.12)	(-3.25)	(-3.28)	(-3.26)
Observations	15,599	15,599	15,599	15,599
R-squared	0.765	0.758	0.759	0.759

Figures and Tables of Chapter 3

Figure 1 – Operating risk by year and contract provision

The figure presents yearly average values of operating risk for firms with contracts with specific contract provisions (sweeps, dividend restrictions, performance pricing, performance and capital covenants) and firms whose contracts contain no such provision. Contract provisions are defined in the Appendix. Operating risk is the first component of a principal-component factor analysis on firm's unlevered beta, R&D, and the quarterly standard deviation of cash flows. The red solid line (blue segmented line) indicates the risk level by firms with contractual provisions (no contractual provision). The analysis is suggestive of an opposite trend between sweeps, performance pricing, performance covenants and dividend restriction, capital covenants, although the trend for dividend restrictions is not clear.

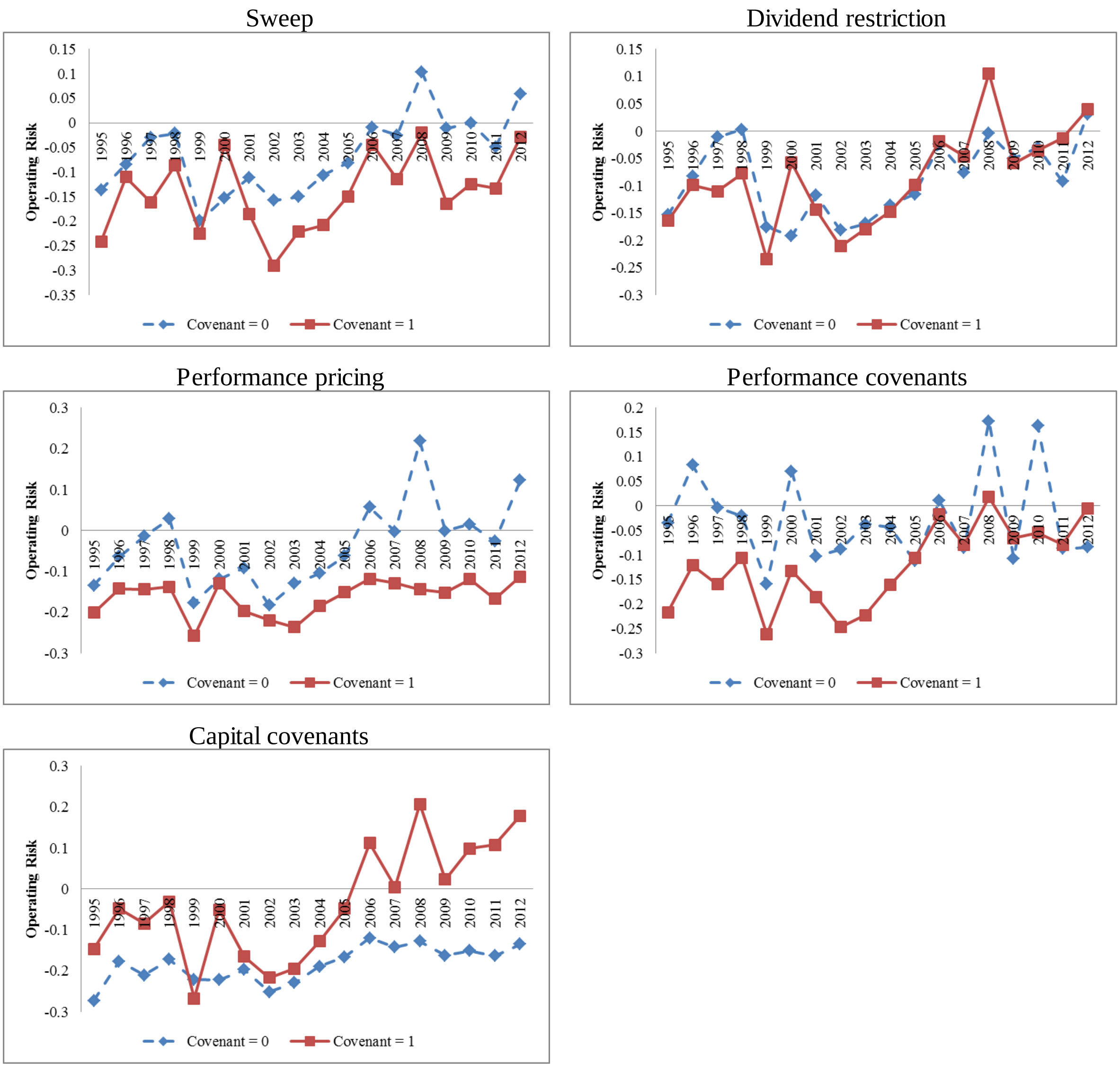


Figure 2 – Vega and contract provisions

The figure presents yearly average values of operating risk for firms with contracts having either risk-increasing (dividend restrictions and capital covenants) or risk-decreasing contract provisions (sweeps, and performance covenants). Contract provisions are defined in the Appendix. Vega is the sensitivity of manager wealth to a one percentage point change in the firm's stock volatility. The red solid line indicates the level of vega for firms with risk-increasing (Fig. A) and risk-decreasing (Fig. B) contractual provisions. The blue segmented line does the same for firms with no contractual provisions. The analysis suggests that firms with risk-increasing (-decreasing) provisions have systematically lower (higher) amounts of vega.

Fig. A – Risk Increasing Provisions

Fig. B – Risk Increasing Provisions

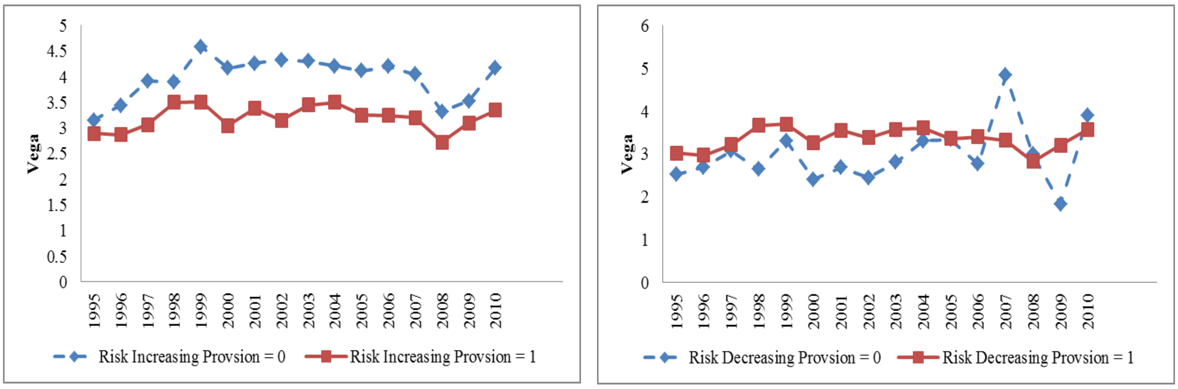


Table 1 – Descriptive statistics

The table presents descriptive statistics for selected variables. The sample consists of 13,823 observations. All variables are defined in the Appendix.

Operating risk	**Mean**	**S.D.**	**Min**	**0.25**	**Mdn**	**0.75**	**Max**
Unlevered beta	0.71	0.47	-0.62	0.36	0.66	0.98	2.51
R&D	0.02	0.10	0.00	0.00	0.00	0.02	5.40
Cash flow volatility	0.03	0.03	0.00	0.01	0.02	0.04	0.35
Financial risk							
Leverage	0.31	0.23	0.00	0.13	0.27	0.47	0.90
Debt to assets	0.32	0.21	0.00	0.17	0.30	0.44	0.96
Equity to assets	0.39	0.23	-0.54	0.26	0.40	0.54	0.95
Total risk							
Stock volatility	0.54	0.29	0.05	0.34	0.47	0.66	2.10
Systematic volatility	0.16	0.12	0.00	0.08	0.13	0.20	0.58
Idiosyncratic volatility	0.50	0.29	0.05	0.30	0.43	0.62	2.09
Contract features							
Sweep	1.45	1.84	0.00	0.00	3.00	1.00	5.00
Dividend restriction	0.77	0.42	0.00	1.00	1.00	1.00	1.00
Performance pricing	3.03	2.88	0.00	0.00	4.00	5.00	40.00
Performance covenants	1.78	0.98	0.00	1.00	2.00	2.00	6.00
Capital covenants	0.66	0.68	0.00	0.00	1.00	1.00	4.00
Controls							
Size	6.17	1.87	0.27	4.86	6.22	7.50	10.20
Book-to-market	0.93	0.49	0.09	0.59	0.86	1.19	3.39
Z-Score	1.48	1.07	-6.31	0.86	1.43	2.03	4.92
Cash flow to sales	0.09	0.34	-17.68	0.03	0.08	0.14	0.62
Stock return	0.22	0.67	-0.87	-0.18	0.11	0.45	3.37
Return on assets	0.03	0.12	-1.10	0.01	0.04	0.08	0.27
Loan spread	202.29	129.24	15.00	100.00	187.50	275.00	825.00
Loan maturity	3.70	0.63	1.39	3.56	3.97	4.09	5.12

Table 2 – Correlation matrix

The table presents the pairwise correlation matrix among selected variables. All variables are defined in the Appendix. Bold values indicate significant correlation at the .05 level.

	Unlevered beta	Capex	R&D	Cash flow volatility	Leverage	Debt to assets	Equity to assets	Sweep	Dividend restriction	Performance pricing	Performance covenants	Capital covenants
Unlevered beta	1											
Capex	**0.04**	1										
R&D	**0.09**	**0.38**	1									
Cash flow volatility	**-0.07**	**-0.05**	**0.07**	1								
Leverage	**-0.31**	**-0.04**	**-0.15**	**-0.09**	1							
Debt to assets	**-0.23**	**0.04**	**-0.10**	**-0.09**	**0.81**	1						
Equity to assets	**0.19**	**0.05**	**0.09**	**-0.06**	**-0.67**	**-0.79**	1					
Sweep	**-0.03**	**-0.01**	**-0.03**	**-0.08**	**0.18**	**0.22**	**-0.16**	1				
Dividend restriction	0.00	**0.01**	**-0.01**	0.00	**0.02**	**0.03**	**0.01**	**0.52**	1			
Performance pricing	0.00	**-0.04**	**-0.04**	**-0.08**	**-0.03**	**0.02**	0.00	**0.27**	**0.38**	1		
Performance covenants	**-0.08**	**-0.02**	**-0.11**	**-0.15**	**0.24**	**0.31**	**-0.22**	**0.49**	**0.26**	**0.17**	1	
Capital covenants	**-0.04**	**0.06**	**0.06**	**0.13**	-0.06	**-0.14**	**0.15**	**-0.10**	**0.00**	**-0.20**	**-0.28**	1

Table 3 – Debt contract provisions and operating risk

The table presents the estimation results of the following model:

$$OpRisk_{t+1} = \boldsymbol{\alpha} Contract\ Provisions_t + \boldsymbol{\beta} Controls_{t-1} + \gamma OpRisk_{t-1} + \varepsilon_t$$

where *OpRisk* is either *Ubeta*, *Rd*, *Sd_cf* or the first component of a principal-component factor analysis on them. *Contract Provisions* is a 5×1 vector of variables indicating the number of *Sweep*, *Dividend restriction*, *Performance pricing*, *Performance covenants*, and *Capital covenants*. *Controls* is a vector of control variables which include *Size*, *Book to market*, *Leverage*, *Z-score*, *Capex*, *Cash flow to sales*, *Stock return*, *Return on assets*, *Delta*, *Vega*, *Loan spread*, *Loan maturity*. All variables are defined in the Appendix. Standard errors are clustered at the firm-level. 2-digit SIC code and year fixed effects are included but not reported to save space, together with the model intercept. t-statistics are in parentheses. *, **, *** indicate p<0.1, p<0.05, and p<0.01 respectively.

		OpRisk							
	expected sign	(1) oprisk	(2) ubeta	(3) rd	(4) sd_cf	(5) oprisk	(6) ubeta	(7) rd	(8) sd_cf
Sweep	–	**-0.013*** **	**-0.006***	**-0.001*** **	**-0.486** **	**-0.012*** **	**-0.010** **	**-0.001**	**-0.382***
		(-5.22)	**(-1.89)**	**(-2.65)**	**(-2.33)**	**(-4.74)**	**(-2.47)**	**(-1.47)**	**(-1.70)**
Dividend restriction	+	**0.033*** **	**0.056*** **	**0.006*** **	**0.731**	**0.016**	**0.049*** **	**0.005*** **	**-0.367**
		(3.54)	**(5.20)**	**(3.03)**	**(1.03)**	**(1.42)**	**(4.04)**	**(2.87)**	**(-0.47)**
Performance pricing	–	**-0.006*** **	**-0.004*** **	**-0.001*** **	**-0.233** **	**-0.004*** **	**-0.004** **	**-0.001*** **	**-0.110**
		(-4.12)	**(-2.59)**	**(-2.98)**	**(-2.53)**	**(-2.74)**	**(-2.57)**	**(-3.61)**	**(-1.30)**
Performance covenants	–	**0.001**	**0.001**	**-0.006*** **	**-0.265**	**0.001**	**-0.000**	**-0.003*** **	**-0.158**
		(0.18)	**(0.09)**	**(-3.96)**	**(-0.65)**	**(0.10)**	**(-0.05)**	**(-2.94)**	**(-0.36)**
Capital covenants	+	**0.016*** **	**0.020** **	**0.003*** **	**1.191** **	**0.016** **	**0.013**	**0.002** **	**1.335** **
		(2.67)	**(2.56)**	**(2.72)**	**(2.27)**	**(2.45)**	**(1.29)**	**(2.31)**	**(2.48)**
Delta						0.003	0.004	-0.001	0.504**
						(0.52)	(0.84)	(-1.51)	(1.99)
Vega						-0.002	-0.003	0.001*	0.177
						(-0.48)	(-0.97)	(1.70)	(0.76)
Size		0.009**	0.042***	0.001	-0.791***	-0.003	0.020***	0.001	-1.155***
		(2.19)	(10.84)	(1.46)	(-3.10)	(-0.62)	(3.63)	(1.63)	(-3.58)
Book to market		-0.018	0.013	-0.009***	0.786	-0.007	0.014	-0.007***	1.448
		(-1.62)	(0.95)	(-3.10)	(0.85)	(-0.56)	(0.86)	(-3.34)	(1.35)
Leverage		-0.101***	-0.164***	-0.028***	0.870	-0.053**	-0.127***	-0.014***	-0.375
		(-3.60)	(-5.59)	(-2.98)	(0.39)	(-1.97)	(-3.41)	(-3.18)	(-0.15)
Z-score		-0.023***	0.001	-0.008***	2.123***	-0.021***	0.009	-0.005***	1.803***
		(-3.70)	(0.15)	(-3.77)	(3.09)	(-3.96)	(1.13)	(-4.32)	(2.74)
Capex		0.025	0.141*	-0.036***	-13.308**	-0.053	0.242**	-0.018	-6.816
		(0.13)	(1.81)	(-2.75)	(-2.42)	(-0.25)	(2.20)	(-1.32)	(-0.99)
Cash flow to sales		0.077	-0.021**	0.024	-1.806**	-0.011	-0.044***	0.004	-0.330
		(1.12)	(-1.97)	(1.50)	(-2.00)	(-0.19)	(-4.50)	(1.32)	(-0.51)
Stock return		0.044***	0.058***	-0.001	0.746	0.045***	0.062***	-0.001	-0.013
		(6.09)	(7.23)	(-0.60)	(1.14)	(5.34)	(6.32)	(-1.08)	(-0.02)
Return on assets		-0.004	-0.290***	0.027	-16.232***	0.108	-0.360***	0.036**	-15.743**
		(-0.04)	(-4.48)	(1.02)	(-2.63)	(1.41)	(-4.26)	(2.29)	(-2.52)
Loan spread		0.000	0.000	0.000**	0.004	-0.000	-0.000	0.000***	0.002
		(1.39)	(1.10)	(2.13)	(1.02)	(-0.41)	(-0.17)	(3.29)	(0.39)
Loan maturity		0.013**	0.009	0.000	-0.312	0.016**	0.013*	-0.002**	0.076
		(2.09)	(1.40)	(0.19)	(-0.71)	(2.23)	(1.72)	(-2.07)	(0.16)
N		12120	12513	12533	12314	8615	8811	8825	8708
Adj R2		0.550	0.461	0.330	0.483	0.656	0.434	0.639	0.513

Table 4 – Debt contract provisions and operating risk: effect of borrowers' financial state

The table presents the estimation results of the following model:

$$OpRisk_{t+1} = \boldsymbol{\alpha} Contract\ Provisions_t + \boldsymbol{\beta} Controls_{t-1} + \gamma OpRisk_{t-1} + \varepsilon_t$$

where *OpRisk* is either *Ubeta, Rd, Sd_cf* or the first component of a principal-component factor analysis on them. *Contract Provisions* is a 5×1 vector of variables indicating the number of *Sweep, Dividend restriction, Performance pricing, Performance covenants,* and *Capital covenants*. *Controls* is a vector of control variables which include *Delta, Size, Book to market, Leverage, Z-score, Capex, Cash flow to sales, Stock return, Return on assets, Loan spread, Loan maturity*. All variables are defined in the Appendix. *Good state* (*Bad state*) refers to firm-years with ROA_t above (below) the median. Standard errors are clustered at the firm-level. 2-digit SIC code and year fixed effects are included but not reported to save space, together with the model intercept. t-statistics are in parentheses. *, **, *** indicate p<0.1, p<0.05, and p<0.01 respectively.

	OpRisk							
	Good state				Bad state			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	oprisk	ubeta	rd	sd_cf	oprisk	ubeta	rd	sd_cf
Sweep	-0.011***	-0.010**	-0.000	-0.473	-0.016***	-0.002	-0.002**	-0.486*
	(-4.42)	(-1.98)	(-0.91)	(-1.63)	(-3.97)	(-0.39)	(-2.47)	(-1.69)
Dividend restriction	0.007	0.044***	0.003*	-0.573	0.056***	0.069***	0.011**	1.767*
	(0.69)	(3.23)	(1.95)	(-0.70)	(3.49)	(4.34)	(2.53)	(1.68)
Performance pricing	-0.002	-0.004*	-0.000**	-0.131	-0.009***	-0.002	-0.001*	-0.323**
	(-1.43)	(-1.66)	(-2.38)	(-1.15)	(-3.70)	(-1.14)	(-1.92)	(-2.15)
Performance covenants	-0.006	0.014	-0.002***	-0.536	0.009	-0.015*	-0.007***	-0.033
	(-0.83)	(1.57)	(-2.68)	(-0.92)	(0.98)	(-1.81)	(-3.49)	(-0.06)
Capital covenants	0.005	0.017	0.002**	0.164	0.026**	0.023**	0.003*	1.975**
	(0.80)	(1.54)	(2.02)	(0.27)	(2.52)	(2.14)	(1.68)	(2.32)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6254	6419	6430	6279	5866	6094	6103	6035
Adj R2	0.638	0.458	0.581	0.600	0.510	0.489	0.305	0.379

Table 5 – Debt contract provisions and operating risk: changes over time

The table presents the estimation results of the following model:

$$OpRisk_{t+k} = \boldsymbol{\alpha}Contract\ Provisions_t + \boldsymbol{\beta}Controls_{t-1} + \gamma OpRisk_{t-1} + \varepsilon_t$$

where *OpRisk* is the first component of a principal-component factor analysis on *Ubeta, Rd,* and *Sd_cf*. The subscript k takes the value 0 (*OpRisk* measured in t), 1(*OpRisk* measured in t+1), and 2 (*OpRisk* measured in t+2). *Contract Provisions* is a 5×1 vector of variables indicating the number of *Sweep, Dividend restriction, Performance pricing, Performance covenants,* and *Capital covenants*. *Controls* is a vector of control variables which include *Delta, Size, Book to market, Leverage, Z-score, Capex, Cash flow to sales, Stock return, Return on assets, Delta, Vega, Loan spread, Loan maturity*. All variables are defined in the Appendix. Standard errors are clustered at the firm-level. 2-digit SIC code and year fixed effects are included but not reported to save space, together with the model intercept. t-statistics are in parentheses. *, **, *** indicate p<0.1, p<0.05, and p<0.01 respectively.

	OpRisk					
	time t	time t+1	time t+2	time t	time t+1	time t+2
Sweep	-0.008***	-0.013***	-0.018***	-0.007***	-0.012***	-0.015***
	(-3.72)	(-5.22)	(-4.70)	(-3.56)	(-4.74)	(-3.83)
Dividend restriction	0.019**	0.033***	0.025*	0.008	0.016	0.016
	(2.33)	(3.54)	(1.74)	(0.80)	(1.42)	(1.03)
Performance pricing	-0.004***	-0.006***	-0.006***	-0.003***	-0.004***	-0.005**
	(-3.80)	(-4.12)	(-3.08)	(-2.80)	(-2.74)	(-2.52)
Performance covenants	0.000	0.001	-0.001	-0.001	0.001	0.005
	(0.04)	(0.18)	(-0.18)	(-0.31)	(0.10)	(0.69)
Capital covenants	0.012**	0.016***	0.014	0.015***	0.016**	0.017*
	(2.37)	(2.67)	(1.53)	(2.76)	(2.45)	(1.78)
Delta				0.006**	0.003	0.002
				(2.16)	(0.52)	(0.50)
Vega				0.000	-0.002	-0.004
				(0.01)	(-0.48)	(-0.86)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	13511	12120	10682	9237	8615	7651
Adj R2	0.689	0.55	0.494	0.738	0.656	0.571

Table 6 – Debt contract provisions and financial risk

The table presents the estimation results of the following model:

$$FinRisk_{t+1} = \boldsymbol{\alpha} Contract\ Provisions_t + \boldsymbol{\beta} Controls_{t-1} + \gamma FinRisk_{t-1} + \varepsilon_t$$

where *FinRisk* is either *Leverage*, *Debt/at*, *Equity/at* or the first component of a principal-component factor analysis on them. *Contract Provisions* is a 5×1 vector of variables indicating the number of *Sweep, Dividend restriction*, *Performance pricing*, *Performance covenants,* and *Capital covenants*. *Controls* is a vector of control variables which include *Delta, Size*, *Book to market*, *Leverage*, *Z-score*, *Capex*, *Cash flow to sales, Stock return, Return on assets, Loan spread*, *Loan maturity*. All variables are defined in the Appendix. Standard errors are clustered at the firm-level. 2-digit SIC code and year fixed effects are included but not reported to save space, together with the model intercept. t-statistics are in parentheses. *, **, *** indicate p<0.1, p<0.05, and p<0.01 respectively.

		FinRisk							
	expected sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(col. 1-3)	finrisk	leverage	debt/at	equity/at	finrisk	leverage	debt/at	equity/at
Sweep	+	**0.057*** **	**0.014*** **	**0.013*** **	**-0.012*** **	**0.055*** **	**0.013*** **	**0.013*** **	**-0.011*** **
		(8.99)	**(7.86)**	**(9.32)**	**(-7.04)**	**(7.86)**	**(7.19)**	**(8.21)**	**(-5.99)**
Dividend restriction	–	**-0.014**	**0.001**	**-0.004**	**0.008**	**-0.017**	**-0.001**	**-0.005**	**0.006**
		(-0.74)	**(0.23)**	**(-0.87)**	**(1.48)**	**(-0.77)**	**(-0.14)**	**(-0.98)**	**(1.08)**
Performance pricing	–	**0.000**	**-0.000**	**0.000**	**0.000**	**-0.005***	**-0.001**	**-0.001**	**0.002** **
		(0.03)	**(-0.03)**	**(0.13)**	**(0.08)**	**(-1.73)**	**(-1.22)**	**(-1.40)**	**(2.14)**
Performance covenants	+	**0.024** **	**0.010*** **	**0.006** **	**-0.001**	**0.006**	**0.006**	**0.002**	**0.004**
		(2.03)	**(2.91)**	**(2.29)**	**(-0.23)**	**(0.42)**	**(1.62)**	**(0.63)**	**(1.03)**
Capital covenants	–	**-0.056*** **	**-0.008** **	**-0.013*** **	**0.017*** **	**-0.039** **	**-0.004**	**-0.009*** **	**0.013*** **
		(-3.90)	**(-2.12)**	**(-4.12)**	**(4.38)**	**(-2.37)**	**(-0.95)**	**(-2.61)**	**(2.97)**
Delta						-0.012	-0.003	-0.002	0.003
						(-1.37)	(-1.35)	(-0.94)	(1.45)
Vega						0.007	0.004**	0.001	-0.001
						(1.02)	(2.31)	(0.33)	(-0.37)
Size		0.032***	0.005**	0.004**	-0.014***	0.044***	0.009***	0.007***	-0.016***
		(4.16)	(2.31)	(2.56)	(-6.76)	(4.64)	(3.26)	(3.26)	(-6.75)
Book to market		-0.030	0.004	-0.039***	-0.012*	-0.002	0.010	-0.035***	-0.012
		(-1.14)	(0.56)	(-6.09)	(-1.77)	(-0.06)	(1.11)	(-4.44)	(-1.56)
Leverage		0.093	0.605***	0.083***	-0.024	-0.213	0.601***	0.049	0.015
		(0.60)	(34.09)	(2.91)	(-1.00)	(-1.16)	(27.14)	(1.42)	(0.57)
Z-score		-0.033**	-0.017***	-0.010***	-0.005	-0.031*	-0.016***	-0.008**	-0.005
		(-2.26)	(-4.20)	(-3.07)	(-1.26)	(-1.74)	(-3.43)	(-1.97)	(-1.06)
Capex		0.684***	0.163***	0.139***	-0.170***	0.530**	0.141**	0.126**	-0.096*
		(3.96)	(3.66)	(3.62)	(-3.49)	(2.31)	(2.32)	(2.44)	(-1.71)
Cash flow to sales		-0.034***	-0.005	-0.006**	0.013***	-0.018*	-0.002	-0.004**	0.007***
		(-2.62)	(-1.50)	(-2.42)	(2.86)	(-1.96)	(-0.53)	(-2.17)	(2.89)
Stock return		-0.020	0.005	-0.005	0.015***	-0.048***	-0.001	-0.010***	0.023***
		(-1.36)	(1.27)	(-1.49)	(3.69)	(-2.96)	(-0.21)	(-2.67)	(4.84)
Return on assets		0.413***	0.180***	0.117***	0.029	0.494***	0.195***	0.121***	0.007
		(3.01)	(5.25)	(3.80)	(0.74)	(3.31)	(4.81)	(3.47)	(0.17)
Loan spread		0.001***	0.000***	0.000***	-0.000***	0.001***	0.000***	0.000***	-0.000***
		(7.67)	(6.84)	(6.74)	(-7.23)	(7.26)	(6.38)	(6.51)	(-6.75)
Loan maturity		0.059***	0.015***	0.014***	-0.011***	0.042***	0.011***	0.010***	-0.008*
		(4.38)	(4.34)	(4.69)	(-3.02)	(2.87)	(2.91)	(3.05)	(-1.94)
N		12519	12519	12519	12533	8816	8816	8816	8825
Adj R2		0.568	0.516	0.586	0.557	0.603	0.546	0.612	0.616

Table 7 – Debt contract provisions and equity incentives

The table presents the estimation results of the following model:

$$Vega_t = \boldsymbol{\alpha} Contract\ Provision_t + \boldsymbol{\gamma} Controls_{t-1} + \varepsilon_t$$

where *Vega* is the natural logarithm of 1 plus the sensitivity of manager wealth to a one percent change in the firm's stock price at time t. *Contract Provisions* is a 2×1 vector of variables indicating the sum of capital covenants and dividend restrictions (*Risk Increasing Prov*) and the sum of performance covenants, performance pricing, and sweep provisions (*Risk Increasing Prov*) contained in the loan contract. *Controls* is a vector of control variables which include *Delta*, *Size, Book to market*, *Leverage*, *Z-score*, *Capex*, *Cash flow to sales*, *Stock return*, *Return on assets*, *Loan spread*, *Loan maturity*. All variables are defined in the Appendix. Standard errors are clustered at the firm-level. 2-digit SIC code and year fixed effects are included but not reported to save space, together with the model intercept. t-statistics are in parentheses. *, **, *** indicate p<0.1, p<0.05, and p<0.01 respectively.

	Vega
Risk Increasing Prov	-0.063**
	(-1.98)
Risk Decreasing Prov	0.024***
	(4.17)
Controls	Yes
N	9328
Adj R2	0.448