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Abstract

This paper investigates how lenders react to borrowers' rating changes under heterogeneous conditions and different regulatory regimes. Our findings suggest that corporate downgrades that increase capital requirements for lending banks under the Basel II framework are associated with increased loan spreads and deteriorating non-price loan terms relative to downgrades that do not affect capital requirements. Ratings exert an asymmetric impact on loan spreads, as these remain unresponsive to rating upgrades, even when the latter are associated with a reduction in risk weights for corporate loans. The increase in firm borrowing costs is mitigated in the presence of previous bank-firm lending relationships and for borrowers with relatively strong performance, high cash flows and low leverage.

1. Introduction

Credit ratings play an important role in various financing channels within the economy by providing investors with the information necessary to gauge the credit quality of financial-instrument issuers. Commercial banks, on the other hand, have traditionally conducted their own risk assessments of the credit quality of their borrowers and other investments and, thus, third-party credit ratings have been less valuable. However, the adoption of ratings-contingent capital regulation since 2004 as part of the Basel II Accord, which includes significant roles for third-party rating providers, changed the scene fundamentally. Banks have since been required to hold a sufficient level of capital against risky assets in their portfolios and, under Basel II, the appropriate risk weights to apply to their assets are largely determined by external rating agencies.

Changes in borrowers' credit ratings may alter risk weights on bank loans under ratings-contingent capital regulation, thereby posing a direct impact on lending banks' capital requirements and the cost of financial intermediation. It is likely that the sensitivity of banks' responses to borrowers' rating changes would be much higher for banks located in countries that already adopted the ratings-contingent regulation under Basel II in the mid to late 2000s. Evidence suggests that sovereign credit ratings have a significant impact not only on international bank flows (e.g., Hasan, Kim, and Wu, 2015) but also on syndicated loan pricing (e.g., Adelino and Ferreira, 2016, Drago and Gallo, 2017). This study aims to shed new light on the impact of the staggered national adoption of Basel II ratings-contingent capital rules on syndicated bank loan contracting and structuring strategies.

In this paper, we examine all syndicated loan facilities over the period from 1998 to 2016 (27,396 facilities) granted by 528 lead lenders from 23 countries to borrowers from 63 countries. These data are ideal for our setting because (i) they are at the loan-level, thereby enabling the adequate identification of causal effects, (ii) include loans from several banks to

several firms in several countries, (iii) provide information about several loan characteristics, and (iv) can be matched with sovereign and corporate credit ratings prior to loan origination. We address the following main research questions: First, how important are borrowing firm credit ratings for syndicated loan spreads and other lending syndicate characteristics? Second, are there asymmetric responses to firm rating upgrades and downgrades? Third, to what extent has the adoption of Basel II, especially capital requirements mapped to the risk weights of loans, impacted the strategies of international loan syndicates? Fourth, have the strategic responses of international loan syndicates affected the profitability and operating performance of downgraded firms? Lastly, what borrower characteristics mitigate the negative impact of rating downgrades in bank loan contracting?

Our findings are summarized as follows: First, loan spreads respond significantly to borrowing firms' rating events. We find that lenders are concerned only about the deterioration of borrowers' ratings and respond to them by raising spreads when rating downgrades also increase lenders' applicable Basel II risk weights. This evidence suggests that the adoption of Basel II in lender countries directly affects loan pricing when borrowers' credit conditions change and thereby induce higher capital charges.

Second, the impact of the Basel II risk-weight requirement is significant only for non-US lenders bound by the Basel Accord. On the other hand, only US lenders respond significantly to spreads for undrawn facilities, especially when rating changes also change borrowers' Basel II risk weights. This finding is consistent with Berg, Saunders, Steffen, and Streitz (2017), where credit-line usage is found to be much more extensive for US banks than for their European counterparts.

Third, a borrower country's sovereign credit rating is also important, in addition to firm ratings. The interaction of sovereign rating downgrades with firm downgrades results in a significant increase in bank loan spreads, especially during the post-Basel II adoption period

and for those rating changes with risk-weight increases. Fourth, we find that firm rating downgrades have a significant impact on firm performance. Downgraded borrowers experience worse borrowing conditions, as evidenced by larger spreads, higher collateral requirements and shorter maturities, all of which lead to a deterioration in firm performance.

Fifth, increases in bank loan spreads following firm downgrades is mostly offset when borrowers have had a prior relationship with lenders (i.e., have previously borrowed from them), especially when such downgrades increase risk weights. We conjecture that lenders will be more lenient with their corporate borrowers when a pre-existing relationship exists, since they have special access to information via relationship lending and, thus, have a better understanding of such borrowers' business conditions.[1] They would, therefore, be more willing to absorb regulatory costs and be less concerned about borrowers' higher default risk levels.

Overall, we find that, although downgrades generally lead to higher loan spreads, firms with a previous relationship with their lenders, strong performance and less debt are affected less than other firms by credit downgrades. Our findings have strong policy implications for the effectiveness of ratings-contingent regulation. The real economic impacts of ratings-contingent bank regulation is evidently strongest where the regulation is most needed to curb banks' credit risk exposures to fundamental deteriorations in the credit quality of the most opaque borrowers.

The rest of this paper is organized as follows. Section 2 reviews the related reaserch and highlights our connection to the literature, Section 3 describes the dataset and the empirical methodology, Sections 4-6 present the investigation results regarding the impact of firm rating changes on syndicated loan spreads and other syndicate characteristics, as well as on firm performance, and identify potential remedies for the increased cost of credit. Section 7 provides concluding remarks.

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[1] For more, see Balasubramanyan, Berger, and Koepke (2019).

2. Literature review

The crucial role of corporate and sovereign credit rating changes for the smooth operation of the economic and financial system is well documented. Corporate ratings affect the prices of the major financial asset prices (e.g., bonds, stocks, and CDS), with downgrades constituting a fundamental driver of credit spreads and CDS spreads (see Hull, Predescu, and White, 2004; Kräussl, 2005; Micu, Remolona, and Wooldridge, 2006; Norden and Weber, 2004). Corporate ratings are further material for management decisions on the optimum level of capital structure, debt and equity financing (see Kisgen, 2006, 2009; Kisgen and Strahan, 2010), while also affect firm performance and investment (see Almeida, Cunha, Ferreira, and Restrepo, 2017; Chernenko and Sunderam 2012; Lemmon and Roberts 2010; Sufi 2009; Tang 2009).

We complement the above studies by documenting how corporate credit ratings are incorporated into bank lending decisions and materialize into higher borrowing costs for the downgraded firms. Importantly, we disentangle the effect of credit ratings from that of ratings-contingent regulation and show the difference on bank lending practices since the adoption of the Basel II Accord. Given the economic importance of bank loans in allocating capital to corporations, we further identify the interplay of corporate credit ratings and regulatory reforms as an essential determinant of bank lending decisions; other determinants include the independence of corporate boards (see Francis, Hasan, Koetter, and Wu, 2012), the impact of firm earnings predictability (see Hasan, Park, and Wu, 2012) and the bank's capitalization levels (see Claessens, Law, and Wang, 2018).

Sovereign credit rating downgrades constitute an important determinant of corporate downgrades and overall firm credit risk (see Augustin, Boustanifar, Breckenfelder, and Schnitzler, 2018; Bedendo and Colla, 2015; Ferri Liu, and Majnoni, 2001) and further have negative spillovers on international financial markets (see Drago and Gallo, 2016; Gande and

Parsley, 2005; Ferreira and Gama, 2007). The emergence of the sovereign-bank nexus during the recent European sovereign debt crisis confirmed that the banking sector constitutes the main channel for the transmission of sovereign risk to the economy. Through the bank's high exposures to troubled Eurozone countries sovereign debt, the negative developments at the sovereign level where transmitted to the domestic banking sector and ultimately to the domestic economy due to the reduced bank lending supply (see Acharya, Eisert, Eufinger, and Hirsch, 2018; Becker and Ivashina, 2014; Drago and Gallo, 2016; Popov and Van Horen, 2015).

In this setting, our study further distinguishes between the differential effect of sovereign and corporate credit ratings on bank lending decisions and firm borrowing costs and highlights the negative externalities connected with ratings-based regulation in the event of concurrent sovereign and corporate downgrades. For what matters, these changes result in higher borrowing costs for the affected firms following the transition to the Basel II era.

Finally, our study contributes to the literature on the bank lending channel. Previous evidence suggests that shocks to bank financial positions reduce liquidity supply across banks with a consequent impact on the real economic activity (see Bernanke and Blinder, 1988; Black and Strahan 2002; Kashyap, Lamont, and Stein 1994. In this regard, the 2007-2008 credit crunch and the resulting global financial crisis have been used as natural experiments to examine the impact of bank distress on the supply of credit and firm real outcomes (see, e.g., Carvalho, Ferreira, and Matos, 2015; Chodorow-Reich 2014; Cornett, McNutt, Strahan, and Tehranian, 2011; Ivashina and Scharfstein 2010; Iyer, Peydró, da-Rocha-Lopes, and Schoar, 2014; Santos 2011). Other experimental settings include that of Adelino and Ferreira (2016), who exploit the asymmetric impact of sovereign downgrades on bank credit ratings due to the rating agencies' sovereign ceiling rule. This asymmetric impact, leads to greater reductions in ratings-sensitive funding and lending of banks bounded by their sovereign's rating relative to other banks.

We document how corporate credit ratings are transmitted to the bank lending channel and whether shocks to the firm's financial position are eventually reflected into their borrowing decisions and real economic activity. Furthermore, we identify potential remedies that help mitigate the adverse impact of corporate downgrades. These remedies which concern specific firm traits (relating to certain levels of profitability and leverage) and the formation of lending relationships, enable the downgraded firms to obtain bank financing without being subject to additional penalties (in the form of high interest rate premia and other non-price loan terms) due to the downgrade event.

3. Data and methodology

We obtain data from three sources. We obtain syndicated loan facilities (the unit of our analysis) from DealScan, which includes the most comprehensive and historical loan-deal information available on the global syndicated loan market. Our examination period is from 1998 to 2016. We omit all loans for which there is no information on loan pricing (i.e., there is no interest spread) and this effectively removes all types of Islamic finance and very specialized credit lines. We match corporate loans with borrowers' credit ratings on their long-term foreign currency debt and with their sovereigns' credit ratings. We consider credit ratings provided by Standard & Poor's (S&P) as the ratings literature has shown that S&P is more active and their ratings are revised more frequently, usually ahead of other CRAs (see Alsakka, ap Gwilym, and Vu, 2014; Badar and Shen, 2019; Drago and Gallo, 2017; Ismailescu and Kazemi, 2010). We further match loans with bank- and firm-specific information from Compustat, as well as with macroeconomic and institutional (country-year) variables from several freely available sources. The number of loan facilities for our baseline specifications ranges from 27,317 to 27,396, depending on the set of control variables used. These loans are arranged by 528 lead

lenders headquartered in 23 countries and for 3,989 borrowers from 63 countries (see Table 1 for key descriptive statistics).

3.1. Control variables

We use a number of control variables at the loan-facility level and, importantly, fixed-effect estimations (see Table A1 for details). Following prior studies on syndicated bank loans (Delis, Hasan, and Ongena, 2020; Hasan, Hoi, Wu, and Zhang, 2017; Ivashina, 2009 among others), we control for loan amount (*Loan amount*), loan duration (*Maturity*), collateral (*Collateral*), number of lender banks in the syndicate (*Number of lenders*), number of financial and general covenants in the loan contract (*General covenants*), and performance-pricing provisions (*Performance provisions*). Although not explicitly priced, these non-price terms have a material impact on how loan and syndicate structures are formed. For example, lenders may lean toward making loans with more loan guarantees and lower direct costs following a corporate and/or sovereign upgrade (see Deli, Delis, Hasan, and Liu, 2018; Kim, 2019).

We also control for bank characteristics with banks' return on assets (*Bank return on assets*), total assets (*Bank size*), and non-performing loans (*NPLs*). Our firm controls include firms' return on assets (*Firm return on assets*), Tobin's Q (*Tobin's Q*), and firm leverage (*Firm leverage*). We include country-pair-specific variables, such as the difference in GDP per capita between a lender's and a borrower's country (*GDP per capita*), or the difference in their GDP growth (*GDP growth*) rates to account for the relative differences in their economic development and macroeconomic environments.

Finally, we also include fixed effects based on the purpose of the loan (e.g., corporate purposes, working capital, takeovers or acquisitions, debt repayment), where we further distinguish between term loans and lines of credit. We also include year, bank, firm, lender's country, borrower's country, and country-pair fixed effects. These fixed effects are intended to

capture any remaining effects on loan spreads stemming from the bank, firm, macroeconomic, or general country-specific characteristics not isolated by the inclusion of our set of control variables.

3.2. Empirical identification

The general form of the empirical model is:

$$Cost\ of\ credit_{lt} = a_0 + a_1 Firm\ rating_{kt-1} + a_2 Controls_{kt-1} + u_{lt} \tag{1}$$

In equation (1), *Cost of credit* measures the cost of loan facility *l* originated at time *t*. The most widely used measure is the all-in-spread-drawn (*AISD*), denoting the spread over LIBOR. Berg, Saunders, and Steffen (2016) further show the importance of fees in the overall pricing of loans. Hence, for robustness, we also consider, as an alternative cost measure, the all-in-spread-undrawn (AISU), which is the sum of facility and commitment fees. The vector a_0 denotes different types of fixed effects, described above. *Controls* is a vector of control variables of a different dimension *k*, and *u* is a stochastic disturbance.

Firm rating is the change in the firm's numerical credit rating in the year before the loan facility start year. Consistent with the ratings literature, lower (higher) numerical credit ratings are associated with a higher (lower) credit rating and, therefore, larger values of this variable reflect a deterioration in a firm's creditworthiness (Table A1 provides information on firm credit ratings and their conversions to numerical credit ratings and risk-weighting categories). This, in turn, forms our primary variable of interest. We expect the coefficient a_1 on *Firm rating* to be positive and significant if a deterioration in the firm's credit rating is incorporated in the determination of the interest rate on the firm's loans. In other words, firms face increasing borrowing costs following a rise in their credit risk.

We also distinguish between positive and negative changes in *Firm rating* by constructing the indicator variables *Firm downgrade* and *Firm upgrade* respectively, and sequentially replacing *Firm rating* as the primary independent variable in our baseline specification. This allows us to identify potential asymmetries with regard to the impact of corporate credit ratings on the cost of credit. Such differentiation is imperative since rating cycles are strongly asymmetric, i.e., the length and depth (duration and amplitude) of upgrade and downgrade phases are very different (see Broto, and Molina, 2016; Koopman, Krussl, Lucas, and Monteiro, 2009, for evidence on sovereign credit ratings). The literature reports that the downgrade periods tend to be shorter than those for upgrades, so we expect credit rating downgrades to exert a greater impact on loan spreads compared to rating upgrades.

To explicitly examine the effects of Basel II ratings-based capital requirements, we directly investigate the effects of the borrowing firm credit rating changes that lead to changes in risk-weight categories under Basel capital rules and those that do not. In this respect, we classify every downgrade (upgrade) into a change or non-change in the firm's risk-weight category. The resulting binary variables, *Firm RW* and *Firm NRW*, assume the value of one when the rating change leads to the crossing and non-crossing of risk-weight categories respectively, and zero otherwise. We then consider the separate interactions of *Firm rating* (and sequentially *Firm downgrade*, and *Firm upgrade*) with *Firm RW* and *Firm NRW* respectively. Thus, in later stages our specification is of the form:

$$Cost\ of\ credit_{lt} = a_0 + a_1 Firm\ rating_{kt-1} \times Firm\ RW_{kt-1} +$$

$$+ a_2 Firm\ rating_{kt-1} \times Firm\ NRW_{kt-1} + a_3 Controls_{kt} + u_{lt} \qquad (2)$$

Under the standardized approach to credit risk in Basel II, risk weights used to calculate capital charges are directly mapped to credit ratings and, thus, rating changes across predefined

rating categories will necessarily lead to changes in the risk weights applied (Hasan, Kim, and Wu, 2015).[2] As such, we expect rating changes that force the borrowing firm to move to a different risk-weight category to exert a stronger effect on loan spreads relative to rating changes that leave the corporate entity in the same risk-weight category. Hence, we anticipate the estimated coefficient a_1 to be not only positive but also greater in absolute value than the coefficient estimate for a_2.

4. The effect of credit rating changes on the cost of credit

4.1. Baseline results

In Table 2 we report the results from the estimation of equation (1) using OLS and a different set of fixed effects, the most stringent contribution being that in column (4), where all the fixed effects are included. We use these regressions to analyze the impact of corporate credit rating changes on their cost of credit. We report coefficient estimates and t-statistics, obtained from standard errors clustered by firm. The general finding is that deteriorating corporate credit ratings (as reflected by a positive value in *Firm rating*) positively and significantly affect loan price terms, both statistically and economically.

Specifically, the coefficient on *Firm rating* is statistically significant at the 1% level across all specifications. A one-notch downgrade in the firm's credit rating increases *AISD* by approximately 6.3-7.5 basis points (bps). These effects are economically large and are attributable to both the increasing loan demand of the firms following their rating deterioration and the risk-aversion of the banks. According to model specification (3), which constitutes our baseline specification, the effect is sizeable and is equal to a 3.2% increase for the average loan

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[2] Under both Basel II and Basel III, credit ratings provided by recognized credit rating agencies are employed in the calculation of minimum capital requirements for banks and, therefore, impose operational constraints for investment funds and financial institutions; in other words, credit rating agencies provide a "certification" service for debt issuers (Kiff, Nowak, and Schumacher, 2012).

in our sample. Given that the average loan size is $669 million, firms experiencing a decrease in their credit rating would, on average, pay approximately USD 0.43 million (=$669,000,000 × 6.4 bps) more per year in interest expense. Moreover, for an average loan maturity of 4.13 years, this represents approximately USD 1.77 million in extra interest paid over the duration of the loan.[3] Considering that every firm in our sample receives, on average, 1.83 loans per year, then the overall borrowing costs arising from the firm's total syndicated bank loans rises to USD 3.24 million (=$1.77 × 1.83 loans).

[Insert Table 2 about here]

In Table 3, we separately consider credit rating downgrades and upgrades, by re-estimating our baseline specification. In column (1), we interact *Firm rating* with *Firm downgrade dummy* to evaluate the differential effect of credit rating downgrades on syndicated loan spreads. The coefficient on *Firm rating* is no longer significant, but the interaction term picks up the significance. This suggests that the positive effect of credit rating changes on loan spreads, documented in Table 2, is driven by credit rating downgrades; the coefficient on *Firm rating* × *Firm downgrade dummy* indicates that a corporate downgrade raises AISD by approximately 7.8 basis points.

[Insert Table 3 about here]

This asymmetric effect of corporate downgrades on loan spreads is further verified when we replace *Firm rating* as the main explanatory variable in our baseline specification with *Firm downgrade* (column 2) and *Firm upgrade* (column 3). Estimates from column (2) indicate that corporate downgrades directly increase loan spreads. In fact, a rating downgrade now raises spreads by almost 8.9 basis points, or an increase of 39%, according to our baseline estimate on the impact of a general rating change, as reflected in the coefficient on *Firm rating*

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[3] Assuming five annual payments and LIBOR as the discount rate, the increase in interest expense equals USD 1.66 million for an average 12-month LIBOR rate of 2.8% during our sample period (for similar calculations, see Ivashina and Sun, 2011).

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in column (3) of Table 2. This effect is not observed when upgrades are considered (column 3). Thus, we confirm that only downgrades are important for firms' borrowing cost.

This result questions the credit rating agencies' (CRAs) information-advantage hypothesis, according to which CRAs possess information not available to the markets. Indeed, if a credit rating change could in practice introduce new information, we would expect to observe a significant change in loan spreads regardless of the direction of the change (downgrade or upgrade). Instead, the asymmetric impacts revealed in our analyses suggest that the corporate credit rating policy associated with downgrades is the most relevant factor for the determination of loan spreads observed after a credit rating event.

In Appendix Table A3 we examine the sensitivity of our estimates to different types of loan, bank, firm, and macro controls. In columns 1-3 we confirm that our results are not subject to the "bad-controls" problem, by interchangeably excluding loan-level control variables from our specifications.[4] We initially omit all loan-level variables (column 1), and consequently we include only variables that provide quantitative information on the loan, such as *Loan amount*, *Maturity*, and *Collateral* (column 2), or variables that include qualitative information, such as *Number of lenders*, *Performance provisions*, and *General covenants* (column 3).[5]

In the subsequent specifications (4-6), we gradually include different controls at the bank-, firm-, and macro-levels. These controls include the bank's equity to total assets (*Bank capital* in column 4), the log of the firm's total assets (*Firm size* in column 5), and the balance of trade between lenders' and borrowers' countries as well as their difference in inflation rates (*Trade balance* and *Inflation* in column 6). Regardless of the specifications employed, the coefficient on *Firm rating* retains its negative and statistically significant value. In fact, its

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[4] Since the "bad-controls" problem occurs 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 (these unreported results are available upon request).

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

magnitude is even stronger, ranging between 6.5 and 7.8 basis points, which confirms the higher cost of corporate loans following a deterioration in the firm's credit rating.[6]

The size and magnitude of coefficients on the control variables shown in Tables 2-3 and Appendix Table A3 are generally in line with our expectations and with the studies of Ivashina (2009), Bae and Goyal (2009), Cai, Saunders, and Steffen (2018), and Delis, Hasan, and Ongena (2020), and others. Specifically, loan spreads decrease with larger loans and increase with maturity. However, loan rates are complementary collateral requirements. We further observe that loans are more competitively priced when more performance provisions and general covenants are included. The behavior of bank-level variables is also largely anticipated. In this regard, a higher return on bank assets is associated with decreasing *AISD*, while an increase in the bank's non-performing loans is associated with higher loan spreads. Unsurprisingly, firms achieving higher returns on their assets and high market-to-book-value ratios have access to lower spreads; the latter increase with the firm's leverage.

4.2. Risk weight changes and the role of Basel II

Thus far we have provided evidence that corporate credit rating changes have significant effects, both statistically and economically, on loan spreads. We further differentiate between downgrades and upgrades and find that the asymmetric impact is exerted by the former. We now direct our focus to whether these effects are attributable to rating-based regulation. To this end, in Table 4 we estimate equation (2) with further interactions, i.e., double interaction terms with a Basel II dummy, which will enable us to consider whether the impact of changes in risk-weight categories is magnified when moving to the Basel II period. Since it is debatable whether the U.S. implemented Basel II in practice or migrated directly to Basel III, we

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[6] In all subsequent estimations we employ these sets of bank-, firm-, and macro-controls interchangeably.

distinguish between loans from non-US lenders and loans from lenders headquartered in the U.S.

[Insert Table 4 about here]

When the full sample is considered (column 1), we observe that loan spreads react only to rating changes that lead to a change in risk-weighting category. The coefficient on *Firm rating × Firm RW* is positive and statistically significant, suggesting that every rating change that causes the firm to move into a higher risk-weight category results in an approximately 5.8-basis-point increase in the firm's loan spread. However, irrespective of their impact on risk-weight categories, rating changes are significant in the post-Basel II sample (positive coefficients on the triple interaction terms). Since a large part of our sample includes loans granted by US banks, we need to distinguish between the countries of origin of bank loans. Thus, in column (2), we estimate the same specification for the sample of syndicated bank loans from non-US banks. We find that the non-US banks price only the rating changes that alter borrowing firms' risk weights and only in the post-Basel II period (coefficient on *Firm rating × Firm RW × Basel II*). The increase is equal to 11.6 bps, almost double the loan-pricing effect in our baseline specification. The importance of risk-weight changes for *AISD* is further verified for loans granted by US banks, regardless of whether these loans are directed to all firms or solely to US firms (coefficient on *Firm rating × Firm RW* in columns 3 and 4 respectively). Most importantly, this appears to be independent of the transition to Basel II capital rules, which in turn indicates that the ratings-contingent regulation has not been incorporated into the lending activities of US banks.

Having established the sensitivity of loan spreads to the ratings-contingent regulation introduced under the Basel regulatory framework, we further examine the asymmetric nature of this sensitivity by differentiating between corporate downgrades and upgrades. We thus re-estimate Table 4, by replacing *Firm rating* with *Firm downgrade* and *Firm upgrade,*

respectively. Results are presented in Table 5 and indicate that the asymmetry evidenced in section 4.1 is further preserved when we consider the role of ratings-based regulation. Specifically, estimates from the examination of the full sample point to a significant sensitivity of *AISD* to a combination of corporate downgrades and changes in risk-weight categories since the implementation of Basel II (coefficients on *Firm downgrade × Firm RW × Basel II* and *Firm upgrade × Firm RW × Basel II* in columns 1 and 5, respectively).

[Insert Table 5 about here]

However, our results highlight differences in the reaction of loan spreads depending on the country of the lender. Spreads on loans granted from non-US lenders (column 2), exhibit an increased sensitivity to corporate downgrades that also results in changes in the firm's risk-weight category. This phenomenon is specifically observed during the post-Basel II period and is approximately 2.3 times the gross change when not differentiating between changes in non-risk-weight changes (see specification 2 in Table 3). Non-US bank-originated loans further display an asymmetric response to credit rating changes, as they remain stable to all types of corporate upgrades (column 6).

This asymmetry is nevertheless not observed when considering loans granted by US lenders: *AISD* responds to either corporate downgrades and upgrades that lead to a change in a firm's risk weight (coefficient on *Firm downgrade × Firm RW* in columns 3-4 and 7-8, respectively). In this respect, corporate downgrades (upgrades) can apparently ease borrowing costs for international firms that borrow from US banks (columns 3 and 7) or for US firms that borrow domestically (columns 4 and 8). Overall, Tables 4-5 point to the asymmetric impact of changes in risk-weight categories for both non-US and US lenders. The major difference is that with the former, this asymmetry occurs during the Basel II period, while with the latter, its presence is independent of the change in the capital regulatory regime.

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4.3. Interaction between corporate and sovereign credit rating changes

An integral part of our analysis is the examination of whether a sovereign rating change in the borrower's country has a significant impact on firms' borrowing costs, particularly when occurring concurrently with a corporate credit rating change. If a sovereign downgrade is important for the pricing of loan contracts, we would expect it to raise the cost of debt for that country's firms. We examine this contingency in Table 6, where we interact each of our credit rating variables (i.e., *Firm rating*, *Firm downgrade*, and *Firm upgrade*) with a change in the borrower country's credit rating (*Sov rating*). To assess the impact of rating-contingent regulation, we further include the triple interactions with the change or non-change in the sovereign's risk weight (*Sov RW* and *Sov NRW*, respectively).

[Insert Table 6 about here]

Estimates in columns 1-2 confirm the impact of a sovereign rating change on loan spreads from domestic firms' perspective. This change is significant, however, only to the extent that it causes a change in the sovereign's risk weight (coefficient on *Firm rating × Sov rating × Sov RW* in column 2). Next, we document that the asymmetric response of loan spreads to corporate credit ratings persists in the presence of sovereign credit rating changes. Estimates in column (3) suggest that a combination of corporate and sovereign credit rating change raises *AISD* by an additional 6.1 bps. Furthermore, column (4) reveals that this is driven, and even magnified, by sovereign rating changes that lead to changes in the sovereign's risk-weight category (coefficient on *Firm downgrade × Sov rating × Sov RW*). This is intuitive, since a sovereign rating change (downgrade) does not only reflect an increase in the sovereign credit risk, but also further affects financial markets and the behavior of economic agents in general; it further points to the transmission of sovereign credit risk onto firms' credit risk (see Bedendo and Colla, 2015; Drago and Gallo, 2017). Columns 5-6 confirm this asymmetric impact

between positive and negative rating changes: A corporate upgrade continues to have no effect on loan spreads, regardless of any movement in the borrower country's credit rating.

In Table 7, we examine whether the influence of sovereign downgrades varies with the origin of the lending bank as well as when moving from the pre- to the post-Basel II period. This complements the analysis of section 4.2 and the evidence that corporate downgrades were only incorporated into non-US banks' lending decisions post Basel II. Indeed, estimates from columns 5-8 reveal that, during the transition to the Basel II capital regime, changes in sovereign credit ratings magnify the impact of corporate downgrades on firms' cost of credit (coefficients on *Firm downgrade × Sov rating* and *Firm downgrade × Sov rating × Sov RW* respectively). Most importantly, these changes in sovereign credit risk are only priced in loans granted by non-US banks, which stands in stark contrast to the minimal sensitivity of loan spreads before the implementation of Basel II (columns 1-4). We thus highlight the negative externalities connected with ratings-based regulation in the event of concurrent sovereign and corporate downgrades, which results in higher borrowing costs for the affected firms and when the latter borrow from non-US banks.

[Insert Table 7 about here]

4.4. Results using AISU

An important extension of our analysis relates to the role of loan fees. According to Berg, Saunders, and Steffen (2016), commitment plus facility fees, defined as the all-in-spread-undrawn (*AISU*), are larger for high-volatility firms. Thus, we might expect that riskier firms face higher borrowing costs through higher fees. A constraining factor of the global DealScan database is that the reporting of fees is limited, either because loan deals do not include specifications for undrawn funds or simply because such information is missing. Nevertheless, in Table 8 we replicate Table 2 with *AISU* as the dependent variable. Across all specifications, the coefficient on *Firm rating* is positive and statistically significant at all conventional levels,

raising *AISU* by approximately 1.3% (specification 3); therefore, we reveal that credit rating changes are further priced in the fees.[7]

[Insert Table 8 about here]

Along the lines of Table 5, we examine potential asymmetries in the response of *AISU* to credit rating and risk-weight changes during the pre- and post-Basel II implementation periods, while differentiating between international and US lenders. We present results in Table 9 and provide evidence of an asymmetric reaction of loan spreads on undrawn funds to corporate downgrades, only to the extent that such downgrades lead to a change in risk-weight category (coefficient on *Firm downgrade × Firm RW × Basel II*). Column 1 confirms this reaction for the full sample; however, columns 3-4 reveal that this practice is only followed by US lenders. The latter increase *AISU* by approximately three basis points, or 10.5%, in the post-Basel II period for borrowers experiencing a simultaneous downgrade and movement to a lower risk-weight category.

[Insert Table 9 about here]

On the other hand, columns 5-8 confirm that corporate upgrades have an insignificant effect on *AISU*. Taken together, estimates in Table 9 provide evidence of a differential pricing structure of undrawn funds between international and US lenders, which complements the finding that the pricing structure of lines of credit differs fundamentally between European and US syndicated loans (see Berg, Saunders, Steffen, and Streitz, 2017). According to our analysis, US lenders further adjust (upwards) their pricing of undrawn funds following a firm's movement to a lower risk-weight category; this adjustment is only observed during the post-Basel II period.

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[7] We further estimate specifications 1-4 without the inclusion of *AISD* as a control variable. Results confirm the positive and statistically significant coefficient on *Firm rating*, which is almost four times the coefficient presented in Table 8. In fact, a change in *Firm rating* now raises *AISU* by 1.22-1.45 basis points across all specifications.

4.5. Effect of credit rating changes on the other loan terms

Our analysis further relates to the effect of corporate credit rating changes on additional loan terms. To this end, each of the specifications in Table 10 estimates our baseline regression by replacing *AISD* with alternative non-price loan terms, namely *Loan amount*, *Maturity*, and *Collateral*. Starting from column (1), we notice that a deterioration in the firm's credit rating exerts a positive, albeit weakly significant, effect on loan amount. This finding is not entirely unexpected, as downgrades might constrain firms' access to an alternative source of funding, causing them to resort to syndicated loan financing. Consequently, we observe that a change in credit rating reduces loan duration (column 2).

Our last specification examines the effect of *Firm rating* on collateral requirements (column 3). It is evident that loans to firms experiencing an adverse rating change are more likely to require collateral. Moreover, in Appendix Table A5 we document that, similar to loan spreads, *Collateral* also exhibits an asymmetric response to credit rating changes. In particular, the use of collateral is intensified after corporate downgrades and risk-weight changes; this is observed post-Basel II and concerns lenders headquartered outside the US (positive coefficient on *Firm downgrade × Firm RW × Basel II* in column 2). We find that, in the Basel II regime, collateral is the non-price term that is readily adjusted by non-US banks, while *AISD* is used to price in the higher regulatory costs for lending activities.

[Insert Table 10 about here]

4.6. Robustness Checks

Thus far our results could be subject to a sample-selection bias, in the sense that the variables driving our findings might further determine the firm's decision to receive a loan from a specific bank. It may be, for instance, that loan spreads are impacted by corporate downgrades because high-credit-risk firms are more likely than others to request a loan. To address this

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potential selection bias, we follow Dass and Massa (2011) and employ Heckman's (1979) two-stage model to calculate first the probability of a firm entering into a loan deal. In the first stage, we run a probit model to estimate the firm's loan-taking decision. During this stage, we extend our loan sample and include all syndicated loan facilities available in DealScan. We calculate Heckman's lambda (inverse mills ratio) and include it as an additional control variable in the second-stage OLS estimation of model specifications 1-3 in Table 2.

In line with Dass and Massa (2011), we assume that the borrower's decision to obtain a syndicated loan is a function of the main determinants of the decision to borrow in general. Consequently, our probit regression is augmented with a set of loan-, bank-, and firm-level characteristics; an indicator of whether the facility constitutes a term loan (*Term loan*); a set of weights for the number, origin, and direction of loans made in a given year; and loan purpose, year, bank, firm, lender's and borrower's country dummies. Our set of annual weights include the number of loans made by a given bank (*Bank loans*), the number of loans to a given firm (*Firm loans*), and the number of loans between a given matched bank-firm pair (*Bank-firm loans*).

We present results from this exercise in columns 1-3 of Appendix Table A6 (Panels A and B). Probit estimates (columns 1-3 of Panel A), reveal that the higher the return on assets, the Tobin's Q and the size of the firm, the more likely is the completion of a syndicated loan deal. Loans of shorter maturity are more likely to be granted, particularly when these include collateral and carry pricing provisions and covenants. Importantly, estimates from the second-stage regressions (columns 1-3 of Panel B) confirm the strong positive impact of credit rating changes on *AISD*. Furthermore, this impact is driven by corporate downgrades (columns 1-2), as corporate upgrades appear to be immaterial for loan spreads (column 3).

According to the risk-taking channel of monetary policy, a positive relationship exists between expansionary monetary policy and bank risk taking.[8] If low interest rates entice banks to assume greater risk positions, higher loan spreads might be attributed to within-year expansionary monetary policy. We test this premise by using a subsample consisting of the U.S., the Eurozone, Japan, and the UK. In these countries, we can better identify the stance of monetary policy, especially using measures encompassing non-conventional monetary policy. We consider the quarterly shadow short rate (*Shadow rate*), which provides a more accurate description of monetary policy when interest rates are near or below the zero-lower bound, compared to the actual short rate (Krippner, 2016; Von Borstel, Eickmeier, and Krippner, 2016).

Results in Appendix Table A7 confirm the importance of risk-weight changes relative to non-changes, as well as the asymmetric effect exerted by rating downgrades. Furthermore, the coefficients on each of the interactions with *Shadow rate* are negative and significant, supporting the positive relation between expansionary monetary policy and bank loan rates (i.e., an operative risk-taking channel). These results are in line with Delis, Hasan, and Mylonidis (2017) and Paligorova and Santos (2017), who use syndicated loans to identify the risk-taking channel in the United States.[9]

As a robustness check, in Appendix Table A8 we further confirm the insensitivity of our estimates to the type of clustering used for our standard errors; this is imperative due to the multi-level nature of our loan data. In this respect, we employ different specifications with standard errors clustered by loan facility, bank, bank and firm, firm and year, and bank and

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[8] Evidence on the risk-taking channel of monetary policy is from, among others, Jiménez, Ongena, Peydró, and Saurina (2014), and Delis, Hasan, and Mylonidis (2017).

[9] We also experiment with specifications that include the shadow short rate, and where the clustering of standard errors is at the bank, firm, and year level. This is necessitated by the limited number of countries, which creates the need for more micro-clustering of standard errors. We further examine the hypothesis that loan spreads are driven by the interest-rate differential between the lender's and the borrower's countries. The results remain qualitatively the same.

firm and year. Across all specifications, estimates remain unchanged from our baseline results. In unreported specifications, standard errors are also clustered at lenders' and borrowers' country levels.

Thus far, all loan deals enter our model with equal weights. Normally, the fielding of lenders' and borrowers' country fixed effects in all our specifications acts as a safeguard against cross-country variation. However, this allows certain countries or firms that receive relatively fewer loans to exert a disproportionate impact on our results. To this end, in Appendix Table A9 we re-estimate our preferred model specification using weighted least squares and employing alternative weights based on the number of loans granted by the bank (column 1), the number of loans received by the firm (column 2), the number of loans between the bank and the firm's country (column 3), and the number of loans between the country-pair (column 4). Results from this approach are similar to those under the OLS method.

Last, we control for differences stemming from the financial and institutional environment between banks' and firms' countries (see, e.g., Delis, Hasan, and Ongena, 2020). Specifically, we include financial and institutional country-pair controls (stock market capitalization, prevalence of democratic institutions, rule of law, protection of property and/or creditor rights, quality of bureaucracy) and characteristics of different financial sectors (bank vs. market systems). In theory, the slow-moving nature of these variables should cause them to correlate strongly with the country-pair fixed effects employed in model specification (4) in Table 2. Due to their high pair-wise correlations, we do not employ all variables simultaneously. Results from this exercise are similar to our baseline and are available on request.

Lastly, we control for the timing of the downgrade event. Rating downgrades occurring shortly before or during loan negotiations might have a stronger effect on loan spreads since this information might not have been considered by the lending bank when determining loan

contract terms. Appendix Table A10 considers different frequencies for the timing of the event (daily, quarterly, bi-annually), with all alternative model specifications confirming the positive effect of corporate downgrades on the cost of corporate loans.

5. Real effects for firms

Thus far, our analysis shows that a firm faces higher borrowing costs if it experiences a rating downgrade that moves it into a higher risk-weight category under Basel capital rules. This phenomenon, however, is observed only for loans granted from banks after their countries implemented Basel II. Hence, a natural question arising is whether these higher borrowing costs affect the profitability and operating performance of downgraded firms. Since they are faced with increasing cost of bank credit following a deterioration in their credit worthiness, it is likely that such financially constrained firms will be forced to forego potentially profitable investments and experience a decline in their overall performance and profitability.

It is reasonable to expect such an impact, since firms with a credit rating bounded by their sovereign credit rating, i.e., with a credit rating equal to the that of the country in which they are headquartered, have been shown to cut corporate investments to a greater extent than those with non-bounded ratings in the aftermath of a sovereign downgrade (see Almeida, Cunha, Ferreira, and Restrepo, 2017), which is further reflected in a reduction in their net debt issuance and in an increase in equity issuance. Furthermore, deteriorating credit ratings can impact customer and employee relationships as well as business operations, including a firm's ability to enter into or maintain long-term contracts. Because of these effects, firms appear to react to rating downgrades by reducing debt issuance and leverage (Kisgen, 2009; Kisgen and Strahan, 2010).

In this regard, to allow us to trace the financial and real consequences of corporate downgrades that are most important for capital requirements, we examine whether corporate

downgrades and risk-weight changes are transmitted to the real economy through higher cost of credit in the country of the affected firms According to our estimates in Section 4, their asymmetric effect on cost of bank credit is found to be fairly strong. This will further enable us to identify the differential effect (if any) of the ratings-contingent regulation. Successful identification of the effect stemming from the higher cost of credit for downgraded firms on their operating performance and profitability lies in disentangling the corporate downgrade event from the increasing spreads on the affected firms' loans.

We conduct our analysis by collapsing our sample at the firm-year level and by interchangeably employing as dependent variables a number of different firm-level characteristics. We then perform a difference-in-differences (DiD) estimation by interacting firms that experience a simultaneous downgrade and a change in their risk-weight category with the higher cost of bank credit faced by these firms following their downgrade. Our specification takes the following form:

$$Firm\ performance_{it} = a_0 + a_1 Firm\ downgrade\ dummy_{it-1} + a_2 High\ borrowing\ rate_{it} +$$
$$+ a_3 Firm\ downgrade\ dummy_{it-1} \times High\ borrowing\ rate_{it} +$$
$$+ a_4 Controls_{it} + u_{it} \tag{3}$$

In equation (3), *Firm performance* measures the performance and profitability of a firm i at time t as reflected in the firm's cash flows and holdings, return on assets, total assets, and employee growth. *Firm downgrade dummy* is a binary variable that equals one for a downgrade in the firm's risk-weight category $t-1$ (otherwise zero), while *High borrowing rate* is an indicator variable that equals one if the borrowing rate in the firm's country is within the 75th percentile of the borrowing rate in our sample at time t (otherwise zero). The specification further includes a vector of firm- and macroeconomic-level controls (*Controls*) and firm and

borrower's country fixed effects (a_0). The coefficient on the interaction between *Firm downgrade dummy* and *High borrowing rate* (coefficient a_3) is the main coefficient of interest and shows the differential effect of higher cost of bank credit on operating performance between firms experiencing a risk-weight category downgrade and those that do not.

In other words, our identification strategy rests upon the fact that a higher borrowing rate is associated with, and thus affects differently, firms that have experienced a risk-weight downgrade (the treatment group), compared to firms that were downgraded but remain in the same risk-weight category or were not downgraded at all (the control group). We expect that this coefficient will be positive if the higher cost of bank credit is transmitted to the real economy and thus affects the performance of downgraded firms. Moreover, the coefficient a_1 shows how the firm's risk-weight-related downgrade affects firm performance, without accounting for the greater borrowing costs in its aftermath. If the model is well identified, the interaction term and the control variables should explain (most of) the effects of the firm's risk-weight-related downgrade on firm characteristics (i.e., a_1 should be statistically insignificant), because the effect of the risk-weight change on firm performance should be minimal or zero, especially when controlling for the accompanying higher borrowing cost.

Equation (3) is estimated twice, as we split the sample into the pre- and post-Basel II periods, respectively; we further estimate the same equation without the inclusion of the interaction term. Results from the latter estimation are presented in Table 11 and confirm the detrimental effect of risk-weight changes on borrowing firms' financial performance in the post-Basel II period. We consequently examine the differential effect of high borrowing costs faced by downgraded firms. Estimates in Table 12 provide evidence of the limited ability of our interaction term to affect firm performance before the implementation of Basel II (columns 1-5). The only exception is column (4), where the firm appears to reduce its total assets in response to a combination of a risk-weight-related downgrade and higher borrowing cost. The

transition to the Basel II period, however, marks a rise in the ability of risk-weight downgrades to impede firm performance through a higher cost of credit (columns 6-10). The negative coefficient on the DiD term reveals that a risk-weight-related downgrade event and higher loan spreads reduce firms' cash flows by almost 14.5 million and their cash holdings in proportion to total assets by 2.1 percentage points (columns 6-7). Moreover, affected firms that borrow at higher rates generate lower returns on their assets by 2.7 percentage points, while asset size also contracts (columns 8-9); this size shrinkage is almost 2.5 times that evidenced in the pre-Basel II period. Last, firms re-adjust their hiring practices as reflected by the reduction in employee numbers (column 10).

[Insert Tables 11 and 12 about here]

Overall, the results in this section suggest that corporate downgrades resulting in risk-weight changes carry significant negative effects for firm performance and profitability due to the higher cost of bank credit following the downgrade event. Firms facing increasing loan spreads after a simultaneous credit rating and risk-weight-related downgrade are more strongly affected compared to downgraded firms that manage to maintain their cost of credit at a relatively low level. These adverse real effects for firms are evident only in the period following the implementation of Basel II. We thus highlight the fact that the ratings-contingent regulation involves competitive disadvantages for downgraded firms that are apparent in the form of lower operating cash flows and profitability, and further reduce employee numbers and thus overall firm size.

6. When it pays to borrow

The analysis in Sections 4 and 5 provides evidence of significant borrowing costs for downgraded firms in the post-Basel II period. These costs are further magnified when firms migrate to a higher risk-weight category. Moreover, affected firms experience a deterioration

in their performance, a direct consequence of the higher borrowing cost of bank credit following their downgrade. Having established that effect of a credit rating downgrade, in this section, we perform a number of tests to identify how firms can alleviate these adverse borrowing costs and are able to borrow at competitive rates after a downgrade event.

6.1. Relationship lending

Prior relationships between banks and borrowing firms allow the former to acquire valuable information about the latter's operations and credit-risk level. It is therefore reasonable to expect that firms with prior loan relationships with their lending banks are able to recover part of the higher loan spread following a downgrade in their credit rating. Indeed the literature shows that there are benefits for both the lenders and the borrowers. According to Bharath, Dahiya, Saunders, and Srinivasan (2007), lenders are much more likely to make future loans to previoUS borrowers than new borrowers, while Bharath, Dahiya, Saunders, and Srinivasan (2011) show that loans to relationship borrowers are 10-17 basis points lower. We test this assumption in Table 13, by interacting our variables of main interest with *Relationship lending*, a variable reflecting the existence of a prior lending relationship between the given matched bank-firm pair in the previous three-year period.

[Insert Table 13 about here]

Estimates in columns 1-3 refer to the pre-Basel II period and suggest that repeated borrowing from the same bank during that period did not result in different loan spreads for affected firms (based on the triple interactions with *Relationship lending*). However, relationship ties gain in importance in the post-Basel II period; in the presence of a lending relationship, the borrowing firm can recover more than four-fifths of the initial interest cost incurred by the downgrade and the resulting change in the firm's risk weight (coefficient on *Firm downgrade × Firm RW × Relationship lending* in column 5). Not surprisingly, no loan-

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pricing effect exists for upgraded firms (column 6), as the lower credit risk of these firms alleviates the need to resort to the same bank for funding.

6.2. Firm-characteristics

Our next step is to identify certain performance, profitability and capital-structure characteristics that enable firms to access the syndicated loan market without being penalized for being downgraded. We therefore replace our relationship lending measures with a set of firm-level characteristics. Results are presented in Table 14 and suggest that profitable firms (as measured by ROA and profitability) can entirely offset higher loan spreads charged by banks to downgraded firms; this activity is more prevalent in cases of risk-weight changes (the coefficient on the triple interaction term in columns 1-2). Furthermore, banks favourably perceive specific corporate actions, such as an increase in the number of employees or in the level of cash flows and retained earnings, since these actions mitigate the negative impact of firm rating downgrades on *AISD* (triple interactions with *Number of employees, Cash flows,* and *Retained earnings* in columns 3-5). However, an increase in firm indebtedness (debt level and leverage) produces the exact opposite effect, as suggested by the positive coefficient on the interaction of *Firm downgrade × Firm RW* with *Total debt* and *Leverage* (columns 6 and 7 respectively).[10] Therefore, our findings reveal that lenders do not raise spreads (or at least raise by less) in response to a firm credit downgrade if the firm was profitable or had less leverage before the downgrade.

[Insert Table 14 about here]

We investigate the identified firm characteristics that mitigate the negative impacts of downgrades further by conducting quartile subsample estimations. We aim to uncover the

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[10] When we replicate Table 14 for the pre-Basel II period, most of the double interactions come with a non-statistically significant coefficient. For brevity, we do not present results from this table (available on request).

thresholds for each firm characteristic that allows the mitigating impact. We further replicate Table 14 by considering each of the quartiles for our firm-level variables. The investigation results are presented in Table 15. We find that the mitigating effect is significant only for firms in the top quartile of firm performance, with the exception of *Retained earnings*, where the negative mitigating effect is significant only for firms in the top 25th and 50th percentiles. For example, the coefficient for *Firm return on assets* turns negative and significant only for values in the top 25th percentile (the highest ROA group). This corresponds to values above 13.4% per annum, indicating that firms above that threshold can fully offset the interest-rate increase due to their risk-weight change (see Table 16).

A similar threshold is calculated for *Retained earnings* and is located in the second quartile, which is the point where retained earnings for firms in our sample turn from negative to positive. Hence, firms with negative retained earnings experience an additional increase in their borrowing costs. Furthermore, we find that for *Asset growth*, the mitigating effect of firm performance disappears for firms in the lower performance groups. Specifically, firms in the bottom quartile experience even greater increases in interest spreads as evidenced by the positive and significant coefficient on the triple interaction term. This evidence suggests that syndicated lenders punish the worst performers when they come to the syndicated loan market with credit rating downgrades in the prior year, while giving previously higher-performing firms with downgraded ratings the benefit of the doubt.

Regarding leverage-related firm characteristics, we find that highly indebted (*Total debt* and *Firm leverage*) firms in the top quartile of our sample experience further increases in loan spread when they are downgraded. The corresponding threshold for *Total debt* is the third quartile, while that for *Firm leverage* is the fourth quartile, corresponding to values of USD 6.4 billion and 46.9%, respectively. The increase in bank cost of credit is further magnified for

firms with debt level and leverage above these values. On the other hand, borrowing costs for less-indebted firms do not increase as much, even when they are downgraded.

[Insert Table 15 about here]

6.3. Summing up

Overall, the results in this section suggest that the effect of ratings-contingent regulation on the cost of bank credit is not homogeneous across all borrowers. In fact, this effect largely depends on firm performance, since profitable and non-highly leveraged firms with constant cash flows can recuperate, and even fully offset, higher loan spreads following a rating-downgrade event. Furthermore, prior bank-firm lending relationships act as an additional mitigating factor against rising borrowing costs. Thus, for downgraded firms migrating to different regulatory risk-weighting categories, resorting to familiar banks enables them to recover part of the higher spreads charged on their loans. A direct corollary of our empirical analysis is that corporate downgrades resulting in risk-weighting changes do not constitute a deterrent for firms aiming to obtain syndicated lending. The empirical evidence indicates that strongly performing firms with relatively low levels of debt and stable bank relationships can still continue to access the syndicated loan market at competitive rates without being subjected to discipline.

7. Conclusion

This paper investigates whether changes in lending behavior in response to corporate credit rating events vary under certain conditions. It specifically examines how syndicated loan spreads respond to rating changes with or without a corresponding risk-weight change under Basel II, and whether different borrower-firm characteristics are significant in determining loan conditions. Our results reveal a number of interesting findings that both confirm various *a priori* expectations and provide important new insights into the impact of ratings-contingent

banking regulation on the corporate lending practices of banks since the adoption of the Basel II Accord.

Our analysis shows that lending banks respond significantly to corporate downgrades by raising loan spreads, increasing required collateral requirements, and reducing loan maturities; corporate upgrades do not, in general, elicit a significant response. Our findings lend support for the efficacy of Basel II accord in terms of eliciting conservative lending decisions by banks in the face of change borrower credit ratings. Furthermore, this response is limited to downgrades that specifically increase Basel II risk weights applied on risky assets and is mainly concentrated in loans from non-US banks. Furthermore, rating changes carry real effects, since corporate downgrades coupled with higher borrowing costs result in worse firm performance.

We additionally reveal the heterogeneous effect of ratings-contingent regulation on firms' cost of credit. This effect is largely dependent on firm performance, as relationship borrowers with high profitability and moderate leverage ratios can recuperate, and even fully offset, any interest-rate increase following their downgrade. Hence, the migration to a different risk-weighting category does not automatically translate into a competitive disadvantage, in the form of increased bank financing costs.

Our research indicates that the adoption of Basel II capital regulation with its refined system of asset risk-weighting (depending on the borrowers' risk profile) had the desired impact on lending banks. These findings highlight the difficulties inherent in the regulatory authorities' attempt to calibrate capital requirements to accurately reflect bank portfolio risks. They are also relevant for ongoing reforms to improve the global financial architecture. Of particular interest is the examination of whether corporate downgrades further alter firm borrowing behavior, as well as firms' choice between alternative financing sources; however, we leave that for future research.

References

Acharya, V. V., Eisert, T., Eufinger, C., Hirsch, C., 2018. Real effects of the sovereign debt crisis in Europe: Evidence from syndicated loans. The Review of Financial Studies, 31(8), 2855-2896.

Almeida, H., Cunha, I., Ferreira, M. A., Restrepo, F., 2017. The real effects of credit ratings: The sovereign ceiling channel. Journal of Finance, 72(1), 249-290.

Alsakka, R., ap Gwilym, O., Vu, T. N., 2014. The sovereign-bank rating channel and rating agencies' downgrades during the European debt crisis. Journal of International Money and Finance, 49, 235-257.

Augustin, P., Boustanifar, H., Breckenfelder, J., Schnitzler, J., 2018. Sovereign to corporate risk spillovers. Journal of Money, Credit and Banking, 50(5), 857-891.

Badar, A, Shen, Y. 2019. Economic policy uncertainty and banks' loan pricing, Journal of Financial Stability, 44, 100695.

Bae, K. H., Goyal, V. K., 2009. Creditor rights, enforcement, and bank loans. Journal of Finance 64, 823-860.

Balasubramanyan, L., Berger, A., Koepke, M. 2019. How do lead bank use private information about the loan quality in the syndicated loan market? Journal of Financial Stability, 43, 53-78.

Becker, B., Ivashina, V., 2018. Financial repression in the European sovereign debt crisis. Review of Finance, 22(1), 83-115.

Bedendo, M., Colla, P., 2015. Sovereign and corporate credit risk: Evidence from the Eurozone. Journal of Corporate Finance, 33, 34-52.

Berg, T., Saunders, A., Steffen, S., 2016. The total cost of corporate borrowing in the loan market: Don't ignore the fees. Journal of Finance 71, 1357-1392.

Berg, T., Saunders, A., Steffen, S., Streitz, D., 2017. Mind the gap: The difference between US and European loan rates. The Review of Financial Studies 30, 948-987.

Ben, B., Blinder, A. S., 1988. Credit, money, and aggregate demand. American Economic Review, 78(2), 435-439.

Bharath, S. T., Dahiya, S., Saunders, A., Srinivasan, A., 2007. So what do I get? The bank's view of lending relationships, Journal of Financial Economics, 85, 368-419.

Bharath, S. T., Dahiya, S., Saunders, A., Srinivasan, A., 2011. Lending relationships and loan contract terms. The Review of Financial Studies 24, 1141-1203.

Black, S. E., Strahan, P. E., 2002. Entrepreneurship and bank credit availability. The Journal of Finance, 57(6), 2807-2833.

Broto, C., Molina, L., 2016. Sovereign ratings and their asymmetric response to fundamentals. Journal of Economic Behavior and Organization, 130, 206-224.

Cai, J., Eidam, F., Saunders, A., Steffen, S., 2018. Syndication, interconnectedness, and systemic risk. Journal of Financial Stability, 34, 105-120.

Carvalho, D., Ferreira, M. A., Matos, P., 2015. Lending relationships and the effect of bank distress: evidence from the 2007–2009 financial crisis. Journal of Financial and Quantitative Analysis, 50(6), 1165-1197.

Chernenko, S., Sunderam, A., 2012. The real consequences of market segmentation. The Review of Financial Studies, 25(7), 2041-2069.

Chodorow-Reich, G.. 2014. The employment effects of credit market disruptions: Firm-level evidence from the 2008–9 financial crisis. The Quarterly Journal of Economics, 129(1), 1-59.

Claessens, S., Law, A., Wang, T., 2018. How do credit ratings affect bank lending under capital constraints?. BIS Working Paper No. 747

Cornett, M. M., McNutt, J. J., Strahan, P. E., Tehranian, H., 2011. Liquidity risk management and credit supply in the financial crisis. Journal of Financial Economics, 101(2), 297-312.

Dass, N., Massa, M., 2011. The impact of a strong bank-firm relationship on the borrowing firm. The Review of Financial Studies, 24(4), 1204-1260.

Deli, Y., Delis, M. D., Hasan, I., Liu, L. 2019. Enforcement of banking regulation and the cost of borrowing, Journal of Banking and Finance, 101, 147-160.

Delis, M. D., Hasan, I., Mylonidis, N., 2017. The risk-taking channel of monetary policy in the U.S.: Evidence from corporate loan data. Journal of Money, Credit and Banking, 49, 187-213.

Delis, M. D., Hasan, I., Ongena, S., 2020. Democracy and credit. Journal of Financial Economics 136.2., 571-596.

Drago, D., Gallo, R., 2016. The impact and the spillover effect of a sovereign rating announcement on the euro area CDS market. Journal of International Money and Finance, 67, 264-286.

Drago, D., Gallo, R., 2017. The impact of sovereign rating changes on European syndicated loan spreads: The role of the rating-based regulation. Journal of International Money and Finance, 73, 213-231.

Ferreira, M. A., Gama, P. M., 2007. Does sovereign debt ratings news spill over to international stock markets?. Journal of Banking and Finance, 31(10), 3162-3182.

Ferri, G., Liu, L. G., Majnoni, G., 2001. The role of rating agency assessments in less developed countries: Impact of the proposed Basel guidelines. Journal of Banking and Finance, 25(1), 115-148.

Francis, B., Hasan, I., Koetter, M., Wu, Q., 2012. Corporate boards and bank loan contracting. Journal of Financial Research, 35(4), 521-552.

Gande, A., Parsley, D. C., 2005. News spillovers in the sovereign debt market. Journal of Financial Economics, 75(3), 691-734.

Hasan, I., Hoi, C. K., Wu, Q., Zhang, H., 2017. Social capital and debt contracting: Evidence from bank loans and public bonds. Journal of Financial and Quantitative Analysis, 52(3), 1017-1047.

Hasan, I., Kim, S. J., Wu, E., 2015. The effects of ratings-contingent regulation on international bank lending behavior: Evidence from the Basel 2 Accord. Journal of Banking and Finance, 61, S53-S68.

Hasan, I., Park, J. C., Wu, Q., 2012. The impact of earnings predictability on bank loan contracting. Journal of Business Finance and Accounting, 39(7-8), 1068-1101.

Heckman, J. J., 1979. Sample selection as a specification error. Econometrica, 47, 153-161.

Hull, J., Predescu, M., White, A., 2004. The relationship between credit default swap spreads, bond yields, and credit rating announcements. Journal of Banking and Finance, 28(11), 2789-2811.

Ismailescu, I., Kazemi, H., 2010. The reaction of emerging market credit default swap spreads to sovereign credit rating changes. Journal of Banking and Finance, 34(12), 2861-2873.

Ivashina, V., 2009. Asymmetric information effects on loan spreads. Journal of Financial Economics, 92(2), 300-319.

Ivashina, V., Scharfstein, D., 2010. Bank lending during the financial crisis of 2008. Journal of Financial Economics, 97(3), 319-338.

Ivashina, V., Sun, Z., 2011. Institutional stock trading on loan market information. Journal of Financial Economics 100, 284-303.

Iyer, R., Peydró, J. L., da-Rocha-Lopes, S., Schoar, A., 2014. Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007–2009 crisis. The Review of Financial Studies, 27(1), 347-372.

Jiménez, G., Ongena, S., Peydró, J. L., Saurina, J., 2014. Hazardous Times for Monetary Policy: What Do Twenty-Three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk-Taking?. Econometrica, 82(2), 463-505.

Kashyap, A. K., Lamont, O. A., Stein, J. C., 1994. Credit conditions and the cyclical behavior of inventories. The Quarterly Journal of Economics, 109(3), 565-592.

Kiff, J., Nowak, S. B., Schumacher, L. B., 2012. Are rating agencies powerful? An investigation into the impact and accuracy of sovereign ratings. IMF Working Paper No. 12/23.

Kim, O. S., 2019. Does Political Uncertainty Increase External Financing Costs? Measuring the Electoral Premium in Syndicated Lending. Journal of Financial and Quantitative Analysis, 54(5), 2141-2178 .

Kisgen, D. J., 2006. Credit ratings and capital structure. The Journal of Finance, 61(3), 1035-1072.

Kisgen, D. J., 2009. Do firms target credit ratings or leverage levels?. Journal of Financial and Quantitative Analysis, 44(6), 1323-1344.

Kisgen, D. J., Strahan, P. E., 2010. Do regulations based on credit ratings affect a firm's cost of capital?. The Review of Financial Studies, 23(12), 4324-4347.

Koopman, S.J., Krussl, R., Lucas, A., Monteiro, A. B., 2009. Credit cycles and macrofundamentals. Journal of Empirical Finance 16, 42-54.

Kräussl, R., 2005. Do credit rating agencies add to the dynamics of emerging market crises?. Journal of Financial Stability, 1(3), 355-385.

Krippner, L., 2016. Documentation for measures of monetary policy. Reserve Bank of New Zealand. Wellington, New Zealand.

Lemmon, M., Roberts, M. R., 2010. The response of corporate financing and investment to changes in the supply of credit. Journal of Financial and Quantitative analysis, 45(3), 555-587.

Micu, M., Remolona, E. M., Wooldridge, P. D., 2006. The price impact of rating announcements: which announcements matter?. BIS Working Paper No. 207.

Norden, L., Weber, M., 2004. Informational efficiency of credit default swap and stock markets: The impact of credit rating announcements. Journal of Banking and Finance, 28(11), 2813-2843.

Paligorova, T., Santos, J. A., 2017. Monetary policy and bank risk-taking: Evidence from the corporate loan market. Journal of Financial Intermediation 30, 35-49.

Popov, A., Van Horen, N., 2015. Exporting sovereign stress: Evidence from syndicated bank lending during the euro area sovereign debt crisis. Review of Finance, 19(5), 1825-1866.

Santos, J. A., 2011. Bank corporate loan pricing following the subprime crisis. The Review of Financial Studies, 24(6), 1916-1943.

Sufi, A., 2009. The real effects of debt certification: Evidence from the introduction of bank loan ratings. The Review of Financial Studies, 22(4), 1659-1691.

Tang, T. T., 2009. Information asymmetry and firms' credit market access: Evidence from Moody's credit rating format refinement. Journal of Financial Economics, 93(2), 325-351.

Von Borstel, J., Eickmeier, S., Krippner, L., 2016. The interest rate pass-through in the euro area during the sovereign debt crisis. Journal of International Money and Finance 68, 386-402.

Table 1. Summary statistics

The table reports summary statistics (number of observations, mean, standard deviation, minimum and maximum values) for all variables used in the estimations of the main text. All variables are defined in Table A1.

	Obs.	Mean	Std. dev.	Min.	Max.
AISD	27,396	202.47	162.68	-3.00	1,600.00
AISU	13,435	28.58	25.18	0.75	450.00
Firm rating	27,396	0.06	0.95	-7.00	6.00
Firm downgrade dummy	27,396	0.13	0.34	0.00	1.00
Firm downgrade	24,237	0.25	0.75	0.00	6.00
Firm upgrade	23,820	0.18	0.60	0.00	7.00
Firm RW	27,396	0.07	0.26	0.00	1.00
Firm NRW	27,396	0.93	0.26	0.00	1.00
Sovereign rating	27,368	0.03	0.44	-9.00	12.00
Sov RW	27,374	0.01	0.10	0.00	1.00
Sov NRW	27,374	0.99	0.10	0.00	1.00
Loan amount	27,396	19.42	1.40	12.47	24.62
Maturity	27,396	49.57	27.72	1.00	1,140.00
Collateral	27,396	0.44	0.50	0.00	1.00
Number of lenders	27,396	10.25	9.31	1.00	290.00
Performance provisions	27,396	0.33	0.47	0.00	1.00
General covenants	27,396	1.01	1.36	0.00	7.00
Relationship lending	27,396	0.34	0.47	0.00	1.00
Bank return on assets	27,396	0.01	0.02	-0.02	0.28
Bank size	27,396	12.04	1.53	5.89	17.81
NPLs	27,396	0.02	0.02	0.00	0.31
Firm return on assets	27,396	0.06	0.08	-0.51	0.31
Tobin's Q	27,396	1.53	0.49	0.23	5.00
Firm leverage	27,396	0.39	0.20	0.00	1.97
GDP per capita	27,396	-1,614.76	10,538.79	-80,909.59	66,633.97
GDP growth	27,396	0.26	1.40	-10.92	25.59
Basel II	26,894	0.43	0.49	0.00	1.00

Table 2. 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 A1. The estimation method is OLS with standard errors clustered by firm. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Firm rating	7.450***	6.421***	6.421***	6.275***
	[6.381]	[5.744]	[5.737]	[5.542]
Loan amount	-4.913***	-5.584***	-5.584***	-5.881***
	[-5.051]	[-5.733]	[-5.726]	[-6.045]
Maturity	0.105**	0.257***	0.257***	0.260***
	[2.456]	[4.583]	[4.578]	[4.626]
Collateral	31.745***	27.702***	27.702***	27.776***
	[8.620]	[8.062]	[8.052]	[7.979]
Number of lenders	-0.784***	-0.879***	-0.879***	-0.885***
	[-6.381]	[-7.566]	[-7.557]	[-7.605]
Performance provisions	-29.466***	-29.035***	-29.035***	-29.413***
	[-12.566]	[-13.531]	[-13.516]	[-13.547]
General covenants	2.348**	2.786***	2.786***	2.774***
	[2.163]	[2.720]	[2.717]	[2.693]
Bank return on assets	-159.540***	-152.489***	-152.489***	-151.439***
	[-5.431]	[-5.590]	[-5.584]	[-5.510]
Bank size	0.044	0.036	0.036	0.034
	[0.110]	[0.095]	[0.094]	[0.090]
NPLs	136.327***	131.039***	131.039***	129.490***
	[5.288]	[5.353]	[5.346]	[5.249]
Firm return on assets	-135.856***	-108.337***	-108.337***	-112.613***
	[-5.408]	[-4.703]	[-4.697]	[-4.816]
Tobin's Q	-49.692***	-34.720***	-34.720***	-35.037***
	[-13.252]	[-10.582]	[-10.570]	[-10.584]
Firm leverage	188.610***	173.767***	173.767***	172.209***
	[12.117]	[12.032]	[12.018]	[11.794]
GDP per capita	-0.006***	-0.003**	-0.003**	-0.004***
	[-4.128]	[-2.573]	[-2.570]	[-2.868]
GDP growth	-2.075**	-0.334	-0.334	-0.010
	[-2.461]	[-0.450]	[-0.450]	[-0.012]
Constant	294.215***	287.402***	287.402***	294.049***
	[14.090]	[14.215]	[14.198]	[14.681]
Observations	27,396	27,396	27,396	27,317
Adj. R-squared	0.675	0.714	0.713	0.715
Loan purpose	Y	Y	Y	Y
Year effects	N	Y	Y	Y
Bank effects	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y
Lender's country effects	N	N	Y	Y
Borrower's country effects	N	N	Y	Y
Country-pair effects	N	N	N	Y
Number of banks	528	528	528	525
Number of firms	3989	3989	3989	3973

Table 3. The asymmetric response of spreads to credit rating changes

The table reports coefficients and t-statistics (in brackets). The dependent variable is *AISD,* and all variables are defined in Table A1. The estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. In specification (1), we interact *Firm rating* with *Firm downgrade dummy*, i.e., a binary variable equal to one if firm is downgraded, otherwise zero. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Firm rating	1.948		
	[1.408]		
Firm rating × Firm downgrade dummy	7.828**		
	[2.253]		
Firm downgrade		8.857***	
		[4.846]	
Firm upgrade			-0.994
			[-0.747]
Firm downgrade dummy	-0.049		
	[-0.009]		
Loan amount	-5.551***	-5.156***	-5.238***
	[-5.694]	[-4.934]	[-5.300]
Maturity	0.259***	0.258***	0.245***
	[4.587]	[4.338]	[4.217]
Collateral	27.617***	26.577***	26.343***
	[8.062]	[7.111]	[7.600]
Number of lenders	-0.880***	-0.939***	-0.731***
	[-7.584]	[-7.891]	[-6.673]
Performance provisions	-28.954***	-30.121***	-23.763***
	[-13.501]	[-13.104]	[-11.418]
General covenants	2.734***	3.254***	1.558
	[2.671]	[2.965]	[1.519]
Bank return on assets	-152.356***	-148.911***	-100.807***
	[-5.585]	[-5.034]	[-3.818]
Bank size	0.059	-0.010	0.226
	[0.156]	[-0.024]	[0.598]
NPLs	130.712***	132.553***	115.758***
	[5.338]	[4.958]	[4.776]
Firm return on assets	-104.726***	-96.517***	-129.328***
	[-4.527]	[-3.798]	[-5.357]
Tobin's Q	-34.665***	-36.399***	-30.527***
	[-10.616]	[-10.057]	[-9.272]
Firm leverage	173.063***	182.013***	161.034***
	[11.913]	[11.394]	[11.057]
GDP per capita	-0.003**	-0.004***	-0.004***
	[-2.554]	[-2.610]	[-3.685]
GDP growth	-0.327	0.327	-0.164
	[-0.443]	[0.381]	[-0.220]
Constant	285.021***	278.541***	269.523***
	[14.105]	[12.942]	[13.127]
Observations	27,396	24,114	23,656
Adj. R-squared	0.714	0.716	0.730
Loan purpose	Y	Y	Y
Year effects	Y	Y	Y
Bank effects	Y	Y	Y
Firm effects	Y	Y	Y
Lender's country effects	Y	Y	Y
Borrower's country effects	Y	Y	Y
Number of banks	528	505	482
Number of firms	3989	3777	3718

Table 4. The response of spreads to risk weight changes and the role of Basel II

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Firm RW* (i.e., a binary variable equal to one for a change in the firm's risk-weighting category, otherwise zero), *Firm NRW* (i.e., a binary variable equal to one for a non-change in the firm's risk-weighting category, otherwise zero), and *Basel II* (i.e., a binary variable equal to one for the implementation of Basel II in the lender's country, otherwise zero). The dependent variable is *AISD,* and all variables are defined in Table A1. The estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. In all specifications, we exclusively interact *Firm rating* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Basel II*. In specification (1), we include all loans. In specification (2), we exclude loans from US lenders. In specification (3), we only include loans from US lenders. In specification (4), we only include loans from US lenders to US borrowers. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) All loans	(2) Non-US lenders	(3) US lenders	(4) US loans
Firm rating × Firm RW	5.758***	-0.026	8.178***	7.196***
	[3.579]	[-0.011]	[3.771]	[3.565]
Firm rating × Firm NRW	2.383	5.991	3.425	4.434*
	[1.088]	[1.571]	[1.411]	[1.810]
Firm rating × Firm RW × Basel II	6.745*	11.597**	1.351	1.973
	[1.935]	[2.200]	[0.289]	[0.412]
Firm rating × Firm NRW × Basel II	5.846*	-0.169	4.622	2.984
	[1.723]	[-0.034]	[1.038]	[0.661]
Basel II	-10.194	32.854		
	[-0.998]	[1.294]		
Observations	26,257	7,734	18,523	17,382
Adj. R-squared	0.716	0.754	0.723	0.727
Full interactions and main terms	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y
Year effects	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y
Lender's country effects	Y	Y	N	N
Borrower's country effects	Y	Y	Y	N
Number of banks	491	201	290	274
Number of firms	3843	1652	2932	2652

Table 5. The asymmetric response of spreads to risk weight changes and the role of Basel II

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Firm RW* (i.e., a binary variable equal to one for a change in the firm's risk-weighting category, otherwise zero), *Firm NRW* (i.e., a binary variable equal to one for a non-change in the firm's risk-weighting category, otherwise zero), and *Basel II* (i.e., a binary variable equal to one if Basel II is implemented in the lender's country, otherwise zero). The estimation is conducted for the full sample of loans and certain subsamples of loans. The dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specifications (1)-(4), we exclusively interact *Firm downgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Basel II*. In specifications (5)-(8), we exclusively interact *Firm upgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Basel II*. In specifications (1) and (5), we include all loans. In specifications (2) and (6), we exclude loans from US lenders. In specifications (3) and (7), we only include loans from US lenders. In specification (4) and (8), we only include loans from US lenders to US borrowers. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All loans	Non-US lenders	US lenders	US loans	All loans	Non-US lenders	US lenders	US loans
Firm downgrade × Firm RW	5.785**	-4.044	8.338***	7.092***				
	[2.348]	[-0.680]	[2.948]	[2.745]				
Firm downgrade × Firm NRW	4.788	9.826*	5.601	5.715				
	[1.398]	[1.699]	[1.574]	[1.587]				
Firm downgrade × Firm RW × Basel II	11.055**	20.424**	10.465	10.943				
	[2.194]	[2.464]	[1.456]	[1.515]				
Firm downgrade × Firm NRW × Basel II	8.887	-1.329	11.929	11.715				
	[1.489]	[-0.140]	[1.621]	[1.563]				
Firm upgrade × Firm RW					-4.547**	-0.359	-7.850**	-8.105**
					[-2.390]	[-0.146]	[-2.100]	[-2.200]
Firm upgrade × Firm NRW					3.245	-1.11	2.506	-1.511
					[0.964]	[-0.229]	[0.565]	[-0.369]
Firm upgrade × Firm RW × Basel II					1.279	3.814	5.408	7.016
					[0.286]	[0.496]	[0.807]	[1.011]
Firm upgrade × Firm NRW × Basel II					-11.116**	-6.251	-8.721	-3.986
					[-2.458]	[-0.873]	[-1.447]	[-0.683]
Basel II	-16.602	-6.159			-5.485	63.492***		
	[-1.372]	[-0.227]			[-0.608]	[2.628]		
Observations	23,052	6,539	16,513	15,580	22,534	6,688	15,844	14,865
Adj. R-squared	0.72	0.786	0.728	0.732	0.735	0.765	0.744	0.747
Full interactions and main terms	Y	Y	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	N	N	Y	Y	N	N
Borrower's country effects	Y	Y	Y	N	Y	Y	Y	N
Number of banks	467	185	282	267	445	182	263	245
Number of firms	3640	1490	2792	2550	3580	1507	2711	2471

Table 6. The response of spreads to sovereign risk weight changes

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Sov rating* (i.e., the change in the sovereign's numerical credit rating), *Sov RW* (i.e., a binary variable equal to one for a change in the sovereign's risk-weighting category, otherwise zero), and *Sov NRW* (i.e., a binary variable equal to one for a non-change in the sovereign's risk-weighting category, otherwise zero). The dependent variable is *AISD* and all variables are defined in Table A1. The estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. In specifications (1), (3), and (5), we interact *Firm rating*, *Firm downgrade*, and *Firm upgrade* respectively, with *Sov rating*. In specifications (2), (4), and (6), we exclusively interact *Firm rating*, *Firm downgrade*, and *Firm upgrade* respectively, with *Sov rating*, and further interact each double interaction term with *Sov RW* and *Sov NRW* respectively. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Firm rating	6.381***	6.448***				
	[5.654]	[5.765]				
Firm rating × Sov rating	2.459					
	[1.206]					
Firm rating × Sov rating × Sov RW		5.616***				
		[2.992]				
Firm rating × Sov rating × Sov NRW		-1.357				
		[-0.717]				
Firm downgrade			8.375***	8.472***		
			[4.577]	[4.605]		
Firm downgrade × Sov rating			6.137***			
			[2.627]			
Firm downgrade × Sov rating × Sov RW				6.807***		
				[3.267]		
Firm downgrade × Sov rating × Sov NRW				0.720		
				[0.132]		
Firm upgrade					-0.837	-0.935
					[-0.602]	[-0.665]
Firm upgrade × Sov rating					1.860	
					[1.224]	
Firm upgrade × Sov rating × Sov RW						0.538
						[0.294]
Firm upgrade × Sov rating × Sov NRW						2.320
						[1.349]
Sov rating	0.924	-1.286	-2.841	-2.689	-0.905	-0.978
	[0.331]	[-0.499]	[-0.818]	[-0.776]	[-0.324]	[-0.350]
Observations	27,322	27,322	24,060	24,060	23,605	23,605
Adj. R-squared	0.713	0.714	0.716	0.716	0.730	0.730
Full interactions and main terms	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y
Number of banks	525	525	502	502	481	481
Number of firms	3975	3975	3767	3767	3706	3706

Table 7. Asymmetric response of spreads to sovereign risk weight changes and the role of Basel II

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Sov rating* (i.e., the change in the sovereign's numerical credit rating), *Sov RW* (i.e., a binary variable equal to one for a change in the sovereign's risk-weighting category, otherwise zero), and *Sov NRW* (i.e., a binary variable equal to one for a non-change in the sovereign's risk-weighting category, otherwise zero). The estimation is conducted for the full sample (all loans) and the subsample of loans from non-US lenders, and for different subperiods with the threshold being the implementation of Basel II in the lender's country. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specifications (1)-(2) and (5)-(6), we interact *Firm downgrade* with *Sov rating*. In specifications (3)-(4) and (7)-(8), we interact *Firm downgrade* with *Sov rating*, and further interact the double interaction term with *Sov RW* and *Sov NRW* respectively. In specifications (1) and (3), and (2) and (4), we include all loans, and loans from non-US lenders respectively, and conduct the estimation for the period before the implementation of Basel II in the lender's country. In specifications (5) and (7), and (6) and (8), we include all loans, and loans from non-US lenders respectively, and conduct the estimation for the period after the implementation of Basel II in the lender's country. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Pre-Basel II				Post-Basel II			
	(1) All loans	(2) Non-US lenders	(3) All loans	(4) Non-US lenders	(5) All loans	(6) Non-US lenders	(7) All loans	(8) Non-US lenders
Firm downgrade	6.837***	-0.152	6.834***	0.079	7.270**	1.286	7.689**	1.348
	[3.095]	[-0.027]	[3.092]	[0.014]	[2.397]	[0.247]	[2.429]	[0.243]
Firm downgrade × Sov rating	1.881	-3.063			6.646***	8.014***		
	[0.233]	[-0.285]			[2.924]	[4.505]		
Firm downgrade × Sov rating × Sov RW			0.763	9.723			7.078***	8.021***
			[0.058]	[0.634]			[3.558]	[4.610]
Firm downgrade × Sov rating × Sov NRW			2.239	-8.918			0.794	7.534
			[0.267]	[-0.770]			[0.094]	[0.706]
Sov rating	-6.183	3.529	-6.168	3.436	-5.849	-2.353	-5.854	-2.337
	[-1.096]	[0.633]	[-1.093]	[0.615]	[-1.317]	[-0.442]	[-1.320]	[-0.439]
Observations	13,453	2,605	13,453	2,605	9,599	3,635	9,599	3,635
Adj. R-squared	0.715	0.680	0.715	0.680	0.754	0.809	0.754	0.809
Full interactions and main terms	Y	Y	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y	Y	Y
Number of banks	360	130	360	130	219	101	219	101
Number of firms	2599	692	2599	692	2100	922	2100	922

Table 8. Results for AISU

The table reports coefficients and t-statistics (in brackets). Dependent variable is *AISU* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) AISU	(2) AISU	(3) AISU	(4) AISU
Firm rating	0.459**	0.363*	0.363*	0.367*
	[2.243]	[1.758]	[1.756]	[1.741]
AISD	0.136***	0.132***	0.132***	0.130***
	[16.902]	[12.328]	[12.313]	[12.036]
Loan amount	-1.006***	-0.615**	-0.615**	-0.589**
	[-3.410]	[-2.203]	[-2.200]	[-2.118]
Maturity	0.028**	0.052***	0.052***	0.054***
	[2.406]	[4.999]	[4.993]	[5.105]
Collateral	3.281***	3.500***	3.500***	3.596***
	[4.185]	[4.290]	[4.285]	[4.373]
Number of lenders	-0.015	-0.036	-0.036	-0.048*
	[-0.583]	[-1.366]	[-1.365]	[-1.881]
Performance provisions	-0.052	-0.504	-0.504	-0.513
	[-0.126]	[-1.185]	[-1.184]	[-1.191]
General covenants	-0.048	-0.119	-0.119	-0.123
	[-0.187]	[-0.429]	[-0.429]	[-0.443]
Bank return on assets	12.941*	12.199	12.199	13.306*
	[1.660]	[1.597]	[1.595]	[1.727]
Bank size	0.071	0.067	0.067	0.086
	[1.017]	[0.976]	[0.975]	[1.265]
NPLs	1.167	1.022	1.022	1.093
	[0.242]	[0.213]	[0.213]	[0.228]
Firm return on assets	-0.599	0.457	0.457	0.087
	[-0.182]	[0.139]	[0.139]	[0.026]
Tobin's Q	-1.079**	-0.735*	-0.735*	-0.760*
	[-2.302]	[-1.653]	[-1.651]	[-1.689]
Firm leverage	-0.631	0.068	0.068	-0.089
	[-0.320]	[0.034]	[0.034]	[-0.043]
GDP per capita	-0.000	-0.000	-0.000	-0.000
	[-0.811]	[-1.023]	[-1.022]	[-0.396]
GDP growth	0.223	0.308	0.308	0.348
	[0.624]	[0.849]	[0.848]	[0.852]
Constant	26.640***	18.264***	18.264***	17.871***
	[4.847]	[3.421]	[3.417]	[3.346]
Observations	12,624	12,624	12,624	12,585
Adj. R-squared	0.763	0.768	0.767	0.768
Loan purpose	Y	Y	Y	Y
Year effects	N	Y	Y	Y
Bank effects	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y
Lender's country effects	N	N	Y	Y
Borrower's country effects	N	N	Y	Y
Country-pair effects	N	N	N	Y
Number of banks	288	288	288	287
Number of firms	2369	2369	2369	2361

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Table 9. Asymmetric response of AISU to risk weight changes and the role of Basel II

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Firm RW* (i.e., a binary variable equal to one for a change in the firm's risk-weighting category, otherwise zero), *Firm NRW* (i.e., a binary variable equal to one for a non-change in the firm's risk-weighting category, otherwise zero), and *Basel II* (i.e., a binary variable equal to one if Basel II is implemented in the lender's country, otherwise zero). The estimation is conducted for the full sample of loans and certain subsamples of loans. Dependent variable is *AISU* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specifications (1)-(4), we exclusively interact *Firm downgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Basel II*. In specifications (5)-(8), we exclusively interact *Firm upgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Basel II*. In specifications (1) and (5), we include all loans. In specifications (2) and (6), we exclude loans from US lenders. In specifications (3) and (7), we only include loans from US lenders. In specification (4) and (8), we only include loans from US lenders to US borrowers. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All loans	Non-US lenders	US lenders	US loans	All loans	Non-US lenders	US lenders	US loans
Firm downgrade × Firm RW	-0.188	0.341	-0.334	-0.395				
	[-0.457]	[0.287]	[-0.730]	[-0.869]				
Firm downgrade × Firm NRW	0.307	2.322	0.146	0.184				
	[0.679]	[1.255]	[0.322]	[0.399]				
Firm downgrade × Firm RW × Basel II	2.618**	2.552	3.008**	2.907**				
	[2.079]	[1.095]	[2.051]	[1.971]				
Firm downgrade × Firm NRW × Basel II	0.332	-0.462	0.293	0.287				
	[0.385]	[-0.181]	[0.313]	[0.300]				
Firm upgrade × Firm RW					-0.564	-1.709**	-0.148	-0.136
					[-1.370]	[-2.118]	[-0.360]	[-0.336]
Firm upgrade × Firm NRW					0.971	2.067*	0.185	0.143
					[1.455]	[1.810]	[0.304]	[0.237]
Firm upgrade × Firm RW × Basel II					0.729	1.313	0.414	0.601
					[0.921]	[0.757]	[0.584]	[0.843]
Firm upgrade × Firm NRW × Basel II					-1.381*	-2.251	-0.424	-0.253
					[-1.726]	[-1.593]	[-0.556]	[-0.338]
Basel II	-1.861	6.101			0.245	3.899		
	[-0.519]	[0.752]			[0.096]	[0.684]		
Observations	10,601	1,727	8,874	8,637	10,232	1,730	8,519	8,276
Adj. R-squared	0.775	0.845	0.755	0.754	0.792	0.87	0.768	0.768
Full interactions and main terms	Y	Y	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	N	N	Y	Y	N	N
Borrower's country effects	Y	Y	Y	N	Y	Y	Y	N
Number of banks	256	80	176	169	245	79	166	159
Number of firms	2117	518	1825	1747	2063	528	1764	1688

Table 10. Response of other loan characteristics to credit rating changes
The table reports coefficients and t-statistics (in brackets). The dependent variable is denoted in the second line of the table and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Loan amount	(2) Maturity	(3) Collateral
Firm rating	0.013*	-0.619***	0.008**
	[1.920]	[-3.736]	[2.453]
AISD	-0.000***	0.013***	0.000***
	[-5.830]	[6.565]	[7.558]
Loan amount		2.237***	0.001
		[9.403]	[0.303]
Maturity	0.004***		0.001***
	[4.601]		[5.969]
Collateral	0.008	7.466***	
	[0.303]	[12.667]	
Number of lenders	0.021***	0.132***	-0.002***
	[12.906]	[4.159]	[-3.511]
Performance provisions	0.086***	0.382	0.007
	[4.794]	[0.859]	[1.070]
General covenants	-0.013*	0.494***	0.064***
	[-1.697]	[2.714]	[16.511]
Bank return on assets	0.088	-8.838*	-0.043
	[0.348]	[-1.744]	[-0.531]
Bank size	0.009**	-0.102	-0.001
	[2.452]	[-1.307]	[-0.493]
NPLs	-0.236	8.279	-0.005
	[-1.042]	[1.541]	[-0.068]
Firm return on assets	0.145	6.051**	-0.108*
	[1.089]	[1.977]	[-1.800]
Tobin's Q	0.048*	0.433	-0.013
	[1.927]	[0.818]	[-1.251]
Firm leverage	-0.109	-1.632	0.132***
	[-1.644]	[-0.722]	[3.781]
GDP per capita	0.000	0.000	-0.000
	[0.852]	[0.836]	[-0.158]
GDP growth	0.009	-0.301	0.001
	[1.094]	[-1.160]	[0.182]
Constant	18.985***	-0.554	0.232***
	[257.127]	[-0.109]	[3.860]
Observations	27,396	27,396	27,396
Adj. R-squared	0.680	0.488	0.706
Loan purpose	Y	Y	Y
Year effects	Y	Y	Y
Bank effects	Y	Y	Y
Firm effects	Y	Y	Y
Lender's country effects	Y	Y	Y
Borrower's country effects	Y	Y	Y
Number of banks	528	528	528
Number of firms	3989	3989	3989

Table 11. Real effects for downgraded firms

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion *Firm RW downgrade* (i.e., a binary variable equal to one for a downgrade in the firm's risk-weighting category, otherwise zero), and *High borrowing rate* (i.e., a binary variable equal to one if the borrowing rate in the borrower's country is within the 75th percentile of the borrowing rate in our sample, otherwise zero). The estimation is conducted for different subperiods with the threshold being the implementation of Basel II in the lender's country. For the pre-Basel II period, *High borrowing rate* is calculated based on the mean of the borrowing rate in the respective period only, while for the post-Basel II period *High borrowing rate* is calculated based on the mean of the borrowing rate in that period only. The dependent variable is denoted in the second line of the table and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The lower part of the table denotes the type of fixed effects used in each specification. In specifications (1)-(5), we conduct the estimation for the period before the implementation of Basel II in the lender's country. In specifications (6)-(10), we conduct the estimation for the period after the implementation of Basel II in the lender's country. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Pre-Basel II					Post-Basel II				
	(1) Cash flow	(2) Cash holdings	(3) Return on assets	(4) Total assets	(5) Employee growth	(6) Cash flow	(7) Cash holdings	(8) Return on assets	(9) Total assets	(10) Employee growth
Firm RW downgrade	-0.212	-0.003***	-0.003	0.018	-0.027***	-5.194***	-0.007***	-0.023***	-0.035**	0.015
	[-0.369]	[-2.879]	[-1.136]	[1.191]	[-8.201]	[-3.468]	[-4.081]	[-7.104]	[-2.423]	[0.853]
High borrowing rate	-0.552	-0.000	0.003***	0.021	-0.017**	16.165***	0.005***	0.002	-0.003	0.015
	[-0.549]	[-0.160]	[3.030]	[1.111]	[-2.673]	[6.982]	[10.265]	[1.341]	[-0.199]	[1.164]
Observations	5,893	5,975	4,969	5,280	5,576	3,873	3,876	2,380	2,920	3,661
Adj. R-squared	0.928	0.803	0.625	0.946	0.337	0.812	0.863	0.695	0.970	0.370
Firm and macro controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 12. Real effects for downgraded firms. Differential effect of high borrowing costs

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion *Firm RW downgrade* (i.e., a binary variable equal to one for a downgrade in the firm's risk-weighting category, otherwise zero), and *High borrowing rate* (i.e., a binary variable equal to one if the borrowing rate in the borrower's country is within the 75th percentile of the borrowing rate in our sample, otherwise zero). The estimation is conducted for different subperiods with the threshold being the implementation of Basel II in the lender's country. For the pre-Basel II period, *High borrowing rate* is calculated based on the mean of the borrowing rate in the respective period only, while for the post-Basel II period *High borrowing rate* is calculated based on the mean of the borrowing rate in that period only. The dependent variable is denoted in the second line of the table and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The lower part of the table denotes the type of fixed effects used in each specification. In specifications (1)-(5), we conduct the estimation for the period before the implementation of Basel II in the lender's country. In specifications (6)-(10), we conduct the estimation for the period after the implementation of Basel II in the lender's country. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Pre-Basel II					Post-Basel II				
	(1) Cash flow	(2) Cash holdings	(3) Return on assets	(4) Total assets	(5) Employee growth	(6) Cash flow	(7) Cash holdings	(8) Return on assets	(9) Total assets	(10) Employee growth
Firm RW downgrade	-2.402	-0.005	-0.001	0.136***	-0.028	6.919	0.008	0.010	0.370***	0.126***
	[-1.034]	[-1.511]	[-0.138]	[5.260]	[-1.597]	[1.461]	[1.315]	[0.675]	[4.758]	[3.069]
High borrowing rate	-0.617	-0.000	0.001	0.040**	-0.021***	16.746***	0.005***	0.004**	-0.003	0.017
	[-0.612]	[-0.214]	[0.579]	[2.482]	[-3.272]	[8.772]	[15.651]	[2.808]	[-0.190]	[1.607]
Firm RW downgrade × High borrowing rate	2.811	0.002	-0.001	-0.179***	0.001	-14.510***	-0.021***	-0.027*	-0.401***	-0.126***
	[1.246]	[0.666]	[-0.072]	[-7.363]	[0.056]	[-3.644]	[-3.392]	[-1.982]	[-5.449]	[-3.159]
Observations	5,898	5,978	5,012	5,292	5,581	3,837	3,841	2,375	2,931	3,618
Adj. R-squared	0.916	0.805	0.573	0.948	0.342	0.812	0.860	0.696	0.961	0.379
Firm and macro controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 13. Lending relationships

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Relationship lending* (i.e., a binary variable equal to 1 for a prior lending relationship between the lender and the borrower during the previous 3-year period, otherwise zero). The estimation is conducted for different subperiods with the threshold being the implementation of Basel II in the lender's country. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specifications (1) and (4), we exclusively interact *Firm rating* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Relationship lending*. In specifications (2) and (5), we exclusively interact *Firm downgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Relationship lending*. In specifications (3) and (6), we exclusively interact *Firm upgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Relationship lending*. In specifications (1)-(3) we conduct the estimation for the period before the implementation of Basel II in the lender's country, and in the specifications (4)-(6) for the period after. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Pre-Basel II			Post-Basel II		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm rating × Firm RW	8.718***			10.765***		
	[4.400]			[2.643]		
Firm rating × Firm NRW	6.669***			5.920**		
	[3.117]			[2.298]		
Firm rating × Firm RW × Relationship lending	-4.883			-9.690*		
	[-1.613]			[-1.850]		
Firm downgrade × Firm RW		8.451***			15.981***	
		[3.118]			[2.669]	
Firm downgrade × Firm NRW		7.697**			7.391*	
		[2.300]			[1.920]	
Firm downgrade × Firm RW × Relationship lending		-5.901			-13.796*	
		[-1.342]			[-1.818]	
Firm upgrade × Firm RW			-4.679**			-3.641
			[-1.988]			[-0.826]
Firm upgrade × Firm NRW			-0.257			-4.392*
			[-0.086]			[-1.697]
Firm upgrade × Firm RW × Relationship lending			-0.422			5.295
			[-0.144]			[0.793]
Observations	15,157	13,483	12,653	11,204	9,624	9,993
Adj. R-squared	0.712	0.715	0.731	0.749	0.754	0.760
Full interactions and main terms	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y
Number of banks	380	364	334	235	219	219
Number of firms	2779	2606	2547	2262	2106	2115

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Table 14. Firm heterogeneities. Post-Basel II

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of a number of firm-level characteristics. The estimation is conducted for the period after the implementation of Basel II in the lender's country. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. In specification (1), we double-interact *Firm downgrade* and *Firm RW* with *Firm return on assets*. In specification (2), we double-interact *Firm downgrade* and *Firm RW* with *Profitability*. In specification (3), we double-interact *Firm downgrade* and *Firm RW* with *Number of employees*. In specification (4), we double-interact *Firm downgrade* and *Firm RW* with *Cash flows*. In specification (5), we double-interact *Firm downgrade* and *Firm RW* with *Retained earnings*. In specification (6), we double-interact *Firm downgrade* and *Firm RW* with *Total debt*. In specification (7), we double-interact *Firm downgrade* and *Firm RW* with *Leverage*. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Firm downgrade × Firm RW	12.437***	23.471***	19.295***	16.612***	16.010***	13.403**	-31.044***
	[2.734]	[3.267]	[3.382]	[3.367]	[3.166]	[2.467]	[-3.020]
Firm downgrade × Firm NRW	8.843**	16.860***	10.831***	10.352***	11.635***	15.749***	12.744***
	[2.270]	[4.164]	[2.797]	[2.612]	[3.022]	[3.865]	[3.380]
Firm downgrade × Firm RW × Firm return on assets	-80.058**						
	[-2.207]						
Firm downgrade × Firm RW × Profitability		-112.172**					
		[-2.342]					
Firm downgrade × Firm RW × Number of employees			-0.058**				
			[-2.182]				
Firm downgrade × Firm RW × Cash flows				-0.001*			
				[-1.761]			
Firm downgrade × Firm RW × Retained earnings					-0.000**		
					[-2.067]		
Firm downgrade × Firm RW × Total debt						6.867***	
						[2.585]	
Firm downgrade × Firm RW × Leverage							113.192***
							[3.970]
Observations	9,624	6,476	7,800	7,702	7,999	6,758	9,624
Adj. R-squared	0.754	0.745	0.752	0.746	0.753	0.745	0.735
Full interactions and main terms	Y	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y	Y
Number of banks	219	168	192	192	202	171	219
Number of firms	2106	1389	1745	1730	1755	1450	2106

Table 15. Firm heterogeneities: Different percentiles. Post-Basel II

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of binary variables for a number of firm-level characteristics if these characteristics are within each of the four 25th percentiles in our sample. The estimation is conducted for the period after the implementation of Basel II in the lender's country. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. Column (1), presents the coefficients on the double interaction of *Firm downgrade* with *Firm RW* and *Firm NRW* along with the coefficient on the triple interaction of *Firm downgrade* with *Firm RW* and each of the firm-level characteristics for the full sample. Column (2), presents the coefficients on the double interaction of *Firm downgrade* with *Firm RW* and *Firm NRW* along with the coefficient on the triple interaction of *Firm downgrade* with *Firm RW* and a binary variable equal to one if each of the firm-level characteristics is within the 1st 25th percentile in our sample, otherwise zero. Column (3), presents the coefficients on the double interaction of *Firm downgrade* with *Firm RW* and *Firm NRW* along with the coefficient on the triple interaction of *Firm downgrade* with *Firm RW* and a binary variable equal to one if each of the firm-level characteristics is within the 2nd 25th percentile in our sample, otherwise zero. Column (4), presents the coefficients on the double interaction of *Firm downgrade* with *Firm RW* and *Firm NRW* along with the coefficient on the triple interaction of *Firm downgrade* with *Firm RW* and a binary variable equal to one if each of the firm-level characteristics is within the 3rd 25th percentile in our sample, otherwise zero. Column (4), presents the coefficients on the double interaction of *Firm downgrade* with *Firm RW* and *Firm NRW* along with the coefficient on the triple interaction of *Firm downgrade* with *Firm RW* and a binary variable equal to one if each of the firm-level characteristics is within the 4th 25th percentile in our sample, otherwise zero. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Full sample	(2) 1st 25th percentile	(3) 2nd 25th percentile	(4) 3rd 25th percentile	(5) 4th 25th percentile
Firm downgrade × Firm RW	12.437***	11.823**	11.145**	11.893**	14.941***
Firm downgrade × Firm NRW	8.843**	10.712**	10.640**	10.656**	8.716**
Firm downgrade × Firm RW × Firm return on assets	-80.058**	1.087	5.871	7.731	-106.771**
Firm downgrade × Firm RW	16.727**	11.582**	11.752**	8.141*	18.561***
Firm downgrade × Firm NRW	12.455***	7.282*	7.240*	7.131*	12.875***
Firm downgrade × Firm RW × Cash holdings	22.245	-8.281	-6.748	19.263	-17.907**
Firm downgrade × Firm RW	16.010***	4.967	11.257**	14.689***	13.642**
Firm downgrade × Firm NRW	11.635***	7.391*	7.299*	7.171*	7.307*
Firm downgrade × Firm RW × Retained earnings	-0.000**	20.824**	-2.468	-24.361**	-6.744
Firm downgrade × Firm RW	17.744***	0.414	9.005*	12.185**	18.058***
Firm downgrade × Firm NRW	10.845***	7.078*	7.365*	7.248*	7.263*
Firm downgrade × Firm RW × Asset growth	-26.333	20.519**	15.279	-8.552	-33.655***
Firm downgrade × Firm RW	17.322***	5.19	7.975	10.099**	18.891***
Firm downgrade × Firm NRW	9.667**	7.232*	7.297*	7.302*	7.262*
Firm downgrade × Firm RW × PPE growth	-17.749	12.286	13.239	9.192	-33.117***
Firm downgrade × Firm RW	13.403**	12.103**	13.783***	11.495**	1.36
Firm downgrade × Firm NRW	15.749***	7.278*	6.972*	7.305*	7.189*
Firm downgrade × Firm RW × Total debt	6.867***	-14.708	-22.550*	-2.655	17.643**
Firm downgrade × Firm RW	-31.044***	16.381***	15.533***	17.790***	1.062
Firm downgrade × Firm NRW	12.744***	12.520***	12.374***	12.329***	12.591***
Firm downgrade × Firm RW × Leverage	113.192***	-16.656**	-17.25	-14.841*	46.025***

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Table 16. Firm heterogeneities: Different percentiles. Post-Basel II

The table reports values across the three 25th percentiles for the firm-level characteristics employed in the estimations of Table 15.

	(1) 25% percentile	(2) 50% percentile	(3) 75% percentile
Firm return on assets	0.017	0.056	0.133
Cash holdings	0.015	0.042	0.093
Retained earnings (millions)	-67.585	538.000	3,253.500
Asset growth	-0.027	0.040	0.120
PPE growth	-0.039	0.030	0.111
Total debt (millions)	561.121	1660.334	6429.116
Leverage	0.274	0.366	0.469

Internet Appendix
Loan syndication under Basel II:
How firm credit ratings affect the cost of credit?

Table A1. 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
AISU	All-in-spread-undrawn, defined as the sum of the facility fee and the commitment fee.	DealScan
B. *Main explanatory variables: Firm credit ratings*		
Firm rating	The change in the borrower's numerical credit rating in the year before the loan facility's origination year.	S&P Credit Ratings
Firm downgrade dummy	A binary variable equal to one, if the borrower's credit rating is downgraded in the year before the loan facility's origination year, otherwise zero.	S&P Credit Ratings
Firm downgrade	The positive changes (i.e., a deterioration in the borrower's credit rating) and non-changes (i.e., the borrower retains the same credit rating) in the borrower's numerical credit rating in the year before the loan facility's origination year.	S&P Credit Ratings
Firm upgrade	The negative changes (i.e., an improvement in the borrower's credit rating) and non-changes (i.e., the borrower retains the same credit rating) in the borrower's numerical credit rating in the year before the loan facility's origination year.	S&P Credit Ratings
Firm RW	A binary variable equal to one, if the borrower's credit rating change leads to a change in the borrower's risk-weighting category in the year before the loan facility's origination year, otherwise zero.	S&P Credit Ratings
Firm NRW	A binary variable equal to one, if the borrower's credit rating change leads to a non-change in the borrower's risk-weighting category in the year before the loan facility's origination year, otherwise zero.	S&P Credit Ratings
Firm RW downgrade	A binary variable equal to one, if the borrower's credit rating change leads to a downgrade in the borrower's risk-weighting category in the year before the loan facility's origination year, otherwise zero.	S&P Credit Ratings
C. *Main explanatory variables: Firm credit ratings*		
Sov rating	The change in the borrower's country numerical credit rating in the year before the loan facility's origination year.	S&P Credit Ratings
Sov RW	A binary variable equal to one, if the borrower's country credit rating change leads to a change in the borrower's country risk-weighting category in the year before the loan facility's origination year, otherwise zero.	S&P Credit Ratings
Sov NRW	A binary variable equal to one, if the borrower's country credit rating change leads to a non-change in the borrower's country risk-weighting category in the year before the loan facility's origination year, otherwise zero.	S&P Credit Ratings
D. *Explanatory variables: Loan characteristics*		
Loan amount	Log of the loan facility amount in USD.	DealScan
Maturity	Loan duration in months.	DealScan
Collateral	A binary variable 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.	DealScan
Performance provisions	A binary variable equal to one if the loan has performance pricing provisions, zero otherwise.	DealScan
General covenants	The total number of covenants in the loan contract.	DealScan
Loan purpose	A series of binary variables indicating loan purpose (e.g., corporate purpose, debt repay, etc.) and whether the loan facility is a term loan or a revolver.	DealScan
Relationship lending	A binary variable equal to one for a prior loan facility between the lender and the borrower in the 3-year period before the loan facility's origination year, zero otherwise.	DealScan
E. *Explanatory variables: Lender characteristics*		
Bank return on assets	The return on total bank assets.	Compustat
Bank size	The log of total bank assets.	Compustat

| NPLs | The ratio of non-performing loans to total loans. | Compustat |

F.   *Explanatory variables: Borrower characteristics*

Firm return on assets	The return on total firm assets.	Compustat
Tobin's Q	The ratio of the market value of assets to the book value of assets.	Compustat
Leverage	The ratio of total debt to total assets.	Compustat
Profitability	The inverse return on total firm assets.	Compustat
Number of employees	The number of firm employees.	Compustat
Cash flows	The income before extraordinary items in million USD.	Compustat
Retained earnings	The retained earnings in million USD.	Compustat
Total debt	The total debt in million USD.	Compustat

G.   *Explanatory variables: Differences between the lender and borrower countries*

GDP per capita	The difference in annual GDP per capita in constant prices between the lender's and the borrower's countries.	WDI
GDP growth	The difference in annual GDP growth rate (%) between the lender's and the borrower's countries.	WDI

H.   *Explanatory variables: Lender's country*

Basel II	A binary variable equal to one if the lending rate in the borrower's country is within the 75th percentile of the lending rate in our sample, otherwise zero	Own estimations

I.   *Explanatory variables: Borrower's country*

High borrowing rate	A binary variable equal to one if the borrowing rate in the borrower's country is within the 75th percentile of the borrowing rate in our sample, otherwise zero.	DealScan

Table A2. Numerical conversions of firm credit ratings

The table presents the conversions of firm credit ratings to numerical credit ratings and numerical risk-weighting categories.

Rating	Numerical rating	Risk-weighting category
AAA	1	1
AA+	2	1
AA	3	1
AA-	4	1
A+	5	2
A	6	2
A-	7	2
BBB+	8	3
BBB	9	3
BBB-	10	3
BB+	11	3
BB	12	3
BB-	13	3
B+	14	4
B	15	4
B-	16	4
CCC+	17	4
CCC	18	4
CCC-	19	4
CC	20	4
C	21	4
D/SD	22	4

Table A3. Baseline results with different controls

The table reports coefficients and t-statistics (in brackets). Different specifications include different loan-, firm-, bank-, and macro- controls. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Firm rating	6.952***	6.852***	6.503***	6.577***	7.781***	6.934***
	[5.986]	[5.998]	[5.724]	[5.296]	[6.785]	[5.714]
Loan amount		-7.826***		-6.139***	-3.686***	-3.587***
		[-7.966]		[-5.691]	[-3.411]	[-3.349]
Maturity		0.239***		0.331***	0.256***	0.221***
		[4.573]		[6.032]	[4.483]	[4.040]
Collateral		27.053***		27.905***	24.350***	24.579***
		[7.751]		[7.454]	[6.780]	[6.644]
Number of lenders			-1.006***	-0.945***	-0.830***	-0.811***
			[-8.505]	[-7.399]	[-6.345]	[-6.189]
Performance provisions			-29.539***	-31.877***	-30.681***	-30.276***
			[-13.525]	[-13.889]	[-13.608]	[-12.623]
General covenants			4.980***	3.030***	3.110***	3.736***
			[4.816]	[2.735]	[2.938]	[3.268]
Bank return on assets	-164.557***	-158.566***	-159.049***	-134.949***	-117.038***	-117.793***
	[-5.929]	[-5.766]	[-5.786]	[-4.459]	[-4.176]	[-4.002]
Bank size	-0.057	0.041	-0.048	0.331	0.128	0.251
	[-0.148]	[0.109]	[-0.126]	[0.777]	[0.305]	[0.601]
NPLs	138.918***	133.300***	136.150***			
	[5.556]	[5.378]	[5.513]			
Firm return on assets	-113.792***	-108.178***	-112.080***	-105.945***	-226.972***	-228.459***
	[-4.733]	[-4.566]	[-4.800]	[-4.345]	[-10.278]	[-9.416]
Tobin's Q	-36.956***	-35.679***	-35.731***	-32.409***	-33.043***	-34.682***
	[-10.713]	[-10.818]	[-10.429]	[-9.368]	[-9.967]	[-10.145]
Firm leverage	185.573***	178.293***	180.291***	175.686***		
	[12.404]	[12.055]	[12.335]	[11.411]		
GDP per capita	-0.003***	-0.003***	-0.003***	-0.003**	-0.002	
	[-2.688]	[-2.622]	[-2.649]	[-2.557]	[-0.770]	
GDP growth	-0.748	-0.603	-0.423	0.032	-1.246	
	[-0.994]	[-0.810]	[-0.566]	[0.032]	[-0.710]	
Bank capital				82.627***	64.295**	80.301**
				[2.613]	[2.154]	[2.573]
Firm size					-44.836***	-54.092***
					[-5.884]	[-9.171]
Trade balance						-0.001**
						[-2.169]
Inflation						-9.964***
						[-3.855]
VIX						1.058***
						[6.097]
Constant	188.072***	315.889***	203.166***	284.773***	696.533***	746.290***
	[22.025]	[15.384]	[23.630]	[12.841]	[11.560]	[15.091]
Observations	27,421	27,396	27,421	22,553	22,552	19,545
Adj. R-squared	0.703	0.708	0.710	0.712	0.742	0.756
Loan purpose	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y
Number of banks	531	528	531	463	462	398
Number of firms	3993	3989	3993	3625	3625	3226

Table A4. Response of spreads to risk weight changes

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Firm RW* (i.e., a binary variable equal to one for a change in the firm's risk-weighting category, otherwise zero) and *Firm NRW* (i.e., a binary variable equal to one for a non-change in the firm's risk-weighting category, otherwise zero). Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. In specification (1), we exclusively interact *Firm rating* with *Firm RW* and *Firm NRW* respectively. In specification (2), we exclusively interact *Firm downgrade* with *Firm RW* and *Firm NRW* respectively. In specification (3), we exclusively interact *Firm upgrade* with *Firm RW* and *Firm NRW* respectively. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Firm rating × Firm RW	7.774***		
	[5.264]		
Firm rating × Firm NRW	5.299***		
	[3.286]		
Firm downgrade × Firm RW		9.324***	
		[4.191]	
Firm downgrade × Firm NRW		8.372***	
		[3.105]	
Firm upgrade × Firm RW			-3.228**
			[-2.201]
Firm upgrade × Firm NRW			0.360
			[0.201]
Observations	27,396	24,114	23,656
Adj. R-squared	0.713	0.716	0.730
Loan purpose	Y	Y	Y
Year effects	Y	Y	Y
Bank effects	Y	Y	Y
Firm effects	Y	Y	Y
Lender's country effects	Y	Y	Y
Borrower's country effects	Y	Y	Y
Number of banks	528	505	482
Number of firms	3989	3777	3718

Table A5. Asymmetric response of collateral to risk weight changes and the role of Basel II

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Firm RW* (i.e., a binary variable equal to one for a change in the firm's risk-weighting category, otherwise zero), *Firm NRW* (i.e., a binary variable equal to one for a non-change in the firm's risk-weighting category, otherwise zero), and *Basel II* (i.e., a binary variable equal to one if Basel II is implemented in the lender's country, otherwise zero). The estimation is conducted for the full sample of loans and certain subsamples of loans. Dependent variable is *Collateral* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specifications (1)-(4), we exclusively interact *Firm downgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Basel II*. In specifications (5)-(8), we exclusively interact *Firm upgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Basel II*. In specifications (1) and (5), we include all loans. In specifications (2) and (6), we exclude loans from US lenders. In specifications (3) and (7), we only include loans from US lenders. In specification (4) and (8), we only include loans from US lenders to US borrowers. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) All loans	(2) Non-US lenders	(3) US lenders	(4) US loans	(5) All loans	(6) Non-US lenders	(7) US lenders	(8) US loans
Firm downgrade × Firm RW	-0.001	-0.026	0.006	0.01				
	[-0.063]	[-1.584]	[0.700]	[1.097]				
Firm downgrade × Firm NRW	0.006	0.004	0.005	0.006				
	[0.732]	[0.108]	[0.597]	[0.753]				
Firm downgrade × Firm RW × Basel II	0.019	0.042**	0.013	0.005				
	[1.491]	[1.998]	[0.728]	[0.255]				
Firm downgrade × Firm NRW × Basel II	0.019	0.028	0.019	0.019				
	[1.498]	[0.711]	[1.328]	[1.303]				
Firm upgrade × Firm RW					-0.022**	-0.012	-0.025	-0.024
					[-1.990]	[-1.308]	[-1.599]	[-1.495]
Firm upgrade × Firm NRW					-0.002	-0.007	-0.002	-0.008
					[-0.159]	[-0.531]	[-0.168]	[-0.609]
Firm upgrade × Firm RW × Basel II					0.005	-0.017	0.012	0.012
					[0.235]	[-0.564]	[0.534]	[0.530]
Firm upgrade × Firm NRW × Basel II					-0.008	-0.023	0.016	0.024
					[-0.460]	[-1.052]	[0.770]	[1.183]
Basel II	-0.002	0.138*			-0.007	0.096		
	[-0.049]	[1.650]			[-0.193]	[1.211]		
Observations	23,052	6,539	16,513	15,580	22,534	6,707	15,879	14,900
Adj. R-squared	0.716	0.798	0.708	0.707	0.714	0.792	0.706	0.706
Full interactions and main terms	Y	Y	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	N	N	Y	Y	N	N
Borrower's country effects	Y	Y	Y	N	Y	Y	Y	N
Number of banks	467	185	282	267	445	182	263	245
Number of firms	3640	1490	2792	2550	3580	1512	2713	2473

Table A6. 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 A1. Estimation method in Panel A is maximum likelihood and in Panel B is OLS with standard errors clustered by bank. Panel A reports the estimates from the first-stage probit model to estimate the determinants of the firm's loan-taking decision. The lower part panel A denotes the dummy variables used in each specification. Panel B reports the estimates from the second-stage OLS regression for the effect of firm credit rating changes on loan spreads. Each of the specification in Panel B includes the inverse mills ratio (*Lambda*) from the corresponding specification in Panel A. The penultimate part of Panel B denotes the type of fixed effects used in each specification. The lower part of Panel B denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Panel A: The loan-taking decision by the firm		
	(1)	(2)	(3)
	Loan deal	Loan deal	Loan deal
Firm return on assets	-0.567***	-0.567***	-0.567***
	[-5.389]	[-5.389]	[-5.389]
Tobins' Q	-0.044**	-0.044**	-0.044**
	[-2.454]	[-2.454]	[-2.454]
Firm leverage	0.296***	0.296***	0.296***
	[6.882]	[6.882]	[6.882]
Firm size	-0.017***	-0.017***	-0.017***
	[-3.909]	[-3.909]	[-3.909]
Firm rating category	-0.187***	-0.187***	-0.187***
	[-15.242]	[-15.242]	[-15.242]
Loan amount	0.006	0.006	0.006
	[0.905]	[0.905]	[0.905]
Maturity	-0.002***	-0.002***	-0.002***
	[-8.345]	[-8.345]	[-8.345]
Collateral	0.068***	0.068***	0.068***
	[3.330]	[3.330]	[3.330]
Number of lenders	0.001	0.001	0.001
	[1.195]	[1.195]	[1.195]
Performance provisions	0.153***	0.153***	0.153***
	[7.017]	[7.017]	[7.017]
General covenants	0.057***	0.057***	0.057***
	[7.744]	[7.744]	[7.744]
Term loan	-0.078***	-0.078***	-0.078***
	[-4.157]	[-4.157]	[-4.157]
Bank return on assets	0.322	0.322	0.322
	[0.865]	[0.865]	[0.865]
Bank size	-0.003	-0.003	-0.003
	[-0.495]	[-0.495]	[-0.495]
NPLs	0.110	0.110	0.110
	[0.316]	[0.316]	[0.316]
Bank loans	5.840***	5.840***	5.840***
	[15.851]	[15.851]	[15.851]
Firm loans	83.195**	83.195**	83.195**
	[2.264]	[2.264]	[2.264]
Bank-firm loans	-164.585***	-164.585***	-164.585***
	[-2.824]	[-2.824]	[-2.824]
Constant	-303.439***	-303.439***	-303.439***
	[-79.371]	[-79.371]	[-79.371]
Observations	37,268	37,268	37,268
Loan purpose dummies	Y	Y	Y
Year dummies	Y	Y	Y
Bank dummies	Y	Y	Y
Firm dummies	Y	Y	Y
Lender's country dummies	Y	Y	Y
Borrower's country dummies	Y	Y	Y

	(1) AISD	(2) AISD	(3) AISD
Firm rating	2.001		
	[1.464]		
Firm rating × Firm downgrade dummy	7.305**		
	[2.142]		
Firm downgrade		8.781***	
		[4.963]	
Firm upgrade			-0.899
			[-0.681]
Firm downgrade dummy	0.484		
	[0.091]		
Loan amount	-5.107***	-4.794***	-5.025***
	[-5.468]	[-4.801]	[-5.247]
Maturity	0.197***	0.220***	0.191***
	[3.409]	[3.626]	[3.206]
Collateral	28.041***	26.498***	26.699***
	[8.222]	[7.126]	[7.786]
Number of lenders	-0.851***	-0.925***	-0.706***
	[-7.353]	[-7.805]	[-6.508]
Performance provisions	-26.468***	-28.614***	-21.506***
	[-11.919]	[-11.983]	[-9.842]
General covenants	3.943***	3.976***	2.447**
	[3.807]	[3.550]	[2.324]
Bank return on assets	-137.961***	-137.071***	-90.871***
	[-5.135]	[-4.707]	[-3.469]
Bank size	-0.164	-0.218	0.077
	[-0.444]	[-0.544]	[0.205]
NPLs	131.914***	130.629***	117.724***
	[5.424]	[4.955]	[4.907]
Firm return on assets	-120.527***	-110.872***	-140.637***
	[-5.359]	[-4.492]	[-5.873]
Tobin's Q	-33.770***	-35.064***	-30.114***
	[-10.589]	[-10.001]	[-9.311]
Firm leverage	166.974***	172.247***	159.034***
	[12.296]	[11.595]	[11.706]
GDP per capita	-0.003**	-0.003**	-0.004***
	[-2.562]	[-2.561]	[-3.644]
GDP growth	-0.322	0.317	-0.218
	[-0.443]	[0.373]	[-0.295]
Lambda	51.634***	29.683*	45.390***
	[3.677]	[1.924]	[3.092]
Constant	264.639***	267.367***	254.325***
	[13.254]	[12.612]	[12.550]
Observations	27,386	24,104	23,649
Adj. R-squared	0.718	0.720	0.733
Loan purpose	Y	Y	Y
Year effects	Y	Y	Y
Bank effects	Y	Y	Y
Firm effects	Y	Y	Y
Lender's country effects	Y	Y	Y
Borrower's country effects	Y	Y	Y
Number of banks	527	504	481
Number of firms	3989	3777	3717

Table A7. Monetary policy stance

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Shadow rate* (i.e., the quarterly shadow short rate in the lender's country). Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we exclusively interact *Firm rating* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Relationship lending*. In specification (2), we exclusively interact *Firm downgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Shadow rate*. In specification (3), we exclusively interact *Firm upgrade* with *Firm RW* and *Firm NRW* respectively, and further interact each double interaction term with *Shadow rate*. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Firm rating × Firm RW	9.818***		
	[4.983]		
Firm rating × Firm NRW	5.615***		
	[3.238]		
Firm rating × Firm RW × Shadow rate	-0.967*		
	[-1.873]		
Firm downgrade × Firm RW		13.463***	
		[4.753]	
Firm downgrade × Firm RW		8.770***	
		[3.109]	
Firm downgrade × Firm RW × Shadow rate		-1.540**	
		[-2.196]	
Firm upgrade × Firm RW			-1.727
			[-0.740]
Firm upgrade × Firm RW			0.305
			[0.148]
Firm upgrade × Firm RW × Shadow rate			-1.027*
			[-1.751]
Observations	23,511	20,705	20,229
Adj. R-squared	0.721	0.725	0.739
Full interactions and main terms	Y	Y	Y
Full set of controls	Y	Y	Y
Loan purpose	Y	Y	Y
Year effects	Y	Y	Y
Bank effects	Y	Y	Y
Firm effects	Y	Y	Y
Lender's country effects	Y	Y	Y
Borrower's country effects	Y	Y	Y
Number of banks	445	424	403
Number of firms	3567	3376	3319

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Table A8. Different clustering of standard errors

The table reports coefficients and t-statistics (in brackets). Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS. The penultimate part of the table denotes the type of fixed effects used in each specification and the last line of the part denotes the type of standard error clustering (B&F&Y refers to Bank *and* Firm *and* Year). The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Firm rating	6.421***	6.421***	6.421***	6.421***	6.421***
	[7.005]	[5.229]	[5.166]	[5.166]	[5.376]
Loan amount	-5.584***	-5.584***	-5.584***	-5.584***	-5.584***
	[-6.922]	[-4.431]	[-4.348]	[-4.348]	[-3.917]
Maturity	0.257***	0.257***	0.257***	0.257***	0.257***
	[5.350]	[4.188]	[4.103]	[4.103]	[5.018]
Collateral	27.702***	27.702***	27.702***	27.702***	27.702***
	[10.059]	[6.768]	[6.630]	[6.630]	[6.027]
Number of lenders	-0.879***	-0.879***	-0.879***	-0.879***	-0.879***
	[-9.825]	[-7.606]	[-7.193]	[-7.193]	[-5.505]
Performance provisions	-29.035***	-29.035***	-29.035***	-29.035***	-29.035***
	[-17.793]	[-11.157]	[-10.769]	[-10.769]	[-7.690]
General covenants	2.786***	2.786***	2.786***	2.786***	2.786*
	[3.443]	[2.972]	[2.704]	[2.704]	[1.792]
Bank return on assets	-152.489***	-152.489***	-152.489***	-152.489***	-152.489***
	[-5.639]	[-4.907]	[-5.069]	[-5.069]	[-4.304]
Bank size	0.036	0.036	0.036	0.036	0.036
	[0.092]	[0.103]	[0.105]	[0.105]	[0.101]
NPLs	131.039***	131.039***	131.039***	131.039***	131.039***
	[5.315]	[3.841]	[4.018]	[4.018]	[4.406]
Firm return on assets	-108.337***	-108.337***	-108.337***	-108.337***	-108.337***
	[-6.056]	[-6.118]	[-5.359]	[-5.359]	[-4.375]
Tobin's Q	-34.720***	-34.720***	-34.720***	-34.720***	-34.720***
	[-15.111]	[-7.185]	[-7.120]	[-7.120]	[-8.055]
Firm leverage	173.767***	173.767***	173.767***	173.767***	173.767***
	[17.046]	[11.080]	[10.230]	[10.230]	[7.646]
GDP per capita	-0.003***	-0.003**	-0.003*	-0.003*	-0.003**
	[-3.269]	[-2.038]	[-1.964]	[-1.964]	[-2.106]
GDP growth	-0.334	-0.334	-0.334	-0.334	-0.334
	[-0.513]	[-0.436]	[-0.447]	[-0.447]	[-0.411]
Constant	287.402***	287.402***	287.402***	287.402***	287.402***
	[17.343]	[10.553]	[10.424]	[10.424]	[9.148]
Observations	27,396	27,396	27,396	27,396	27,396
Adj. R-squared	0.715	0.714	0.713	0.713	0.713
Loan purpose	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y
Clustering	Loan	Bank	Bank & Firm	Firm & Year	B&F&Y
Number of banks	528	528	528	528	528
Number of firms	3989	3989	3989	3989	3989

Table A9. Weighted least squares

The table reports coefficients and t-statistics (in brackets). Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is weighted least squares with standard errors clustered by borrower. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. In specification (1), we weight by the number of loans of the lender to the total number of loans in that year. In specification (2), we weight by the number of loans to the borrower in a year to the total number of loans in that year. In specification (3), we weight by the number of loans between a lender and the borrower's country in a given year to the total number of loans extended in that year. In specification (4), we weight by the number of loans between the lender's country and the borrower's country in a given year to the total number of loans extended in that year. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Firm rating	5.885***	7.000***	6.827***	6.782***
	[4.052]	[5.304]	[4.156]	[4.888]
Loan amount	-6.522***	-8.496***	-7.594***	-9.130***
	[-6.281]	[-7.171]	[-6.398]	[-7.023]
Maturity	0.249***	0.262***	0.243***	0.225***
	[4.870]	[5.189]	[5.613]	[4.197]
Collateral	33.124***	31.525***	35.361***	32.952***
	[7.633]	[8.796]	[7.726]	[8.900]
Number of lenders	-0.640***	-0.810***	-0.587***	-0.746***
	[-5.821]	[-6.628]	[-5.016]	[-6.024]
Performance provisions	-25.684***	-34.075***	-28.712***	-35.530***
	[-10.353]	[-13.804]	[-10.472]	[-13.760]
General covenants	2.977***	4.391***	3.650***	4.778***
	[2.600]	[3.944]	[3.071]	[4.155]
Bank return on assets	-122.122***	-145.424***	-106.058***	-136.443***
	[-4.222]	[-4.828]	[-3.457]	[-4.343]
Bank size	0.032	0.152	0.240	0.210
	[0.074]	[0.370]	[0.523]	[0.487]
NPLs	85.330***	114.555***	42.693	91.663***
	[3.186]	[4.100]	[1.543]	[3.120]
Firm return on assets	-78.797**	-101.188***	-86.039***	-109.857***
	[-2.500]	[-3.950]	[-2.725]	[-4.178]
Tobin's Q	-27.077***	-30.310***	-23.352***	-27.680***
	[-7.602]	[-9.093]	[-6.747]	[-8.320]
Firm leverage	157.449***	139.339***	142.568***	130.344***
	[9.989]	[9.790]	[9.966]	[9.169]
GDP per capita	-0.003**	-0.000	-0.009**	-0.009***
	[-2.166]	[-0.162]	[-2.543]	[-2.988]
GDP growth	-0.677	-1.257	0.189	0.831
	[-0.697]	[-1.220]	[0.079]	[0.388]
Constant	277.959***	343.815***	295.334***	357.737***
	[12.753]	[14.415]	[12.449]	[13.905]
Observations	27,396	27,396	27,396	27,396
Adj. R-squared	0.747	0.725	0.756	0.730
Loan purpose	Y	Y	Y	Y
Year effects	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y
Number of banks	528	528	528	528
Number of firms	3989	3989	3989	3989

Table A10. Timing of the downgrade event

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of *Event distance* (i.e., the distance between the loan facility start date and the corporate credit rating downgrade within the year). Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by firm. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. In specifications (1) and (4), *Event distance* is a continuous variable measuring the days between the loan facility start date and the corporate credit rating downgrade. In specifications (2) and (5), *Event distance* is a continuous variable measuring the quarters between the loan facility start date and the corporate credit rating downgrade. In specifications (3) and (6), *Event distance* is a binary variable equal to one if the corporate credit rating downgrade occurred 6 months before the loan facility start date, and zero otherwise. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Firm rating × Firm RW	7.681***	7.620***	7.842***			
	[5.212]	[5.187]	[5.314]			
Firm rating × Firm NRW	5.310***	5.302***	5.340***			
	[3.295]	[3.299]	[3.319]			
Firm downgrade × Firm RW				8.495***	8.179***	9.832***
				[3.261]	[2.995]	[4.335]
Firm downgrade × Firm NRW				7.219**	6.777*	9.053***
				[2.046]	[1.805]	[3.252]
Event distance	0.005	0.823	-3.133	0.008	1.070	-10.052
	[1.047]	[1.607]	[-0.658]	[0.735]	[0.857]	[-1.368]
Observations	27,396	27,396	27,396	24,114	24,114	24,114
Adj. R-squared	0.713	0.713	0.713	0.716	0.716	0.716
Full set of controls	Y	Y	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y
Bank effects	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	Y	Y	Y	Y	Y
Number of banks	528	528	528	528	528	528
Number of firms	3989	3989	3989	3989	3989	3989