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# Regulators vs. markets: Do differences in their bank risk perceptions affect lending terms?


**Abstract**

We quantify the differences between market and regulatory assessments of bank portfolio risk, showing that larger differences significantly reduce corporate lending rates. Specifically, to entice borrowers, banks reduce spreads by approximately 4.1% following a one standard deviation increase in our measure for bank asset-risk differences. This amounts to an interest income loss of USD 1.95 million on a loan of average size and duration. The separate effects of market and regulatory risk are much less potent. Our study reveals a disciplinary-competition effect in favor of corporate borrowers when there is information asymmetry between investors and bank regulators.



Keywords: bank portfolio risk; markets vs. regulators; syndicated loans; cost of credit; market discipline; competition

JEL classification: G21, G34, G33, G2

## 1. Introduction

Financial markets and bank regulators both monitor the solvency of banks, disclose information, and discipline misconduct in order to achieve banking and financial stability. Despite markets and regulators being the two most important banking disciplinary mechanisms, their assessments on bank (solvency) risk levels may diverge significantly, implying a significant source of asymmetric information (Vallascas and Hagendorff, 2013). This type of asymmetric information, and the resulting differences in risk perceptions, creates uncertainty for the players involved in bank lending, especially in the case of large systemic banks and loans of substantial amount. Is this uncertainty systematically priced or accounted for in bank loan contracting? Does it affect the structure of loan deals? This paper seeks to answer these questions by focusing on large corporate loan deals made in syndicated loan markets around the world.

Markets use all available information, including information disclosed by bank regulators, to form their perceptions of overall bank risk. Regulators, on the other hand, focus on accounting-based measures and other operational reports obtained directly from the banks under their supervision to derive bank ratings but also increasingly use auditing and market-based measures. In the presence of low information asymmetry, markets and regulators should, in principle, agree in their evaluations of healthy and transparent banks. In contrast, relatively high levels of information asymmetry, whether caused by forces endogenous or exogenous to bank operations, might cause considerable disagreement between markets and regulators, implying higher uncertainty regarding the financial health of a bank.

The syndicated loan market is an excellent laboratory for examining the potential effects of different risk perceptions of market and regulators on bank lending. In the presence of significantly differing bank risk perceptions, a syndicate's lead bank (the one making the important decisions regarding lending, including finding borrowers and participant lenders and setting the lending terms) might need to exert additional effort to "convince" corporate borrowers and participant lenders to actively engage. This especially holds when the markets' assessments on its risk level is higher than the regulator's. We hypothesize that this act of convincing results in two observable outcomes for the banks under scrutiny: 1) banks offering more competitive (lower) loan spreads to assure borrowing firms that their interests are being served and 2) banks expanding the syndicate to reduce information asymmetry for borrowing firms and other participant banks.

To test these hypotheses, we first calculate the difference between the market and regulatory estimates of bank portfolio risk, henceforth referred to as "portfolio risk differences." For market risk, we use the volatility of bank asset returns derived from option pricing theory (e.g. Ronn and Verma, 1986; Flannery and Rangan, 2008; Vallascas and Hagendorff, 2013). For regulatory risk, we use the risk-based capital ratio, which bank regulators most often examine because it reflects a bank's portfolio risk vis-à-vis the capital available to support the bank's risk-related choices. This ratio is jointly determined by the bank and its supervisors and is subject to supervisory approval, even in cases where the bank's economic capital exceeds regulatory capital requirements (Basel Committee, 2017). Subsequently, we estimate the differences in portfolio risk between the two measures from the residuals of their bivariate regression and use these residuals to explain lending terms (primarily, the loan spread over LIBOR to assess the direct effects on firm financing costs) and syndicated loan structures (e.g. the share of lead banks in the loan and loan concentration).

Our dataset includes more than 40,000 syndicated loan deals over 2002–2016. In addition to the theoretical advantage of using syndicated loans to test our central hypotheses, there are at least two practical advantages. First, most of the banks participating in this market are listed, allowing for the market-based measure of portfolio risk. Second, the loan-level data allow the use of several layers of information, for banks, firms, and loans, in our tests, making it easier to identify causal effects.

We recognize that the uncertainty resulting from the divergence between the market-based and regulatory estimates of portfolio risk is only one of many sources of information asymmetry that shapes bank-lending decisions. An additional source includes asymmetric information stemming from a bank's overall or idiosyncratic exposure to firm credit risk which is usually evident in the formation of a syndicate and the loan share of its lead bank (Sufi, 2007; Ivashina, 2009). Since our aim is to identify a causal effect between portfolio risk differences and bank loan terms/syndicate structure, proper identification rests on correctly addressing this alternative source of information asymmetry.

We achieve this through several tests. Importantly, the loan-level data and the observation of repeated lending to the same firm within a given year allow using firm times year fixed effects. These fixed effects control for any alternative time-varying demand (firm) side explanations for our findings. We also control for certain loan characteristics, including the number of lenders in a syndicate, the number of participant banks, and the syndicate's concentration, all of which capture information asymmetry within the syndicate (see Sufi, 2007). In even more stringent specifications, we control for general evolving economic conditions alongside other conditions in the lender's and borrower's countries via lender's and borrower's countries times year fixed effects, as well as quarter effects to control for common global effects on all banks and firms. We conduct several additional tests, including the use of Heckman-type models to account for selection issues between banks and firms, and use of alternative measures of portfolio risk differences.

We find that, ceteris paribus, loan spreads on drawn funds decrease by an economically significant 4.1%, or 11.2 basis points, in response to a one standard deviation increase in our measure of portfolio risk differences (market risk above regulation risk). This amounts to approximately USD 0.39 million less in annual interest income for a loan of average size, increasing to USD 1.95 million over the loan's duration for a loan with an average size and duration. Given that each lead bank in our sample extends approximately 26 loans per year while retaining a 29% loan share, the mean annual foregone interest soars to USD 2.95 million.

Notably, the negative effect of these risk differences is mainly concentrated in banks perceived to be higher risk by markets, with banks perceived to be riskier by regulators not experiencing a significant effect on their loan spreads. We show, however, that the difference between risk perceptions is what has the greatest effect, and not the two perceptions separately. This is the key finding of our paper, highlighting the operative and disciplinary role of market forces in banking supervision, which materialize when there are conflicting bank risk estimates between investors and supervisors.

We further enhance our identification approach for a supply-side effect of portfolio risk differences by looking into bank heterogeneity with respect to financial health. We thus hypothesize that the negative effect of portfolio risk differences should be less potent for more financially sound banks. We examine this hypothesis using models with interaction terms between our measure of portfolio risk differences and measures of banks' financial health. Besides highlighting relevant heterogeneity in the results, these models further enhance our identification of a supply-side mechanism driving our findings (e.g., Jimenez, Ongena, Peydro, and Saurina, 2014). We indeed find that this is the case for more profitable banks, with better credit ratings, and lower levels of non-performing loans. We also show a significantly lower role for portfolio risk differences in explaining loan spreads when there is a recently established bank–firm relationship.

Portfolio risk differences can also exacerbate changes in the structure of the loan syndicate. In light of large portfolio risk differences for lead banks, these banks must convince borrowers. One way to provide incentives is through the formation of a more dispersed syndicate with the lead bank retaining a smaller share of the loan. The reason is that such syndicates can provide a certification effect, minimizing adverse selection and subsequent moral hazard concerns regarding the lead bank's solvency risk. We show that the negative overall effect of portfolio risk differences on loan spreads is significantly contained by reducing the loan share of a syndicate's lead bank and forming wider, less concentrated syndicates.

Section 2 describes the conceptual framework and places our study within the existing literature. We develop three testable hypothesis on the effect of portfolio risk differences on loan spreads and how this effect can be heterogeneous with respect to lead banks' financial characteristics, relationship lending, and changes in syndicate structure. Section 3 presents our dataset and discusses our identification strategy. Sections 4, 5, and 6 report and discuss the empirical results. Section 7 concludes the paper.

## 2. Conceptual Framework and Hypotheses Development

### *2.1. Conceptual Framework and Contribution*

Our theoretical priors for the effect on bank loan terms of the differences between regulatory and market estimations of bank risk are threefold. First, regulatory estimates of bank portfolio risk have long been inconsistent with market-based estimates. After extensive consideration, risk-weighting methodology for assessing minimum regulatory capital requirements under Basel I and II has been broadly determined to be unable to accurately reflect the degree of risk attached to bank portfolios (Kim and Santomero, 1988; Avery and Berger, 1991; Jones, 2000; Hellwig, 2010; Vallascas and Hagendorff, 2013).

Specifically, early studies following the introduction of the Basel Accord show that the ratio of a bank's risk-weighted assets to total assets is negatively related to the capital holdings of banks in the U.S., with no effect on bank portfolio risk (e.g., Jacques and Nigro, 1997). These findings are reinforced by evidence that the predictive ability of risk-adjusted capital ratios for U.S. bank failures is not necessarily higher than that of non-weighted capital to asset ratios (Estrella, Park, and Peristiani, 2002). Since the transition to Basel II from 2007 onwards in major lending countries (except for the US), there have been few notable improvements on this front, with risk-weighted assets shown to be poorly matched to the market measure of bank portfolio risk: bank asset volatility (Vallascas and Hagendorff, 2013). Moreover, markets are incapable of exerting a thorough disciplining effect. This is particularly apparent when banks substitute equity with debt, as the presence of debt investors help to reduce moral hazard by bank managers (Ashcraft, 2008).

Second, we build on the literature surrounding the heterogeneous response of banks in supplying credit according to their levels of capital. In general, well-capitalized banks supply more expensive loans (Dell'Ariccia, Laeven, and Marquez, 2014; Dell'Ariccia, Laeven, and Suarez, 2017), especially those with higher liquidity risk through the holding of illiquid assets (Acharya and Naqvi, 2012). Existing evidence further suggests that higher bank capitalization results in increased bank risk-taking and a consequent increase in loan spreads, an effect magnified in a loose monetary policy environment (Delis, Hasan, and Mylonidis, 2017; Paligorova and Santos, 2017). By anchoring bank capital (the regulatory-based perception of bank risk) to market-based estimates of bank risk, we examine whether portfolio risk differences also matter (on top of a bank's level of capital) in bank credit supply decisions and the determination of loan spreads.

Third, connecting the first two lines of consideration, we aim to uncover an important but so far overlooked source of information asymmetry between bank supervisors and bank investors in their conflicting measures for bank portfolio risk. Our study is the first to examine whether the size of these risk differences is inversely related to the loan rates offered by banks, with our priors suggesting that banks with significant portfolio risk differences offer discounted rates on their corporate loans in an attempt to entice borrowing firms and thereby maintain their market share. If this hypothesis holds, these banks are expected to see reductions in their interest income.

### *2.2. Hypotheses Development*

In theory, differences in loan pricing arise as a consequence of asymmetric information (Besanko and Thakor, 1987; Chan and Thakor, 1987; Sharpe, 1990). In line with most theories of asymmetric information, the key source of informational asymmetry postulated here is the asymmetry arising between bank supervisors and markets. Supervisory authorities carry out on-site inspections in order to examine bank operations and determine bank compliance with legislative and supervisory requirements. By law, supervisory authorities have outright flexibility in conducting on-site inspections and collecting any information deemed necessary for performing their duties in ensuring that each regulated institution holds capital resources commensurate with its risk profile. Off-site inspections are an integral component of the supervisory process, providing supervisors with information on both current and impending issues within an institution that may not have been otherwise detected between scheduled on-site inspections. The end result of these inspections is the establishment of capital adequacy requirements to help supervised banks absorb significant unforeseen losses. By construction, these requirements reflect the supervisory evaluation of the economic risks associated with bank portfolios.

A large body of theoretical and empirical literature suggests that capital requirements affect bank capital ratios and that, due to deviations from the assumptions of the Modigliani-Miller theorems, a shortfall of capital relative to the target capital ratio may result in a downward shift in bank loan supply (e.g., Berger and Udell, 1994; Peek and Rosengren, 1995; Gambacorta and Mistrulli, 2004; Francis and Osborne, 2012). These individual capital requirements are a combination of the minimum capital standards as defined in the Basel

Framework and unique supervisory assessments that reflect judgment on risk management practices as well as a bank's corporate governance or market conditions.

However, as banks continue to become more adept at innovating beyond the boundaries of existing regulation, policy makers are looking to the marketplace as a potential additional monitor of bank risk-taking (see Flannery 1998, 2001; Furfine, 2001). In fact, existing studies on whether market information is a useful component of bank regulation and supervision report that in many circumstances, supervisors and markets are complementary sources of information on bank operations and solvency risk (De Young, Flannery, Lang, and Sorescu, 1998; Peek, Rosengren, and Tootell, 1999; Berger, Davies, and Flannery 2000).

Thus, market-based risk estimates emerge as a valuable supplement to traditional regulatory and supervisory practices, largely due to the market's forward-looking character and ability to quickly incorporate new information. For example, many economic agents take corrective action based on information inferred from the changing market price of securities (Bond, Goldstein, and Prescott, 2009; Francis, Hasan, Liu, and Wang, 2019). Upon receiving these price signals, the market can penalize banks for excessive risk-taking by raising the cost of external funding (indirect influence) or influence bank operations so as to reduce the banks' risk exposure (direct influence).

Despite this, intermediation and agency theories suggest that greater uncertainty regarding banks is inevitable. As "delegated monitors," banks are expected to lend to information-intensive borrowers, although lending to opaque borrowers may cause opaque banks (Diamond, 1984; Morgan, 2002). This opacity further reflects the extremely high level of debt and low level of equity in bank capital structure, which acts as an incentive for a bank to take excessive risk. The increasing complexity of large banking organizations requires high levels of expertise and sophistication among private lenders to meaningfully assess bank risk profiles (Flannery, 1998; Gilbert, Meyer, and Vaughan, 1999; Francis, Hasan, Liu, and Wang, 2019).

In practice, regulatory monitoring based on capital requirements is not sufficient to address banks' moral hazard concerns (Hellmann, Murdock, and Stiglitz, 2000). Banks typically hold opaque assets, while their financial conditions change over time (Flannery, Kwan, and Nimalendran, 2004); as such, regulatory discipline (including capital requirements) often lags behind bank operations, and strict bank capital requirements may create greater moral hazard problems (Besanko and Kanatas, 1993; Anginer, Demirgüç-Kunt, and Mare, 2018). On the other hand, supervisory access to inside information on a bank's condition may be superior for two reasons: a supervisory authority can force managers to reveal information, while a single supervisory authority does not suffer the coordination (free rider) problems associated with having many fragmented stakeholders (Flannery, 1998).

Our basic premise is that portfolio risk differences reflect the presence of asymmetric information regarding the true level of bank portfolio risk and can ultimately affect the way a bank organizes its financing arrangements. The public information made available to the markets has an additional effect on loan spreads driven by the degree of information asymmetry between the lending bank and the borrowing firm.

We expect this effect to be more prevalent when market-based estimates of bank portfolio risk are higher than regulatory estimates, as the communication of these estimates of higher risk reflects new information made available to the market. Unexpected (negative) developments regarding the creditworthiness of a bank increases the cost of asymmetric information and may consequently raise market concerns about the bank's ability to conduct business. Investors, who have instantaneous access to this new information, might adjust their estimates, and the affected banks are likely to try even harder to entice borrowers when negotiating the syndication of a new loan in an attempt to ease market concerns regarding bank solvency. This additional effort might take the form of competitive loan terms, primarily reflected in lower loan spreads and secondarily in non-price terms such as reduced collateral requirements, larger loan amounts, or longer maturities.

Conversely, when the market's risk assessment of a bank is more favorable (lower risk) than that of the regulators, investors are confronted with a positive information shock, which reduces, if not eradicates, the cost of asymmetric information. As a result, the bank is no longer subject to intense scrutiny by the market, nor is it obliged to take supplementary actions to convince regulators of its reduced solvency risk; in fact, it may even exploit this situation by increasing its loan spreads.

If these factors constitute an underlying channel through which portfolio risk differences affect loan terms, we expect to observe a reduction in loan spreads among banks with positive portfolio risk differences (i.e., when the bank's portfolio risk is considered higher by the markets than by regulators). This in turn forms our first hypothesis:

H1: *An increase in portfolio risk differences for banks deemed riskier by markets than by regulators decreases the cost of bank loans extended to corporate borrowers.*

We further expect the downward adjustment of loan spreads following an increase in bank portfolio risk differences to be contingent on the characteristics of the lending bank. In this respect, the adjustment should be less sizeable – or even reversed – for large, profitable lenders with limited exposure to non-performing loans. Large institutions have distinct structural characteristics and corporate governance schemes compared to small institutions, which leads them to process the same economic news and developments differently (Chan and Chen, 1991). In addition, large, sophisticated lenders might have more efficient credit risk departments for monitoring overall credit risk exposure and counterparty risk, rendering these banks less susceptible than smaller, less sophisticated lenders to adverse information stemming from market-based estimates.

The existence of a prior lending relationship between the lead bank and the borrowing firm further emerges as an additional mechanism for minimizing uncertainty regarding a bank's ability to serve a loan. Typically, these relationships can convey information to banks that firms cannot credibly communicate to the capital markets; however, they also work in the opposite direction, as firms can obtain valuable information from banks in excess of that available to the markets (Kang and Stulz, 2000; Bharath, Dahiya, Saunders, and Srinivasan, 2009). Either party can capitalize on this relationship in bad times, with banks in particular being able to increase their bargaining power during the loan negotiation process, limiting the effects of increased portfolio risk differences (Bolton, Freixas, Gambacorta, and Mistrulli, 2016).

In the presence of the above mechanisms, we expect to observe a reversal in the sign on portfolio risk differences for loans granted by well-managed lenders with a prior relationship with the borrower compared to poorly managed first-time lenders. This leads to our second hypothesis:

H2: *The adverse effects of portfolio risk differences on loan spreads are contained for well-performing lenders with a previous borrower relationship than poorly performing first-time lenders.*

Another mechanism potentially affecting loan spreads operates through the syndicate structure. Although participant banks can place their own non-restrictive bids for buying shares of a loan, they depend primarily on the negotiation and facilitation of the loan conducted by their syndicate's lead bank. This can result in adverse selection concerns, however, as the lead bank has an incentive to syndicate discounted loans in order to entice borrowing firms and facilitate its own loan portfolio growth.

Furthermore, when the lead bank retains a very large share of the loan, the borrowing firm is largely exposed to the bank's idiosyncratic credit risk. In the case of positive portfolio risk differences (i.e., excess market risk over regulation risk), this risk is higher than the initial regulatory estimate, and so the spreading of the loan across a wider syndicate signals a higher-quality loan. This in turn reduces asymmetric information between the lead bank and the borrowing firm, minimizing or removing the discount offered to the borrowing firm.

From a different perspective, the allocation of the lead bank's share of a loan over its (dispersed) syndicate also decreases the bank's credit-risk exposure. Considering the importance of credit-risk diversification for the lead bank's loan sales (see Pavel and Phillis, 1987; Pennacchi, 1988; Gorton and Pennacchi, 1995; Demsetz, 2000), the bank will therefore be able to increase the loan rate offered to the borrower. These two co-directional effects stemming from the reduction of asymmetric information and increase in diversification will increase the bank's loan spread.

If the lead bank's share and the degree of syndicate concentration are indeed effective mechanisms for reducing the cost of information asymmetry in terms of the higher-than-expected level of a bank's solvency risk, we expect a negative relation between loan characteristics and the offered loan rate. Similarly, the lower the lead bank's share, the more aligned the incentives between the lead bank and its syndicate participants and the higher the loan spread. This gives rise to our third hypothesis:

H3: *The adverse effect of portfolio risk differences on loan spreads is contained for wider, less concentrated syndicates relative to smaller, more concentrated syndicates.*

## 3. Data and Empirical Methodology

We use syndicated loans from DealScan, which provides information on the loan pricing of banks with actively traded stocks and, by extension, measurable market-based portfolio risk. We consider only loans with information on loan spreads, which eliminates all types of Islamic finance and very specialized credit lines. Our dataset covers the 2002–2016 period and the number of loan facilities in our baseline specifications ranges from 42,982 to 52,038 in total, depending on the control variables used. The loans are drawn from 364 lead banks headquartered in 41 countries and offered to 10,255 borrowers operating in 102 countries.

We match the loans with bank- and firm-specific information, although in most of our analyses, we use firm × year fixed effects that render firm-year characteristics redundant. In a third round of data collection, we match the resulting dataset with macroeconomic and institutional (country-year) variables from several freely available sources. Again, the specifications using lender country × year fixed effects and borrower country × year fixed effects render the effects of country-year characteristics redundant. We provide variable definitions and sources in Table 1 and basic summary statistics in Table 2.

Further, in Table A1 we report the number of loans and the mean and standard deviation of *Portfolio risk differences* by lender country. In loans granted by U.S. lenders, which represent about half of our sample, *Portfolio risk differences* range from -0.31 to 0.09. The phenomenon is even more pronounced in the Eurozone countries, where *Portfolio risk differences* are persistently negative, pointing to more conservative regulator estimates.

[Insert Tables 1 & 2 here]

### *3.1. Empirical Model and Key Variables*

The baseline form of our empirical model is:

$$Cost\ of\ credit_{lt} = a_0 + a_1 Portfolio\ risk\ differences_{bt} + a_2 Controls_{kt} + u_{lt}. \quad (1)$$

The outcome variable *Cost of credit* is the all-in spread drawn (*AISD*) of loan facility *l* originated at time *t*. *AISD* equals the spread of the loan facility over LIBOR plus any facility fees. The main coefficient of interest in Equation (1) is $a_1$, which indicates the effect of portfolio risk differences on the cost of credit. In line with Hypothesis 1, we expect $a_1$ to be negative if the differences between the market and regulator estimations of risk increase market discipline, imposing a competition effect and thus lowering the cost of credit offered by banks to borrowing firms.

*Portfolio risk differences* for each lender $b$ at time $t$ are the (standardized) residuals $e$ of the OLS regression of a lender's asset volatility (*Bank asset volatility*) on the lender's ratio of capital to risk-weighted assets (*RBC ratio*), or:

$$Bank\ asset\ volatility_{bt} = a_0 + a_1 RBC\ ratio_{bt} + e_{bt}. \quad (2)$$

The residuals from Equation (2) capture the components of the market perception of lender risk not embedded in the regulatory measure of lender risk, with results reported in Table A3. A positive (negative) residual means that the assessment of a bank's portfolio risk according to the market is higher (lower) than the assessment made by regulatory authorities. This is our measure for asymmetric information between markets and regulators regarding bank portfolio risk.

The suitability of asset volatility as a measure for bank portfolio risk stems from its ability to reflect asset value changes, liability value changes, and other developments in off-balance items and operating efficiency. To derive a bank's asset volatility, we follow prior literature (e.g., Ronn and Verma, 1986; Flannery and Sorescu, 1996; Flannery and Rangan, 2008; Vallascas and Hagendorff, 2013) and use the Black-Scholes-Merton option pricing model. Specifically, bank equity ($V_T$) at time $T$ is modeled as a call option on bank assets with strike price equal to the promised debt payment (i.e., the bank's total liabilities $L_T$):

$$V_T = \max[V_T - L_T, 0]. \tag{3}$$

Therefore, the market value of bank equity ($V_{E,t}$) at time $t$ (with $t < T$) is expressed as a function of the (unobservable) market value of bank assets ($V_{A,t}$), satisfying:

$$V_{E,t} = V_{A,t}N(d_{1,t}) - L_t e^{-r_f T} N(d_{2,t}), \tag{4}$$

with

$$d_{1,t} = \left[\ln\left({}^{V_{A,t}}/_{L_t}\right) + \left(r_{f_t} + \frac{1}{2}\sigma_{A,t}\right)T\right]/\sigma_{A,t}T, \tag{5}$$

and

$$d_{2,t} = d_{1,t} - \sigma_{A,t}T. \tag{6}$$

Based on Merton (1974), the value of bank equity is a function of the value of bank assets and time so that the volatility of bank equity ($\sigma_{E,t}$) is related to the volatility of bank assets ($\sigma_{A,t}$):

$$\sigma_{E,t} = \frac{V_{A,t}}{V_{E,t}} N(d_{1,t})\sigma_{A,t}. \tag{7}$$

In Equation (4), the term $N(d_{1,t})$ can be interpreted as the factor by which the present value of the contingent receipt of bank assets (discounted at risk-free rate $r_f T$) exceeds the current value of bank assets, while $N(d_{2,t})$ reflects the probability of the (bank closure) option being exercised.

By simultaneously solving Equations (4) and (7) and setting $T = 1$, we extract $\sigma_{A,t}$ for each bank annually. Similarly to Vallascas and Hagendorff (2013), we employ, as starting values for $\sigma_{A,t}$, the historical annualized yearly standard deviation of bank equity returns multiplied by the ratio of the market value of bank equity to the sum of the market value of bank equity and the book value of bank total liabilities; that is:

$$\sigma_{A,t} = \sigma_{E,t} V_{E,t} / \left(V_{E,t} + L_t\right). \tag{8}$$

Through an iterative process, we use a Newton search algorithm to calculate the (implied) yearly values for bank asset volatility ($\sigma_{A,t}$) and bank asset value ($V_{A,t}$). The resulting measure ($\sigma_{A,t}$) is our preferred market-based measure for bank risk and we use it as the dependent variable in Equation (2). For our sample of banks, the mean (median) bank asset volatility, expressed in percentages, is 2.42 (1.89).

### *3.2. Identification, Controls, and Fixed Effects*

Identifying the causal effect of *Portfolio risk differences* on the *Cost of credit* is the key aim of our empirical analysis. Simultaneity and reverse causality are not the main identification problems because bank capital and risk are predetermined when new loan decisions are made; our main problem is omitted-variable bias, especially in distinguishing between loan supply and loan demand.

Consistent with related studies (e.g., Sufi, 2007; Ivashina, 2009; Delis, Hasan, and Ongena, 2019), we control for the log of the loan amount, loan maturity (in months), the number of participant banks in a syndicate, dummies for performance-pricing provisions and collateral, and the total number of covenants.[1] We also conduct sensitivity tests without loan control variables to confirm that our model is not subject to a "bad controls" problem. We further control for bank characteristics, such as bank size, return on assets, and non-performing loans; likewise, our set of firm-level controls include firm size, firm return on assets, and firm Tobin's Q. We provide exact definitions of these variables in Table 1 and summary statistics in Table 2.

To maintain a high level of variation in *Portfolio risk differences,* we initially consider a specification with a very simple set of fixed effects – namely, year-, bank-, and firm-level effects – allowing us to estimate the coefficient on our portfolio risk differences measure for the largest possible number of banks and firms in our sample. However, since our basic hypothesis is that the interest rate response to changes in our risk differences measure is supply-driven, we adopt more restrictive fixed effects in subsequent specifications.

Importantly, we use firm × year fixed effects to control for time-varying firm-side (demand-side) explanations for our findings, such as firm-year changes in risk, changes in loan demand, borrowers' corporate governance, etc. This means that to estimate Equation (1) we obtain identification from firms with at least two loan facilities extended within the same year. Moreover, the inclusion of lender country × year fixed effects shields our specification from country-year (macroeconomic) developments in the lender's country. The regression still yields results on the main coefficient of interest because there are multiple loan facilities from the same country within a year, with the inclusion of borrower country × year fixed effects as

[1] Including either the total number of covenants or the number of general and financial covenants leaves our results unaffected.

an additional sensitivity test serving the same purpose for the borrower's country. Our last set of fixed effects includes those at the quarter level, which eliminates any undesired variation beyond the quarterly frequency not absorbed by our remaining fixed effects.

## 4. The Effect of Portfolio Risk Differences on the Cost of Credit

### *4.1. Baseline Results*

Table 3 reports the results of the estimation of Equation (1) using OLS and various fixed effects, including the coefficient estimates and t-statistics obtained from standard errors clustered by lender country and bank. In column (1), we include year, bank, and firm fixed effects, and in column (2), we introduce lender country × year fixed effects that control for time-varying macroeconomic conditions in the bank's country, while column (3) introduces loan-type fixed effects.[2] Across these specifications, the coefficients on *Portfolio risk differences* are negative and statistically significant at conventional levels.

In column (4), we add firm × year fixed effects, controlling for loan-demand forces for each firm-year, and consequently notice that the coefficient on our variable of interest doubles in magnitude while retaining its negative, statistically significant sign. This effect is further confirmed in column (5), where we add borrower country fixed effects along with loan purpose fixed effects. Specification (6) is the most demanding as it also includes borrower country × year fixed effects, controlling for the macroeconomic environment in the borrowing firm's country, and quarter fixed effects, which control for any remaining variations at the quarterly level. Across all specifications, the general finding is that larger *Portfolio risk differences* exert a negative, statistically significant effect on loan spreads.

[Insert Table 3 about here]

[2] In the last row of each table, we report the number of banks and firms from which we obtain identification in the corresponding estimations.

We choose specification (4) as our baseline since it controls to a reasonable extent for time-varying loan-demand forces and macroeconomic fundamentals without being overburdened by fixed effects, thereby allowing for sufficient variation in our variable of interest. The main coefficient of interest, $a_1$, reveals that a one standard deviation increase in *Portfolio risk differences* decreases *AISD* by an average of 11.2 basis points (=56.0 basis points × 0.20). Economically, this is a sizeable effect, equal to a 4.1% (=11.2 basis points ÷ 272.0 basis points) decrease for the average loan amount in our sample. Given that the average loan size is USD 352 million, banks with increased asset volatility relative to the regulatory estimation of their portfolio risk lose approximately USD 0.39 million (=USD 352 million × 11.2 basis points) per year in foregone interest. For an average loan maturity of 5.0 years, this represents approximately USD 1.95 million in interest losses over the loan's duration.[3]

However, this forms only part of the picture: each lead bank in our sample grants on average 26.1 loans per year, while the average bank share for the available observations is 28.7%. Assuming that the loan share figure is representative of the average lender in our sample, the overall annual cost arising from the lender's total loan operations within a given year increases to USD 2.95 million (=USD 0.39 million × 26.1 loans × 28.7% share).[4]

We next include *Negative risk differences* and *Positive risk differences*, i.e., values of *Portfolio risk differences* below and above zero, in our baseline specification. This enables us to identify any related asymmetric effects exerted by our risk differences measure on loan spreads. We report the results in Table 4. Column (1) reveals that the negative values for risk differences fail to exert a material effect on loan spreads. In column (2), however, a one standard deviation increase in *Positive risk differences* lowers spreads by almost 12 basis

[3] Assuming five annual payments and LIBOR as the discount rate, the increase in interest expense equals USD 1.86 million for the average 12-month LIBOR rate of 2.1% during our sample period (for similar calculations, see Ivashina and Sun, 2011).

[4] Bank share is only reported for 6,276 of the 42,982 loan facilities in our sample. Generalizing this average to apply to all loan facilities is a plausible assumption, since it is not very different from the average loan share values reported in previous studies (e.g., Sufi, 2007; Ivashina, 2009).

points. The dominance of *Positive risk differences* over *Negative risk differences* is further confirmed in column (3), which features both of the aforementioned measures in the absence of our overall risk differences measure. In this case, the effect of risk differences on *AISD* results solely from positive values on our risk differences measure.

[Insert Table 4 about here]

Further, column (4) presents the interaction between *Portfolio risk differences* and an indicator for the group of banks with *Portfolio risk differences* above our sample mean. Since the average *Portfolio risk difference* in our sample is -0.18, a one standard deviation increase in this measure (raising the mean value to 0.20) will automatically move the average bank into the positive risk differences group, wherein its market risk is deemed higher than its regulatory risk (or increase the risk differences value of banks with already positive *Portfolio risk differences* yet further). In this case, *Portfolio risk differences* has a positive, statistically significant coefficient, with the significance of our risk differences measures being picked up by our interaction term (the coefficient on *Portfolio risk differences* × *Positive risk differences group*).

These results reveal that the (negative) effect of portfolio risk differences on loan spreads is not symmetric across all banks, but is instead focused in banks considered higher risk by markets than by regulators. Banks with negative risk differences are affected the least, if at all, suggesting that a higher regulatory assessment acts as a safeguard against lending cost.

In Table 5, we examine whether the disciplining effect exerted by *Portfolio risk differences* is market- or regulatory-driven. We re-estimate Table 3's specification (2) by sequentially including different combinations of our risk differences measure with its constituents (each of the regulatory- and market-based measures). In columns (1) and (2), *Portfolio risk differences* is interacted with *Bank asset volatility* and *RBC ratio*, respectively. The coefficient on *Portfolio risk differences* is negative and statistically significant in both specifications, ranging between 5.5 and 12.8 basis points in response to a one standard deviation increase. The effect of *Bank asset volatility* is picked up by *Portfolio risk differences* in column (1), while the regulatory measure appears significant for syndicated loan spreads in column (2), with a one standard deviation increase in *RBC ratio* raising *AISD* by 4.8 basis points. However, the effect of the regulatory estimate is independent of the effect exerted by the risk differences measure, with *RBC ratio* failing to absorb the size and significance of the coefficient on *Portfolio risk differences*.

[Insert Table 5 about here]

Presenting the individual components of our *Portfolio risk differences* in column (3), we observe the dominance of market-based risk estimates over regulatory estimates: market risk estimates come with a negative and statistically significant value, while regulatory estimates do not affect loan spreads. Most importantly, a one standard deviation increase in *Bank asset volatility* lowers *AISD* by 11.7 basis points, which corresponds to the effect of *Portfolio risk differences* in our baseline specification in Table 3, column (4). When including all of our measures concurrently in column (4), *Bank asset volatility* and *RBC ratio* no longer have statistically significant coefficients, while our risk differences measure retains its negative, statistically significant sign. It appears that although market-based estimates have a relatively greater impact than their regulatory counterparts, it is the difference between the two (and the relevant information asymmetry) that exerts a disciplining (negative) effect on bank loan spreads.

Based on our estimates in Tables 3–5, and consistent with Hypothesis 1, we can infer that wider differences between regulatory and market-based measures of bank portfolio risk substantially decrease the cost of loans offered by banks, *ceteris paribus*. We illustrate the implications of this estimate by considering the example of a prominent U.S. bank, Bank of America Merrill Lynch. During our sample period, the average *Portfolio risk differences* value for Bank of America is -0.12, meaning the market-based assessment of its portfolio risk is lower than the regulatory assessment. Furthermore, the average *AISD* on the loan facilities granted by Bank of America when its *Portfolio risk differences* is above its mean value is 280.19 basis points, approximately 19% higher than the below-mean value of 235.02 basis points. Looking at specific sub-periods, from 2013 to 2016, Bank of America's average *Portfolio risk differences* is -0.31, the average *AISD* on its loans is 267.23 basis points, and the average amount of each loan is USD 392 million. However, during the 2002–2005 period, the mean value for Bank of America's *Portfolio risk differences* is 0.09, the average *AISD* is 231.51 basis points, and the average loan amount is less than half of its amount nearly a decade later: USD 176 million. Similar examples exist for other leading banks predominantly based in countries with developed economies.

In Table A3 of the Appendix, we examine the sensitivity of our estimates to the "bad controls" problem by interchangeably excluding loan-level control variables from our specifications.[5,6] Irrespective of the specifications used, the coefficient on *Portfolio risk differences* retains its negative, statistically significant value, ranging between 9.3 and 10.7 basis points per one standard deviation increase.

The size and magnitude of the coefficients on the control variables in Tables 3–5 are generally in line with the recent works of Bae and Goyal (2009), Ivashina (2009), Cai, Eidam, Saunders, and Steffen (2018), and Delis, Hasan, and Ongena (2019). In particular, loan spreads decrease in loan amount and increase in maturity as well as being more competitively priced when collateral and more performance provisions are included in the spread or more members enter the syndicate. The behavior of bank-level variables is also largely anticipated, with

[5] Since the "bad controls" problem is due to differences in the composition of loans to a given firm, in an alternative sensitivity test, we include weights based on the number and amount of loans received by each firm (results available upon request).

[6] The replacement (or addition) of *Number of covenants* with *Financial covenants* or *Net covenants* leaves our results unchanged.

greater bank size and return on assets associated with decreasing *AISD* while increased non-performing loans are associated with higher loan spreads.

*4.2. Additional Sensitivity Tests*

In Table A4, we test our results' sensitivity to the type of standard error clustering. Column (1) features clustering by lender country *and* year, column (2) by bank *and* year, and column (3) by bank *and* firm. In the subsequent specifications, we adopt even more demanding clustering, such as lender's country *and* bank *and* year in column (4), bank *and* firm *and* year in column (5), and lender's country *and* borrower's country *and* year in column (6). Across all specifications, the coefficient on *Portfolio risk differences* is similar to that of our baseline specification.

We next re-estimate our baseline specification by employing different versions of our original portfolio risk differences measure and report the results in Table A5. Specifically, we use a common risk-free rate for all European monetary union countries in Equation (4), and estimate Equation (2) without a constant, without standardized residuals, and for each bank separately.

So far, we have assumed that all loans enter the model weighted equally. While the fixed effects in Table 3 provide a safeguard against cross-country variation, we nevertheless acknowledge that our empirical specification might be open to criticism that borrower countries receiving more or fewer loans could disproportionately affect our results. To this end, in Table A6 we use weighted least squares and several different weights based on the country–year number of loans, retaining the same set of fixed effects. Our results are very similar to the baseline.

Further, considering a positive relation between expansionary monetary policy and bank risk-taking, we test whether our estimates might be contaminated by the actions of policy makers.[7] As such, we interact *Portfolio risk differences* with a set of proxies for monetary policy conditions to see whether the effect of risk differences varies in different monetary policy regimes.[8] Regardless of the frequency used in our monetary policy measure, the results in Table A8 show that the coefficient on *Portfolio risk differences* is negative and statistically significant at 1%. Moreover, the coefficients on each of the interaction terms are positive and significant, indicating that a sizeable portion of the impact of *Portfolio risk differences* (i.e., between 30.2% and 30.9%) is reversed during periods of monetary contraction. The coefficient on our monetary policy measure (*Discount rate*), on the other hand, is negative and statistically significant, thereby confirming the operative risk-taking channel of monetary policy. Similar evidence is provided for the U.S. by Delis, Hasan, and Mylonidis (2017) and Paligorova and Santos (2017). Most importantly, the effect of risk differences net of monetary conditions (as reflected in the difference between the coefficient on *Portfolio risk differences* and each of the coefficients on the interaction terms) is within the range suggested by our baseline regressions.[9]

*4.3. Accounting for Sample Selection Bias*

In this section, we consider whether our results are affected by selection bias if the effect of *Portfolio risk differences* on *AISD* is due to firms borrowing from relatively riskier banks in order to obtain more favorable loan terms. To exclude this possibility, we follow Dass and Massa (2011) in employing Heckman's (1979) two-stage model. In the first stage, we estimate a probit model of the probability of a firm borrowing from the given bank. We then calculate Heckman's lambda (inverse Mills ratio) and include it as an additional control variable in the

[7] According to the risk-taking channel of monetary policy, low interest rates entice banks to assume positions of greater risk (see, among others, Jiménez, Ongena, Peydró, and Saurina, 2012, 2014; Altunbas, Gambacorta, and Marquéz-Ibáñez, 2014; Delis, Hasan, and Mylonidis, 2017).
[8] Consistent with the risk-taking channel literature, these proxies are lagged by one period (i.e., by one month and one year in specifications (1) and (2) respectively).
[9] These results further hold in regressions where standard errors are clustered by lender's country *and* year (available upon request).

second-stage OLS estimation of Equation (1). We include all syndicated loan facilities in DealScan, providing enough information for the first-stage probit to estimate the determinants of a firm's decision to borrow from a given lead bank. Similar to Dass and Massa (2011), we assume that a firm's decision to obtain a syndicated loan is a function of the main determinants of its decision to borrow in general. These determinants consist of a set of bank and firm characteristics, and loan type, year, firm, and borrower's country dummies.

We report the results in Table A7. According to the probit estimates in columns (1) and (2) of Panel A, the higher the size, Tobin's Q, and leverage of a firm, the more likely it is to complete a syndicated loan deal. Unsurprisingly, firms opt for syndicate financing when seeking loans with longer maturity; however, these loans require increasing amounts of collateral and performance-pricing provisions. Most importantly, the estimates from the second-stage regressions in columns (1) and (2) of Panel B confirm the strong negative effect of *Portfolio risk differences* on *AISD*. In fact, this effect is significantly larger than in our baseline estimations, amounting to 12.8–12.9 basis points per one standard deviation increase in our risk differences measure.

### *4.4. The Discrepancy between Bank Asset Volatility and Bank Leverage*

A distinctive feature of the global financial crisis in 2008 was the build-up of excessive on- and off-balance sheet leverage in the banking system. During the crisis period, we witnessed the paradox of banks building up excessive leverage, despite simultaneously maintaining relatively strong risk-based capital requirements. This caused a deleveraging process that in turn led to significant bank write-offs and a reduction of available credit in the real economy. The regulatory response by the Basel Committee was to introduce a leverage ratio with the aim of assisting the risk-based capital ratio and containing the negative consequences of bank deleveraging. In this subsection, we consider the discrepancy between bank asset volatility and bank leverage. We create the new risk differences measure by re-estimating Equation (2) and replacing the *RBC ratio* with the bank leverage ratio. We then examine the impact of this measure on the cost of credit according to Equation (1) and present the results in Table 6.

Across specifications (1)–(3), the new risk differences measure has a sizeable, statistically significant impact on loan spreads. This is the case when the measure is considered individually in column (1) as well as along with each of its two components in columns (2) and (3). However, when we estimate these components together in the absence of our leverage-based risk differences measure, as seen in column (4), they have a non-statistically significant coefficient. When all measures are simultaneously included in our model, only *Portfolio risk differences (leverage)* has a statistically significant effect of 6.4 basis points on *AISD*. This highlights the significance of our leverage-based portfolio risk differences measure on the determination of loan spreads, though the results pale in comparison to those estimated by our market-based measure.

[Insert Table 6 about here]

## 5. The Role of Bank Characteristics and Lending Relationships

The previous section documents how syndicate structure and the inclusion of additional lending parties (each with a non-trivial stake in the loan) minimizes the cost of information asymmetry in terms of a lead bank's solvency risk. In this section, we first build on our findings that the effect of portfolio risk differences is supply-driven and examine whether the effect of portfolio risk differences varies across different bank types and bank financial health. We present the results in Table 7, with each column including the interaction of *Portfolio risk differences* with a different bank-level characteristic.

[Insert Table 7 about here]

Our first assumption is that large banks are less sensitive to economic news compared to smaller banks. This may be a consequence of large banks' organizational structures, market power, corporate governance schemes, and level of operations and credit risk diversification. However, in column (1) we observe that the coefficient on *Portfolio risk differences* × *Bank size*, albeit positive, is not statistically significant at conventional levels, rejecting that bank size offsets the impact of risk differences on loan spreads.

We then consider banks' financial health (variables that proxy for bank performance and credit risk), expecting that more profitable, better-managed banks might have less need to establish their creditworthiness. According to the estimates in column (2), the effect of *Portfolio risk differences* inversely relates to a bank's return on assets, suggesting that stronger bank performance acts as a counterforce to decreasing loan spreads. Specifically, banks achieving an additional 2% return on their assets are able to contain their interest loss by almost 11.7% (the coefficient on the interaction term). This is expected, because stronger performance favorably affects private agent expectations. Moreover, column (3) shows that banks completely offset the discount in their offered loan rates by limiting the proportion of non-performing loans in their portfolio. Specifically, a decrease of one standard deviation in *Bank NPLs* brings an increase in *AISD* of more than 2.2 basis points, reversing approximately 25.9% of the initial interest rate discount (coefficient on *Portfolio risk differences* × *Bank NPLs*).

In columns (4) and (5), we consider the role of bank credit ratings, which are frequently employed by market participants and regulatory authorities as general measures of creditworthiness, although these ratings are more static and less responsive to various systematic and idiosyncratic events than our principal risk differences measure. An upgrade in a bank's credit rating has a positive effect on loan spreads, with the coefficient on the interaction between *Portfolio risk differences* and *Bank credit rating* in column (4) as well as

*Portfolio risk differences* and *Bank credit rating category* in column (5) being positive and statistically significant.

Another important source of heterogeneity in the effect of *Portfolio risk differences* on bank lending is relationship lending. In relationship lending, the bank acquires valuable information on the borrower's operations and credit risk. Due to the resulting reduction of information asymmetry, it is possible that banks do not provide the same discounts on loans offered to repeat borrowers compared to those to new borrowers. In Table 8, we use measures that reflect the existence and intensity of a prior bank–firm lending relationship (e.g., Bharath, Dahiya, Saunders, and Srinivasan, 2009). Our basic measure is the number of loans between a given bank–firm pair as part of the total number of loans extended by the bank within a five-year period. We observe that the lead bank is able to recover an approximately 6.4 basis points or 50.3% of initial interest loss due to *Portfolio risk differences* (the coefficient on the interaction term). We confirm this effect for alternative measures, with columns (2) and (3) showing that this effect further depends on the intensity and magnitude of the lending relationship.

[Insert Table 8 about here]

Overall, consistent with Hypothesis 2, the analysis in this section shows that the effect of portfolio risk differences is contingent on a lending bank's performance and management practices as well as prior transactions with a borrowing firm.

## 6. The Role of Syndicate Structure

A potential channel through which the disciplining effect of increased portfolio risk differences could manifest is syndicate structure, which operates via other lenders that join the lead bank in forming a syndicate. If borrowing firms are unfamiliar with the lead bank, this gives rise to an adverse selection problem wherein the lead bank must convince the borrower of its solid credit reputation. By forming a more dispersed syndicate and retaining a smaller share of the loan, the lead bank can minimize this problem of information asymmetry. This can alleviate the need for potential borrowers to spend more time investigating the lead bank in order to acquire more "informed" capital regarding the bank's financial health (Sufi, 2007).

Being part of a more dispersed syndicate can also serve a certification effect, easing potential adverse selection and subsequent moral hazard concerns regarding the lead bank's solvency risk (Ivashina, 2009; Sufi, 2007). This can be accomplished by including additional lead and/or participant banks in the syndicate. Existing studies show that syndicate structure varies in regards to borrower attributes related to credit risk and transparency (e.g., Dennis and Mullineaux, 2000; Lee and Mullineaux, 2004; Jones, Lang, and Nigro, 2005; Ivashina, 2009; Sufi, 2007). In our setting, the addition of more syndicate members and greater spreading of loan shares across the syndicate is expected to ease lead bank solvency risk concerns, allowing the bank to reverse the discount on its offered loan rates. This will in turn be reflected in the higher spreads for loans granted by more diverse, less concentrated syndicates.

Below, we examine how syndicate structure helps alleviate the effect of risk differences by interacting *Portfolio risk differences* with a number of loan characteristics reflecting the size and structure of a syndicate. The results are presented in Table 9, with estimates from column (1) suggesting that an increase in a syndicate's number of lenders provides a positive signal for a lead bank's creditworthiness. Specifically, including eight additional lenders in the syndicate (i.e., increasing *Number of lenders* by approximately one standard deviation) saves the lead bank almost 5.2 basis points. Column (2) shows that this effect is mainly driven by the addition of lead banks (the coefficient on *Portfolio risk differences* × *Number of leads*), with the addition of four lead banks in a syndicate resulting in loan spread savings of 3.6 basis points.

[Insert Table 9 about here]

Columns (3) and (4) feature the interaction of our risk differences measure with lead bank loan share and degree of syndicate concentration, respectively.[10] Both specifications confirm the beneficial effect of spreading the loan share across the (many) members of a syndicate. According to column (3), decreasing *Bank share* by one standard deviation (or 24.5%) results in a higher *AISD* by approximately 11.6 basis points (the coefficient on the interaction term). This is further reflected in syndicate structure, with a decrease in a syndicate's Herfindahl index (i.e., the formation of a less concentrated syndicate) resulting in an additional increase of similar magnitude in an offered loan spread (coefficient on *Portfolio risk differences* × *Syndicate Herfindahl*).

Across all specifications, the coefficient on *Portfolio risk differences* remains negative and statistically significant, confirming the disciplining effect of portfolio risk differences on syndicated loan spreads. However, consistent with Hypothesis 3, this effect can be largely mitigated when limiting the lead bank's stake in a loan and forming a less concentrated syndicate.

## 7. Conclusions

In this paper, we note considerable differences between perceptions of regulators and financial markets in the degree of risk attached to a bank's portfolio. We maintain that this difference reveals information asymmetry between regulators and markets about bank portfolio risk. We examine the effect of such information asymmetry on the loan pricing decisions of banks, using data from the syndicated loans market.

Our baseline specification shows that a one standard deviation increase in our measure of portfolio risk differences reduces loan spreads by more than 11 basis points (equivalent to a 4.1% increase), rendering banks subject to a loss of about USD 1.95 million in interest income

[10] Both measures are mean-centered before entering the regressions.

over the duration of the average loan. Considering that the average lead bank extends approximately 26 loan facilities per year, in which it retains an average 29% stake, the annual cost increases to USD 2.95 million. These results persist in an array of sensitivity exercises and alternative estimation methods, and are most significant when portfolio risk differences are positive (i.e., market estimations of bank risk are higher than regulator estimations). Importantly, the separate effects of market and regulatory risk (i.e., not their difference) are much less potent.

We further show that the effect of portfolio risk differences is heterogeneous to banks' financial health. For banks with higher profitability ratios, better credit ratings, and lower levels of non-performing loans, the negative effect of portfolio risk differences is much less potent, if at all present. Even for banks exposed to the negative effect, there are two strategies to mitigate it. First, banks can form strong bank–firm relationships, thereby reducing the adverse effects of information asymmetries between markets and regulators on their loan spreads. Second, the reduction of a lead bank's loan share via the formation of a wider, less concentrated syndicate can have a certification effect, easing potential adverse selection and subsequent moral hazard concerns regarding the lead bank's solvency risk.

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**Table 1. Variable definitions and sources**

| Variable | Description | Source |
|---|---|---|
| *A. Dependent variables in main specifications* | | |
| AISD | All-in-spread-drawn, defined as the sum of the spread over LIBOR plus any facility fee. | DealScan |
| *B. Main explanatory variables: Difference between market-based and regulatory measure of bank risk* | | |
| Portfolio risk differences | The residuals from the regression of *Bank asset volatility* on *RBC ratio*. | Own estimations |
| Negative risk differences | The negative values of *Portfolio risk differences*. | Own estimations |
| Positive risk differences | The positive values of *Portfolio risk differences*. | Own estimations |
| Portfolio risk differences (leverage) | The residuals from the regression of *Bank asset volatility* on bank leverage, i.e., the sum of the bank long-term debt, short-term debt and current portion of long-term debt divided by the bank common equity. The estimation method is the same as that for the calculation of *Portfolio risk differences*. | Own estimations |
| *C. Explanatory variables: Loan characteristics* | | |
| Loan amount | Log of the loan facility amount in USD. | DealScan |
| Maturity | Loan duration in months. | DealScan |
| Collateral | Dummy equal to one if the loan is secured with collateral, zero otherwise. | DealScan |
| Number of lenders | The number of banks involved in the syndicated loan (lead and participant banks). | DealScan |
| Performance provisions | Dummy equal to one if the loan has performance pricing provisions, zero otherwise. | DealScan |
| Number of covenants | The total number of covenants in the loan contract. | DealScan |
| Number of participants | The number of participant banks involved in the syndicated loan. | DealScan |
| Number of leads | The number of lead banks involved in the syndicated loan. | DealScan |
| Bank share | The bank's share in the loan facility (%). | DealScan |
| Syndicate Herfindahl | The syndicate's Herfindahl index, calculated as the sum of the squared individual shares in the loan. It ranges from 0 to 10,000, with 10,000 being the Herfindahl when a lender holds 100% of the loan. | DealScan |
| Loan type | A series of dummy variables indicating loan type (e.g., term loans, revolvers, etc.). | DealScan |
| Loan purpose | A series of dummy variables indicating loan purpose (e.g., corporate purpose, debt repay, etc.). | DealScan |
| Relationship lending | A binary variable equal to one for a prior loan facility between the lender and the borrower in the 5-year period before the loan facility's origination year, zero otherwise. | DealScan |
| Relationship lending number | The ratio of the number of prior loan facilities between the lender and the borrower in the 5-year period before the loan facility's origination year to the total number of loans received by the borrower during the same period. | DealScan |
| Relationship lending amount | The ratio of the amount of prior loan facilities between the lender and the borrower in the 5-year period before the loan facility's origination year to the total amount of loans received by the borrower during the same period. | DealScan |
| *D. Explanatory variables: Lender characteristics* | | |
| Bank asset volatility | The volatility of bank assets estimated via option pricing theory. | Datastream own estimations |
| RBC ratio | The ratio of capital to risk-weighted assets. | Compustat |
| Bank size | The log of total bank assets. | Compustat |
| Bank ROA | The return on total bank assets. | Compustat |
| Bank NPLs | The ratio of non-performing loans to total loans. | Compustat |
| Bank credit rating | A categorical variable (from -1 to +1) reflecting the change in the bank's credit rating. A value of -1 reflects a downgrade in the bank's credit rating, a value of 0 reflects an upgrade in the bank's credit rating, and a value of +1 reflects no change in the bank's credit rating. | S&P Capital IQ |
| Bank credit rating category | A categorical variable (from -1 to +1) reflecting the change in the bank's credit rating category. A value of -1 reflects a downgrade in the bank's credit rating category, a value of +1 reflects an upgrade in the bank's credit rating category, and a value of 0 reflects no change in the bank's credit rating category. | S&P Capital IQ |

E. *Explanatory variables: Borrower characteristics*

| | | |
|---|---|---|
| Firm size | The log of total firm assets. | Compustat |
| Firm ROA | The return on total firm assets. | Compustat |
| Firm Tobin's Q | The firm's Tobin's Q. | Compustat |
| Firm leverage | The firm's leverage. | Compustat |

F. *Explanatory variables: Lender's country characteristics*

| | | |
|---|---|---|
| GDP growth | The difference in annual GDP growth rate (%) between the lender's and the borrower's countries. | WDI |
| GDP per capita | The difference in annual GDP per capita in constant prices between the lender's and the borrower's countries. | WDI |
| Stock market capitalization | The difference in stock market capitalization between the lender's and the borrower's countries. Stock market capitalization is measured as the total value (in USD) of all listed shares in the borrower's country stock market as a percentage of GDP. | WDI |
| Interbank rate | The difference in the interbank rate between the lender's and the borrower's countries. | WDI |
| Discount rate | The discount rate set by the central bank in the lender's country. | IMF |

**Table 2. Summary statistics**

Variable definitions are in Table 1.

| | Obs. | Mean | Std. dev. | Min. | Max. |
|---|---|---|---|---|---|
| AISD | 42,982 | 271.96 | 176.89 | 1.00 | 1,750.00 |
| Portfolio risk differences | 42,982 | -0.18 | 0.20 | -1.82 | 2.12 |
| Negative risk differences | 42,982 | -0.21 | 0.14 | -1.82 | 0.00 |
| Positive risk differences | 42,982 | 0.03 | 0.10 | 0.00 | 2.12 |
| Portfolio risk differences (leverage) | 42,807 | -0.19 | 0.11 | -1.63 | 1.18 |
| Loan amount | 42,982 | 18.50 | 1.58 | 10.88 | 24.62 |
| Maturity | 42,982 | 59.50 | 34.22 | 0.00 | 540.00 |
| Collateral | 42,982 | 0.53 | 0.50 | 0.00 | 1.00 |
| Number of lenders | 42,982 | 7.46 | 7.74 | 1.00 | 161.00 |
| Performance provisions | 42,982 | 0.15 | 0.36 | 0.00 | 1.00 |
| Number of covenants | 42,982 | 0.54 | 1.10 | 0.00 | 7.00 |
| Number of participants | 42,982 | 4.53 | 6.70 | 0.00 | 159.00 |
| Number of leads | 42,982 | 2.94 | 3.30 | 1.00 | 40.00 |
| Bank share | 42,958 | 28.68 | 24.51 | 0.00 | 100.00 |
| Syndicate Herfindahl | 42,958 | 2,804.70 | 2,465.12 | 0.00 | 10,000.00 |
| Relationship lending | 42,982 | 0.28 | 0.45 | 0.00 | 1.00 |
| Relationship lending number | 42,982 | 0.18 | 0.34 | 0.00 | 1.00 |
| Relationship lending amount | 42,839 | 0.19 | 0.35 | 0.00 | 1.00 |
| Bank asset volatility | 42,982 | 2.42 | 1.93 | 0.07 | 18.39 |
| RBC ratio | 42,982 | 13.89 | 2.79 | 1.10 | 168.48 |
| Bank size | 42,982 | 12.02 | 1.53 | 5.67 | 19.55 |
| Bank ROA | 42,982 | 0.01 | 0.02 | -0.02 | 0.30 |
| Bank NPLs | 42,982 | 0.02 | 0.02 | 0.00 | 0.34 |
| Bank credit rating | 36,835 | -0.01 | 0.27 | -1.00 | 1.00 |
| Bank rating category | 36,835 | -0.03 | 0.33 | -1.00 | 1.00 |
| Firm size | 42,946 | 7.29 | 1.95 | 0.03 | 24.13 |
| Firm ROA | 42,791 | 0.11 | 0.06 | -0.50 | 0.31 |
| Firm Tobin's Q | 42,855 | 0.45 | 0.20 | -0.92 | 1.61 |
| Firm leverage | 42,959 | 0.39 | 0.15 | 0.00 | 1.97 |
| GDP | 41,963 | 0.21 | 1.57 | -13.23 | 25.59 |
| GDP per capita | 41,969 | -2,082.12 | 11,978.34 | -86,860.58 | 100,538.20 |
| Stock market capitalization | 39,425 | 0.84 | 90.91 | -1,158.55 | 1,201.18 |
| Interbank rate | 39,443 | -0.10 | 1.08 | -33.53 | 6.77 |

**Table 3. Baseline results with different fixed effects**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Each specification includes a different set of fixed effects, as given in the lower part of the table. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Portfolio risk differences | -12.600** | -20.278** | -18.869** | -56.023*** | -52.449*** | -51.769*** |
| | [-2.308] | [-2.191] | [-2.308] | [-2.836] | [-2.964] | [-3.081] |
| Loan amount | -0.571 | -0.564 | -3.197*** | -6.150*** | -6.286*** | -6.170*** |
| | [-0.876] | [-0.865] | [-4.467] | [-3.861] | [-3.901] | [-3.884] |
| Maturity | 0.230*** | 0.230*** | 0.271** | 1.222*** | 1.201*** | 1.211*** |
| | [2.907] | [2.969] | [2.389] | [3.868] | [3.835] | [3.834] |
| Collateral | 15.046*** | 15.066*** | 20.345*** | -13.471** | -17.113** | -16.859*** |
| | [3.533] | [3.521] | [15.304] | [-2.098] | [-2.704] | [-2.771] |
| Number of lenders | -0.168 | -0.161 | 0.438 | -1.502*** | -1.729*** | -1.744*** |
| | [-0.228] | [-0.225] | [0.500] | [-3.000] | [-3.348] | [-2.909] |
| Performance provisions | -24.905*** | -24.603*** | -21.280*** | -24.388*** | -24.253*** | -23.342*** |
| | [-11.924] | [-11.042] | [-11.559] | [-6.911] | [-7.267] | [-7.472] |
| Number of covenants | -1.364 | -1.369 | -1.322 | 4.606** | 4.241* | 3.643 |
| | [-1.050] | [-1.050] | [-1.129] | [2.248] | [1.980] | [1.669] |
| Number of participants | -0.470 | -0.484 | -0.803 | 0.545 | 0.770 | 0.769 |
| | [-0.658] | [-0.695] | [-0.915] | [0.843] | [1.054] | [0.959] |
| Bank size | -0.570*** | -0.574*** | -0.609*** | -0.747** | -0.738** | -0.742** |
| | [-3.254] | [-3.401] | [-4.396] | [-2.078] | [-2.052] | [-2.025] |
| Bank ROA | -89.837*** | -88.533*** | -81.669*** | -132.123*** | -130.667*** | -130.751*** |
| | [-9.106] | [-8.778] | [-7.989] | [-5.800] | [-5.825] | [-5.695] |
| Bank NPLs | 58.827** | 59.934** | 57.930** | 175.391*** | 174.259*** | 171.781*** |
| | [2.619] | [2.485] | [2.263] | [4.139] | [4.197] | [4.088] |
| Firm size | -100.418*** | -100.440*** | -92.923*** | | | |
| | [-30.795] | [-30.806] | [-44.527] | | | |
| Firm ROA | -293.301*** | -293.109*** | -279.358*** | | | |
| | [-9.214] | [-9.436] | [-10.830] | | | |
| Firm Tobin's Q | -112.505*** | -112.713*** | -105.709*** | | | |
| | [-7.754] | [-7.682] | [-8.761] | | | |
| GDP growth | -1.642*** | -0.770 | -0.902 | | | |
| | [-3.177] | [-0.780] | [-1.079] | | | |
| GDP per capita | -0.000 | -0.001 | -0.001 | | | |
| | [-0.443] | [-0.451] | [-0.627] | | | |
| Stock market capitalization | 0.017 | 0.041 | 0.025 | | | |
| | [0.245] | [0.899] | [0.457] | | | |
| Interbank rate | 1.299 | 0.825 | 1.039 | | | |
| | [0.638] | [0.326] | [0.446] | | | |
| Constant | 1,072.994*** | 1,070.895*** | 1,052.591*** | 326.496*** | 333.602*** | 331.233*** |
| | [25.214] | [26.124] | [38.689] | [9.639] | [9.896] | [9.716] |
| Observations | 52,038 | 52,015 | 52,011 | 42,982 | 42,982 | 42,982 |
| Adj. R-squared | 0.849 | 0.849 | 0.860 | 0.743 | 0.745 | 0.746 |
| Year effects | Y | Y | Y | N | N | N |
| Bank effects | Y | Y | Y | Y | Y | Y |
| Firm effects | Y | Y | Y | N | N | N |
| Lender's country × year effects | N | Y | Y | Y | Y | Y |
| Loan type effects | N | N | Y | Y | Y | Y |
| Firm × year effects | N | N | N | Y | Y | Y |
| Borrower's country effects | N | N | N | N | Y | N |
| Loan purpose effects | N | N | N | N | Y | Y |
| Borrower's country × year effects | N | N | N | N | N | Y |
| Quarter effects | N | N | N | N | N | Y |
| Number of banks | 290 | 288 | 288 | 364 | 364 | 364 |
| Number of firms | 11,250 | 11,242 | 11,241 | 10,255 | 10,255 | 10,255 |

**Table 4. Distinguishing between positive and negative Portfolio risk differences**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Each specification includes different combinations of *Portfolio risk differences* with its positive and negative values. In specification (1), the negative values of *Portfolio risk differences* (*Negative risk differences*) are included alongside *Portfolio risk differences*. In specification (2), the positive values of *Portfolio risk differences* (*Positive risk differences*) are included alongside *Portfolio risk differences*. In specification (3), the negative values of *Portfolio risk differences* (*Negative risk differences*) are included alongside the positive values of *Portfolio risk differences* (*Positive risk differences*). In specification (4), *Portfolio risk differences* is interacted with *Positive risk differences group*, i.e., a binary variable equal to one for values of *Portfolio risk differences* above our sample mean, and zero otherwise. The lower part of the table denotes the type of fixed effects used in each specification. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Portfolio risk differences | | | | 50.849* |
| | | | | [1.882] |
| Negative risk differences | -41.843 | | -42.752 | |
| | [-0.985] | | [-1.029] | |
| Positive risk differences | | -58.404** | -58.842** | |
| | | [-2.102] | [-2.144] | |
| Portfolio risk differences × Positive risk differences group | | | | -114.232*** |
| | | | | [-3.202] |
| Positive risk differences group | | | | -25.005*** |
| | | | | [-2.908] |
| Loan amount | -6.288*** | -6.278*** | -6.284*** | -6.279*** |
| | [-3.908] | [-3.900] | [-3.907] | [-3.899] |
| Maturity | 1.201*** | 1.200*** | 1.201*** | 1.200*** |
| | [3.835] | [3.834] | [3.834] | [3.833] |
| Collateral | -17.174*** | -17.129** | -17.110** | -17.184** |
| | [-2.730] | [-2.688] | [-2.697] | [-2.695] |
| Number of lenders | -1.703*** | -1.697*** | -1.725*** | -1.724*** |
| | [-3.333] | [-3.242] | [-3.356] | [-3.407] |
| Performance provisions | -24.242*** | -24.313*** | -24.267*** | -24.250*** |
| | [-7.280] | [-7.333] | [-7.313] | [-7.344] |
| Number of covenants | 4.193* | 4.212* | 4.240* | 4.253* |
| | [1.961] | [1.951] | [1.980] | [1.985] |
| Number of participants | 0.750 | 0.738 | 0.766 | 0.758 |
| | [1.058] | [0.996] | [1.057] | [1.056] |
| Bank size | -0.734** | -0.740** | -0.739** | -0.739** |
| | [-2.040] | [-2.062] | [-2.060] | [-2.066] |
| Bank ROA | -130.703*** | -130.872*** | -130.705*** | -130.745*** |
| | [-5.810] | [-5.841] | [-5.808] | [-5.857] |
| Bank NPLs | 174.095*** | 174.114*** | 174.246*** | 174.468*** |
| | [4.190] | [4.192] | [4.193] | [4.198] |
| Constant | 334.407*** | 344.507*** | 335.757*** | 362.279*** |
| | [8.953] | [10.272] | [8.952] | [10.916] |
| Observations | 42,982 | 42,982 | 42,982 | 42,982 |
| Adj. R-squared | 0.745 | 0.745 | 0.745 | 0.745 |
| Loan type | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y |
| Number of banks | 364 | 364 | 364 | 364 |
| Number of firms | 10,255 | 10,255 | 10,255 | 10,255 |

**Table 5. Market-based vs regulatory measures**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Each specification includes a different combination of the market-based, the regulatory-based, and the market-regulatory differences measures. The lower part of the table denotes the type of fixed effects used in each specification. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Portfolio risk differences | -27.620* | -64.071*** | | -35.676** |
| | [-1.872] | [-2.868] | | [-2.127] |
| Bank asset volatility | -4.322 | | -6.060* | -3.917 |
| | [-1.042] | | [-1.738] | [-0.943] |
| RBC ratio | | -1.734** | -0.305 | -1.163 |
| | | [-2.045] | [-0.437] | [-1.278] |
| Loan amount | -6.148*** | -6.150*** | -6.145*** | -6.148*** |
| | [-3.859] | [-3.861] | [-3.861] | [-3.858] |
| Maturity | 1.222*** | 1.222*** | 1.222*** | 1.222*** |
| | [3.868] | [3.867] | [3.867] | [3.868] |
| Collateral | -13.493** | -13.498** | -13.527** | -13.509** |
| | [-2.100] | [-2.100] | [-2.108] | [-2.102] |
| Number of lenders | -1.478*** | -1.492*** | -1.449*** | -1.474*** |
| | [-2.949] | [-2.957] | [-2.932] | [-2.928] |
| Performance provisions | -24.419*** | -24.411*** | -24.449*** | -24.432*** |
| | [-6.915] | [-6.943] | [-6.932] | [-6.937] |
| Number of covenants | 4.671** | 4.644** | 4.677** | 4.691** |
| | [2.335] | [2.284] | [2.343] | [2.347] |
| Number of participants | 0.525 | 0.533 | 0.499 | 0.520 |
| | [0.815] | [0.818] | [0.791] | [0.803] |
| Bank size | -0.745** | -0.749** | -0.743** | -0.747** |
| | [-2.078] | [-2.088] | [-2.073] | [-2.087] |
| Bank ROA | -132.148*** | -132.115*** | -132.222*** | -132.140*** |
| | [-5.807] | [-5.804] | [-5.813] | [-5.809] |
| Bank NPLs | 175.425*** | 175.527*** | 175.367*** | 175.513*** |
| | [4.140] | [4.150] | [4.137] | [4.150] |
| Constant | 341.961*** | 349.107*** | 355.298*** | 355.679*** |
| | [11.464] | [9.146] | [9.925] | [9.800] |
| Observations | 42,982 | 42,982 | 42,982 | 42,982 |
| Adj. R-squared | 0.743 | 0.743 | 0.743 | 0.743 |
| Loan type | Y | Y | Y | Y |
| Loan purpose | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y |
| Number of banks | 364 | 364 | 364 | 364 |
| Number of firms | 10,255 | 10,255 | 10,255 | 10,255 |

**Table 6. Discrepancy between bank asset volatility and bank leverage**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. In all specifications *Portfolio risk differences* (*leverage*) is the residuals from the estimation of Equation (2) when *RBC ratio* is replaced by bank leverage, i.e., the sum of the bank long-term debt, short-term debt and current portion of long-term debt divided by the bank common equity. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Portfolio risk differences (leverage) | -30.231*** | -59.315** | -27.981*** | | -58.542** |
| | [-6.899] | [-2.299] | [-5.580] | | [-2.638] |
| Bank asset volatility | | 4.141 | | 1.013 | 4.100 |
| | | [1.176] | | [0.461] | [1.231] |
| RBC ratio | | | -0.002 | -0.003 | -0.000 |
| | | | [-0.506] | [-0.965] | [-0.139] |
| Loan amount | -5.852*** | -5.858*** | -5.853*** | -5.844*** | -5.859*** |
| | [-4.389] | [-4.378] | [-4.386] | [-4.386] | [-4.377] |
| Maturity | 1.256*** | 1.257*** | 1.257*** | 1.256*** | 1.257*** |
| | [4.291] | [4.290] | [4.288] | [4.288] | [4.287] |
| Collateral | -14.490** | -14.481** | -14.481** | -14.437** | -14.479** |
| | [-2.229] | [-2.226] | [-2.228] | [-2.220] | [-2.226] |
| Number of lenders | -1.170*** | -1.187** | -1.164*** | -1.143** | -1.186*** |
| | [-2.740] | [-2.695] | [-2.737] | [-2.662] | [-2.707] |
| Performance provisions | -25.597*** | -25.586*** | -25.585*** | -25.525*** | -25.584*** |
| | [-8.501] | [-8.514] | [-8.466] | [-8.352] | [-8.480] |
| Number of covenants | 3.639 | 3.533 | 3.635 | 3.640 | 3.533 |
| | [1.179] | [1.173] | [1.179] | [1.193] | [1.173] |
| Number of participants | 0.315 | 0.327 | 0.309 | 0.283 | 0.326 |
| | [0.749] | [0.747] | [0.742] | [0.678] | [0.753] |
| Bank size | -0.698* | -0.699* | -0.697* | -0.694* | -0.699* |
| | [-1.983] | [-1.992] | [-1.975] | [-1.960] | [-1.987] |
| Bank ROA | -139.055*** | -138.928*** | -139.086*** | -139.222*** | -138.936*** |
| | [-4.926] | [-4.946] | [-4.924] | [-4.920] | [-4.942] |
| Bank NPLs | 159.605*** | 159.227*** | 159.548*** | 159.534*** | 159.218*** |
| | [4.544] | [4.507] | [4.539] | [4.535] | [4.505] |
| Constant | 326.391*** | 311.101*** | 327.701*** | 330.196*** | 311.536*** |
| | [11.672] | [10.908] | [11.808] | [12.286] | [11.579] |
| Observations | 50,503 | 50,503 | 50,503 | 50,503 | 50,503 |
| Adj. R-squared | 0.737 | 0.737 | 0.737 | 0.737 | 0.737 |
| Loan type | Y | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y | Y |
| Number of banks | 461 | 461 | 461 | 461 | 461 |
| Number of firms | 11,525 | 11,525 | 11,525 | 11,525 | 11,525 |

**Table 7. Portfolio risk differences and bank characteristics**

The table reports coefficients and t-statistics (in brackets). The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. The lower part of the table denotes the type of fixed effects used in each specification. Each specification includes the interaction of *Portfolio risk differences* with a different loan-, bank-, and firm-level variable. In specification (1), *Portfolio risk differences* is interacted with *Bank size*. In specification (2), *Portfolio risk differences* is interacted with *Bank ROA*. In specification (3), *Portfolio risk differences* is interacted with *Bank NPLs*. In specification (4), *Portfolio risk differences* is interacted with *Bank credit rating*, i.e., a categorical variable (from -1 to +1) reflecting the change in the bank's credit rating (-1 is for a downgrade, +1 is for an upgrade, and 0 is for no change). In specification (5), *Portfolio risk differences* is interacted with *Bank credit rating category*, i.e., a categorical variable (from -1 to +1) reflecting the change in the bank's credit rating category (-1 is for a downgrade, +1 is for an upgrade, and 0 is for no change). The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Portfolio risk differences | -76.165** | -59.589*** | -43.260** | -40.531** | -32.155* |
| | [-2.238] | [-3.095] | [-2.182] | [-2.789] | [-1.870] |
| Portfolio risk differences × Bank size | 1.706 | | | | |
| | [1.127] | | | | |
| Portfolio risk differences × Bank ROA | | 347.348*** | | | |
| | | [3.761] | | | |
| Portfolio risk differences × Bank NPLs | | | -561.078*** | | |
| | | | [-3.872] | | |
| Portfolio risk differences × Bank credit rating | | | | 50.193** | |
| | | | | [2.328] | |
| Portfolio risk differences × Bank credit rating category | | | | | 57.930* |
| | | | | | [1.956] |
| Observations | 42,982 | 42,982 | 42,982 | 36,677 | 36,677 |
| Adj. R-squared | 0.743 | 0.742 | 0.742 | 0.734 | 0.734 |
| Full set of controls | Y | Y | Y | Y | Y |
| Loan type | Y | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y | Y |
| Number of banks | 364 | 364 | 364 | 159 | 159 |
| Number of firms | 10,255 | 10,255 | 10,255 | 8,750 | 8,750 |

## Table 8. Lending relationships

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Each specification includes a different set of fixed effects, as given in the lower part of the table. In specification (1), we interact *Portfolio risk differences* with *Relationship lending*, i.e., a binary variable equal to 1 for a prior lending relationship between the lender and the borrower during the previous 5-year period, and zero otherwise. In specification (2), we interact *Portfolio risk differences* with *Relationship lending number*, i.e., the ratio of the number of prior loans between the lender and the borrower during the previous 5-year period to the total number of loans received by the borrower during the same period. In specification (3), we interact *Portfolio risk differences* with *Relationship lending amount*, i.e., the ratio of the amount of prior loans between the lender and the borrower during the previous 5-year period to the total amount of loans received by the borrower during the same period. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) |
|---|---|---|---|
| Portfolio risk differences | -63.889*** | -62.213*** | -60.108*** |
| | [-3.088] | [-3.133] | [-3.216] |
| Portfolio risk differences × Relationship lending | 32.142*** | | |
| | [3.828] | | |
| Portfolio risk differences × Relationship lending number | | 58.610*** | |
| | | [4.544] | |
| Portfolio risk differences × Relationship lending amount | | | 51.067*** |
| | | | [4.099] |
| Observations | 42,982 | 42,982 | 42,839 |
| Adj. R-squared | 0.743 | 0.743 | 0.742 |
| Full set of controls | Y | Y | Y |
| Loan type | Y | Y | Y |
| Bank effects | Y | Y | Y |
| Firm × year effects | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y |
| Number of banks | 364 | 364 | 364 |
| Number of firms | 10,255 | 10,255 | 10,238 |

**Table 9. The syndicate's structure**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Different specifications include the interaction of *Portfolio risk differences* with measures of the syndicate's structure. In specification (1), *Portfolio risk differences* is interacted with *Number of lenders*. In specification (2), *Portfolio risk differences* is interacted with *Number of participants*. In specification (3), *Portfolio risk differences* is interacted with *Bank share*. In specification (4), *Portfolio risk differences* is interacted with *Syndicate Herfindahl*. The lower part of the table denotes the type of fixed effects used in each specification. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Portfolio risk differences | -78.309*** | -67.712*** | -72.744*** | -72.628*** |
| | [-2.964] | [-3.626] | [-4.600] | [-4.548] |
| Portfolio risk differences × Number of lenders | 3.220* | | | |
| | [1.833] | | | |
| Portfolio risk differences × Number of leads | | 4.455*** | | |
| | | [3.327] | | |
| Portfolio risk differences × Bank share | | | -2.371*** | |
| | | | [-6.400] | |
| Portfolio risk differences × Syndicate Herfindahl | | | | -0.024*** |
| | | | | [-6.120] |
| Observations | 42,982 | 42,982 | 42,948 | 42,948 |
| Adj. R-squared | 0.743 | 0.743 | 0.744 | 0.744 |
| Full set of controls | Y | Y | Y | Y |
| Loan type | Y | Y | Y | Y |
| Loan purpose | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y |
| Number of banks | 364 | 364 | 363 | 363 |
| Number of firms | 10,255 | 10,255 | 10,247 | 10,247 |

## Internet Appendix

**Abstract**

The first section includes information on the construction of the sample and additional summary statistics and the results from the OLS regression for the estimation of the regulatory-market differences measure. The second section reports (i) estimates from the regression for the construction of our market-regulatory portfolio risk differences measure, (ii) estimates from our baseline regressions with different assumptions about standard error-clustering, (iii) results from specifications with alternative portfolio risk differences measures, (iv) weighted regressions, (v) estimates from the Heckman regressions, and (vi) the examination of the role of monetary policy.

**Table A1. Number of loans and mean and standard deviation of Portfolio risk differences by lender's country**

The table reports the number of observations (loan facilities), and the mean and standard deviation of *Portfolio risk differences* by lender's country.

| Country | Obs. | Mean of Portfolio risk differences | Std. Dev. of Portfolio risk differences |
|---|---|---|---|
| Australia | 947 | -0.11 | 0.14 |
| Austria | 31 | -0.25 | 0.08 |
| Belgium | 53 | -0.23 | 0.10 |
| Brazil | 2 | 0.39 | 0.00 |
| Canada | 3,169 | -0.25 | 0.07 |
| China | 210 | -0.24 | 0.14 |
| Czech Republic | 4 | 0.44 | 0.09 |
| Denmark | 44 | -0.35 | 0.10 |
| Finland | 7 | -0.21 | 0.04 |
| France | 2,547 | -0.29 | 0.07 |
| Germany | 2,842 | -0.36 | 0.06 |
| Greece | 26 | 0.21 | 0.41 |
| Hong Kong | 345 | -0.08 | 0.21 |
| India | 171 | -0.10 | 0.19 |
| Indonesia | 2 | 2.12 | 0.00 |
| Ireland | 7 | -0.46 | 0.08 |
| Italy | 284 | -0.10 | 0.18 |
| Japan | 540 | -0.29 | 0.08 |
| Macau | 5 | -0.28 | 0.02 |
| Malaysia | 47 | -0.12 | 0.16 |
| Mexico | 14 | -0.13 | 0.09 |
| Netherlands | 410 | -0.25 | 0.06 |
| New Zealand | 4 | 0.45 | 0.00 |
| Norway | 224 | -0.24 | 0.10 |
| Philippines | 2 | 0.59 | 0.00 |
| Poland | 12 | 1.07 | 0.66 |
| Portugal | 6 | -0.09 | 0.05 |
| Russia | 18 | -0.34 | 0.09 |
| Saudi Arabia | 19 | 0.64 | 0.48 |
| Singapore | 149 | -0.12 | 0.23 |
| South Africa | 2 | -0.17 | 0.00 |
| South Korea | 25 | -0.30 | 0.19 |
| Spain | 807 | -0.15 | 0.17 |
| Sweden | 107 | -0.33 | 0.10 |
| Switzerland | 2,580 | -0.41 | 0.09 |
| Taiwan | 856 | -0.22 | 0.11 |
| Thailand | 11 | -0.04 | 0.08 |
| Turkey | 8 | -0.11 | 0.23 |
| United Arab Emirates | 4 | -0.35 | 0.00 |
| United Kingdom | 3,499 | -0.21 | 0.18 |
| United States of America | 22,942 | -0.11 | 0.20 |
| Total | 42,982 | | |

**Table A2. OLS of Bank asset volatility on RBC ratio**

The table reports coefficients and t-statistics (in brackets) from the regression of *Bank asset volatility* on *RBC ratio* at the bank-year level. In specification (1), the estimation method is OLS with constant. In specification (2), the estimation method is OLS without constant. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) |
|---|---|---|
| RBC ratio | 0.027*** | 0.032*** |
| | (5.897) | (18.336) |
| Constant | 0.083 | |
| | (1.185) | |
| Observations | 2,221 | 2,221 |
| Adj. R-squared | 0.015 | 0.131 |

**Table A3. Different loan controls**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Different specifications include different loan controls to show that the estimates on the variable *Portfolio risk differences* are not overly sensitive to the loan controls used. The lower part of the table denotes the type of fixed effects used in each specification. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Portfolio risk differences | -48.658** | -53.363** | -51.784*** | -46.260** |
| | [-2.579] | [-2.491] | [-2.826] | [-2.616] |
| Loan amount | | -6.936*** | | |
| | | [-4.456] | | |
| Maturity | | 1.221*** | | |
| | | [3.880] | | |
| Collateral | | | -15.556** | |
| | | | [-2.182] | |
| Number of lenders | | | -1.016 | |
| | | | [-1.666] | |
| Performance provisions | | | | -27.192*** |
| | | | | [-8.547] |
| Number of covenants | | | | 2.192 |
| | | | | [0.699] |
| Number of participants | | | -0.161 | |
| | | | [-0.193] | |
| Bank size | -0.888*** | -0.783** | -0.871*** | -0.874** |
| | [-2.804] | [-2.278] | [-2.768] | [-2.603] |
| Bank ROA | -142.306*** | -133.713*** | -141.426*** | -140.871*** |
| | [-7.305] | [-6.033] | [-7.052] | [-7.227] |
| Bank NPLs | 188.979*** | 176.333*** | 187.395*** | 188.213*** |
| | [4.277] | [4.153] | [4.271] | [4.259] |
| Constant | 272.274*** | 324.833*** | 288.068*** | 275.473*** |
| | [63.760] | [9.115] | [39.574] | [61.184] |
| Observations | 43,948 | 42,982 | 43,948 | 43,948 |
| Adj. R-squared | 0.726 | 0.741 | 0.727 | 0.727 |
| Loan type | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y |
| Number of banks | 364 | 364 | 369 | 369 |
| Number of firms | 10,255 | 10,255 | 10,415 | 10,415 |

**Table A4. Different clustering of standard errors**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS. The lower part of the table denotes the type of fixed effects used in each specification and the last line of the table denotes the type of standard error clustering (LC&Y refers to Lender's country *and* Year, B&Y refers to Bank *and* Year, B&F refers to Bank *and* Firm: LC&B&Y refers to Lender's country *and* Bank *and* Year, B&F&Y refers to Bank *and* Firm *and* Year, LC&BC&Y refers to Lender's country *and* Borrower's country *and* Year). The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Portfolio risk differences | -56.023*** | -56.023*** | -56.023* | -56.023*** | -56.023*** | -56.023*** |
| | [-6.454] | [-3.025] | [-1.682] | [-6.454] | [-3.010] | [-4.619] |
| Loan amount | -6.150*** | -6.150*** | -6.150*** | -6.150*** | -6.150*** | -6.150** |
| | [-4.412] | [-4.509] | [-4.420] | [-4.412] | [-4.449] | [-2.924] |
| Maturity | 1.222*** | 1.222*** | 1.222*** | 1.222*** | 1.222*** | 1.222*** |
| | [4.195] | [6.117] | [6.846] | [4.195] | [6.098] | [3.389] |
| Collateral | -13.471* | -13.471* | -13.471** | -13.471* | -13.471* | -13.471 |
| | [-1.950] | [-2.084] | [-2.433] | [-1.950] | [-2.080] | [-1.734] |
| Number of lenders | -1.502 | -1.502 | -1.502 | -1.502 | -1.502 | -1.502 |
| | [-0.826] | [-1.269] | [-1.487] | [-0.826] | [-1.233] | [-1.283] |
| Performance provisions | -24.388*** | -24.388*** | -24.388*** | -24.388*** | -24.388*** | -24.388*** |
| | [-6.166] | [-4.949] | [-5.971] | [-6.166] | [-4.924] | [-6.064] |
| Number of covenants | 4.606 | 4.606* | 4.606* | 4.606 | 4.606* | 4.606** |
| | [1.658] | [1.927] | [1.775] | [1.658] | [1.915] | [2.720] |
| Number of participants | 0.545 | 0.545 | 0.545 | 0.545 | 0.545 | 0.545 |
| | [0.257] | [0.423] | [0.531] | [0.257] | [0.415] | [0.513] |
| Bank size | -0.747 | -0.747* | -0.747** | -0.747 | -0.747* | -0.747 |
| | [-1.652] | [-1.831] | [-2.303] | [-1.652] | [-1.831] | [-1.382] |
| Bank ROA | -132.123*** | -132.123*** | -132.123*** | -132.123*** | -132.123*** | -132.123*** |
| | [-8.478] | [-6.196] | [-5.082] | [-8.478] | [-6.161] | [-9.138] |
| Bank NPLs | 175.391*** | 175.391*** | 175.391*** | 175.391*** | 175.391*** | 175.391*** |
| | [5.463] | [5.612] | [5.538] | [5.463] | [5.601] | [8.647] |
| Constant | 326.496*** | 326.496*** | 326.496*** | 326.496*** | 326.496*** | 326.496*** |
| | [12.161] | [11.725] | [11.571] | [12.161] | [11.598] | [12.676] |
| Observations | 42,982 | 42,982 | 42,982 | 42,982 | 42,982 | 42,982 |
| Adj. R-squared | 0.743 | 0.743 | 0.743 | 0.743 | 0.743 | 0.743 |
| Loan type | Y | Y | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y | Y | Y |
| Clustering | LC&Y | B&Y | B&F | LC&B&Y | B&F&Y | LC&BC&Y |
| Number of banks | 364 | 364 | 364 | 364 | 364 | 364 |
| Number of firms | 10,255 | 10,255 | 10,255 | 10,255 | 10,255 | 10,255 |

**Table A5 Different Portfolio risk differences measures**

The table reports coefficients and t-statistics (in brackets). The Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Each specification includes a variation of *Portfolio risk differences*. *Portfolio risk differences (EMU-adjusted)* is the measure calculated when a common risk-free rate for all countries of the Economic and Monetary Union (EMU) is employed in Equation (4). *Portfolio risk differences (OLS w/o constant)* is the measure calculated when the OLS in Equation (2) is estimated without a constant. *Portfolio risk differences (unstandardized)* is the measure calculated when the residuals from the OLS in Equation (2) are not standardized. *Portfolio risk differences (OLS by bank)* is the measure calculated when the OLS in Equation (2) is estimated for each lender separately. The lower part of the table denotes the type of fixed effects used in each specification. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (3) |
|---|---|---|---|---|
| Portfolio risk differences (EMU-adjusted) | -56.020*** | | | |
| | [-2.836] | | | |
| Portfolio risk differences (OLS w/o constant) | | -53.892*** | | |
| | | [-2.852] | | |
| Portfolio risk differences (unstandardized) | | | -44.523*** | |
| | | | [-2.836] | |
| Portfolio risk differences (OLS by bank) | | | | -44.000** |
| | | | | [-2.632] |
| Loan amount | -6.150*** | -6.150*** | -6.150*** | -6.149*** |
| | [-3.861] | [-3.862] | [-3.861] | [-3.860] |
| Maturity | 1.222*** | 1.222*** | 1.222*** | 1.222*** |
| | [3.868] | [3.868] | [3.868] | [3.868] |
| Collateral | -13.471** | -13.469** | -13.471** | -13.481** |
| | [-2.098] | [-2.098] | [-2.098] | [-2.098] |
| Number of lenders | -1.502*** | -1.502*** | -1.502*** | -1.506*** |
| | [-3.000] | [-3.001] | [-3.000] | [-3.016] |
| Performance provisions | -24.388*** | -24.386*** | -24.388*** | -24.398*** |
| | [-6.911] | [-6.907] | [-6.911] | [-6.930] |
| Number of covenants | 4.606** | 4.599** | 4.606** | 4.613** |
| | [2.248] | [2.242] | [2.248] | [2.262] |
| Number of participants | 0.545 | 0.545 | 0.545 | 0.549 |
| | [0.843] | [0.845] | [0.843] | [0.847] |
| Bank size | -0.747** | -0.747** | -0.747** | -0.748** |
| | [-2.078] | [-2.077] | [-2.078] | [-2.078] |
| Bank ROA | -132.123*** | -132.129*** | -132.123*** | -132.147*** |
| | [-5.800] | [-5.800] | [-5.800] | [-5.804] |
| Bank NPLs | 175.391*** | 175.368*** | 175.391*** | 175.464*** |
| | [4.139] | [4.138] | [4.139] | [4.144] |
| Constant | 326.509*** | 327.450*** | 326.497*** | 335.922*** |
| | [9.639] | [9.691] | [9.639] | [10.105] |
| Observations | 42,982 | 42,982 | 42,982 | 42,982 |
| Adj. R-squared | 0.743 | 0.743 | 0.743 | 0.743 |
| Loan type | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y |
| Number of banks | 364 | 364 | 364 | 364 |
| Number of firms | 10,255 | 10,255 | 10,255 | 10,255 |

**Table A6. Weighted regressions**

The table reports coefficients and t-statistics (in brackets). The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Each specification includes a different weight. In specification (1), we weight by the number of loans between the lender's country and the borrower's country to the total number of loans in our sample. In specification (2), we employ the weight of specification (1) at the yearly frequency. In specification (3), we weight by the number of loans between the lender and the borrower's country to the total number of loans in our sample. In specification (4), we employ the weight of specification (3) at the yearly frequency. In specification (5), we weight by the number of loans between the lender and the borrower to the total number of loans in our sample. In specification (6), we employ the weight of specification (5) at the yearly frequency. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Portfolio risk differences | -56.273*** | -56.258*** | -56.118*** | -55.270*** | -55.965*** | -56.419*** |
| | [-2.824] | [-2.822] | [-2.821] | [-2.757] | [-2.807] | [-2.871] |
| Loan amount | -6.153*** | -6.152*** | -6.155*** | -6.144*** | -6.151*** | -6.159*** |
| | [-3.866] | [-3.866] | [-3.867] | [-3.855] | [-3.860] | [-3.860] |
| Maturity | 1.221*** | 1.221*** | 1.221*** | 1.222*** | 1.222*** | 1.221*** |
| | [3.869] | [3.869] | [3.868] | [3.868] | [3.868] | [3.866] |
| Collateral | -13.517** | -13.506** | -13.566** | -13.593** | -13.476** | -13.407** |
| | [-2.095] | [-2.095] | [-2.107] | [-2.099] | [-2.094] | [-2.083] |
| Number of lenders | -1.519*** | -1.517*** | -1.528*** | -1.519*** | -1.502*** | -1.484*** |
| | [-3.020] | [-3.019] | [-3.040] | [-3.053] | [-2.994] | [-2.980] |
| Performance provisions | -24.371*** | -24.372*** | -24.365*** | -24.373*** | -24.388*** | -24.383*** |
| | [-6.929] | [-6.927] | [-6.932] | [-6.933] | [-6.911] | [-6.899] |
| Number of covenants | 4.594** | 4.597** | 4.573** | 4.558** | 4.601** | 4.693** |
| | [2.233] | [2.235] | [2.230] | [2.222] | [2.242] | [2.246] |
| Number of participants | 0.565 | 0.563 | 0.57 | 0.562 | 0.545 | 0.529 |
| | [0.877] | [0.874] | [0.887] | [0.883] | [0.843] | [0.831] |
| Bank size | -0.747** | -0.747** | -0.746** | -0.745** | -0.747** | -0.747** |
| | [-2.079] | [-2.078] | [-2.080] | [-2.072] | [-2.078] | [-2.087] |
| Bank ROA | -131.881*** | -131.917*** | -131.947*** | -132.033*** | -132.105*** | -131.941*** |
| | [-5.790] | [-5.791] | [-5.792] | [-5.784] | [-5.799] | [-5.820] |
| Bank NPLs | 175.408*** | 175.423*** | 175.311*** | 175.166*** | 175.380*** | 175.423*** |
| | [4.134] | [4.134] | [4.133] | [4.131] | [4.139] | [4.141] |
| Constant | 331.602*** | 331.172*** | 331.047*** | 330.160*** | 326.312*** | 330.417*** |
| | [10.798] | [10.837] | [9.966] | [10.156] | [9.740] | [9.277] |
| Observations | 42,982 | 42,982 | 42,982 | 42,982 | 42,982 | 42,982 |
| Adj. R-squared | 0.743 | 0.743 | 0.743 | 0.743 | 0.743 | 0.743 |
| Loan type | Y | Y | Y | Y | Y | Y |
| Bank effects | Y | Y | Y | Y | Y | Y |
| Firm × year effects | Y | Y | Y | Y | Y | Y |
| Lender's country × year effects | Y | Y | Y | Y | Y | Y |
| Number of banks | 364 | 364 | 364 | 364 | 364 | 364 |
| Number of firms | 10,255 | 10,255 | 10,255 | 10,255 | 10,255 | 10,255 |

**Table A7. Heckman sample-selection model**

The table reports coefficients and t-statistics (in brackets) from Heckman's (1979) sample-selection model. The dependent variable is in the second line of each panel and all variables are defined in Table 1. The estimation method in Panel A is maximum likelihood and in Panel B it is OLS with standard errors clustered by lender's country *and* bank. Specifications (1) and (2) of Panel A report the estimates from the first-stage probit model for the determinants of the firm's loan-taking decision. The lower part of Panel A denotes the dummy variables used in each specification. Panel B reports the estimates of the second-stage OLS regression for the effect of *Portfolio risk differences* on loan spreads. Each of the specifications in Panel B includes the inverse Mills ratio (Lambda) from the corresponding specification in Panel A. The lower part of Panel B denotes the type of fixed effects used in each specification. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: The firm's loan-taking decision

| | (1)<br>Loan deal | (2)<br>Loan deal |
|---|---|---|
| Loan amount | -0.022*** | -0.022*** |
| | [-7.630] | [-7.618] |
| Maturity | 0.002*** | 0.002*** |
| | [15.359] | [15.352] |
| Collateral | 0.268*** | 0.268*** |
| | [32.828] | [32.791] |
| Number of lenders | 0.015*** | 0.015*** |
| | [10.857] | [10.873] |
| Performance provisions | 0.104*** | 0.104*** |
| | [8.466] | [8.488] |
| Number of covenants | -0.051*** | -0.051*** |
| | [-13.497] | [-13.473] |
| Number of participants | -0.003* | -0.003* |
| | [-1.763] | [-1.779] |
| Bank size | | -0.003 |
| | | [-1.168] |
| Bank ROA | | -0.463*** |
| | | [-2.772] |
| Bank NPLs | | 0.075 |
| | | [0.483] |
| Firm size | 0.011*** | 0.011*** |
| | [5.182] | [5.288] |
| Firm ROA | -0.123** | -0.122** |
| | [-2.002] | [-1.984] |
| Firm Tobin's Q | 0.112*** | 0.113*** |
| | [6.115] | [6.145] |
| Firm leverage | 0.242*** | 0.241*** |
| | [9.219] | [9.178] |
| Constant | -207.691*** | -207.593*** |
| | [-123.219] | [-123.131] |
| Observations | 167,721 | 167,721 |
| Loan type dummies | Y | Y |
| Year dummies | Y | Y |
| Firm dummies | Y | Y |
| Borrower's country dummies | Y | Y |

Panel B: The effect of Portfolio risk differences on loan spreads

| | (1) AISD | (2) AISD |
|---|---|---|
| Portfolio risk differences | -64.709*** | -64.197*** |
| | [-4.817] | [-4.931] |
| Loan amount | -42.225*** | -44.473*** |
| | [-4.710] | [-4.746] |
| Maturity | 3.972*** | 4.145*** |
| | [4.382] | [4.448] |
| Collateral | 431.701*** | 459.437*** |
| | [3.646] | [3.724] |
| Number of lenders | 21.467*** | 22.958*** |
| | [3.146] | [3.217] |
| Performance provisions | 152.206*** | 164.035*** |
| | [3.402] | [3.504] |
| Number of covenants | -78.015*** | -83.136*** |
| | [-3.504] | [-3.590] |
| Number of participants | -2.459 | -2.679 |
| | [-1.418] | [-1.481] |
| Bank size | -0.772** | -5.720*** |
| | [-2.113] | [-3.630] |
| Bank ROA | -115.165*** | -942.858*** |
| | [-4.988] | [-4.480] |
| Bank NPLs | 157.611*** | 290.632*** |
| | [3.994] | [4.538] |
| Lambda | 2,413.047*** | 2,566.640*** |
| | [3.631] | [3.702] |
| Constant | -2,052.194*** | -2,139.723*** |
| | [-3.035] | [-3.113] |
| Observations | 42,631 | 42,631 |
| Loan type | Y | Y |
| Bank effects | Y | Y |
| Firm × year effects | Y | Y |
| Lender's country × year effects | Y | Y |
| Number of banks | 362 | 362 |
| Number of firms | 10,195 | 10,195 |

**Table A8. The effect of monetary policy**

The table reports coefficients and t-statistics (in brackets). Dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by lender's country *and* bank. Specifications (1) and (2) include the interaction of *Portfolio risk differences* with *Discount rate*, i.e., the discount rate in the lender's country at the monthly (specification 1) and the annual frequency (specification 2). The lower part of the table denotes the type of fixed effects used in each specification. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) |
|---|---|---|
| Portfolio risk differences | -80.751*** | -80.265*** |
| | [-18.744] | [-18.738] |
| Portfolio risk differences × Discount rate | 24.380*** | 24.794*** |
| | [19.695] | [17.754] |
| Discount rate | -22.101*** | -20.082*** |
| | [-54.506] | [-35.059] |
| Loan amount | -6.964*** | -6.972*** |
| | [-16.134] | [-16.433] |
| Maturity | 0.996*** | 0.995*** |
| | [7.340] | [7.349] |
| Collateral | -11.821*** | -11.657*** |
| | [-3.425] | [-3.394] |
| Number of lenders | -4.059* | -4.063* |
| | [-2.091] | [-2.092] |
| Performance provisions | -21.412*** | -21.369*** |
| | [-70.591] | [-69.751] |
| Number of covenants | 4.410*** | 4.355*** |
| | [12.293] | [12.144] |
| Number of participants | 3.351 | 3.353 |
| | [1.741] | [1.741] |
| Bank size | -0.212 | -0.207 |
| | [-0.880] | [-0.882] |
| Bank ROA | -157.524*** | -157.066*** |
| | [-5.549] | [-5.741] |
| Bank NPLs | 142.781*** | 141.830*** |
| | [14.192] | [14.481] |
| Constant | 406.610*** | 402.089*** |
| | [48.672] | [47.251] |
| Observations | 23,786 | 23,788 |
| Adj. R-squared | 0.738 | 0.738 |
| Loan type | Y | Y |
| Bank effects | Y | Y |
| Firm × year effects | Y | Y |
| Lender's country × year effects | Y | Y |
| Number of banks | 176 | 176 |
| Number of firms | 6,234 | 6,235 |