Gender board diversity and the cost of bank loans *

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September 2020

Abstract

We examine the relationship between female board representation and the cost of lending, using a dataset that contains 13,714 loans originated by 386 banks matched with 2,432 non-financial firms over the period 1999 to 2013. We find that firms with female directors command lower loan spreads. In addition, female independent directors have a stronger impact on lowering spreads compared to female directors' other attributes. However, as firms build relationships with their lenders this effect becomes less potent. Finally, when we introduce firm-level heterogeneity we document that changes in gender diversity exert a stronger impact on the cost of lending in the case of bank-dependent firms, especially for relationship borrowers.

Key words: Gender diversity; Board of directors; Bank loans; Relationship lending
JEL: G21, G30

*We are grateful to Douglas Cumming and Geoffrey Wood (editors) and three anonymous reviewers for insightful comments and suggestions. We acknowledge Nuri Ersahin, Franco Fiordelisi, Jens Hagendorff, Martin Jacob, Pantelis Kazakis, William Megginson, Alex Michaelides, Stefan Ruenzi and participants at the 2019 EFiC Conference in Banking and Corporate Finance and the 2020 British Academy of Management in the Cloud for their useful comments.

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1 Introduction

The extant literature on corporate governance uses a combination of legislation and agency costs alleviation to explain why, in various settings, boards are central in governing organizations (Hermalin and Weisbach (2003)). Importantly, the structure of the board is a critical factor in influencing the integrity of the financial accounting process through auditing and disciplining senior management (Anderson et al. (2004)). In turn, recent turmoil in the financial markets has focused attention on corporate social responsibility (CSR), particularly on the role and the composition of corporate boards of directors (Terjesen et al. (2009)).[1] For instance, one specific channel through which improved performance on CSR can generate value in the long run is by relaxing credit constraints that firms face on the supply side, from financial markets and financial intermediaries (Cheng et al. (2014)). Hence, superior CSR levels are more likely to ease access to external finance, which may then also improve financial costs.

Why would improving board diversity, especially gender diversity, matter for the cost of obtaining external finance? Female presence is key to enhancing corporate financial performance and reputation (Bear et al. (2010)). In addition, board diversity could improve the quality of board discussions and increase the ability of the board to provide greater transparency (Carter et al. (2003). Adams and Ferreira (2009) note that female representation provides greater oversight of managers' actions and accounting reports through promoting better board attendance, higher auditing, and demanding greater accountability from managers. Finally, female directors are more concerned with the reduction in negative business practises (Cumming et al. (2015)). Therefore, previous research on women on corporate boards examines the characteristics of female directors and their favourable traits that may enhance board decision-making, tasks and roles, paying attention on firm performance (Tanaka (2014)).

[1] CSR is difficult to conceptualize and remains open to different interpretations (Wood (2010)). A widely adopted interpretation is that CSR is made up by demonstrable actions and outcomes reflecting business responsibility for societal good (Galbreath and Shum (2012)).

In this paper, we argue that the cost of obtaining bank loans hinges, at least to some extent, on the board of directors and female presence more specifically. We follow the line of inquiry of Anderson et al. (2004) which shows that female board representation is related to improved accounting process. This is achieved through transparent financial reporting that complements screening and monitoring which ultimately implies a reduction of agency costs. Therefore, our hypothetical argument is: female board representation can improve accounting practises which is what banks observe when they decide to charge interest rates on the loans. Hence, banks observe this favourable trait of gender diverse boards and provide their firms with lower interest loans. The motivation to focus on bank financing stems from two important considerations. First, board attributes influence the validity of accounting statements by increasing the disclosure of firm-specific information and improving the incentives for the collection of private information (Gul et al. (2011)). This is of great importance for the lending process because accounting-based information is the traditional standard that potential lenders use to assess the firm's credit quality using public information. Second, bank loans provide a major source of financing, even for large public companies significantly affecting firms' financial structure (Bradley and Roberts (2015)). Finally, we examine the extent to which this link differs at firms that have established relationships with their lenders compared to their counterparts as well as to firms that are more and less bank dependent.

We contribute to the literature in three main ways. First, we examine the extent to which female board representation can help reduce information asymmetry between the lender and the borrower with implications for the cost of bank lending. Previous empirical studies find that female CFOs reduce the cost of bank loans (Francis et al. (2013)), while Pandey et al. (2019) and Usman et al. (2019) conclude that female presence on the board is negatively associated with the cost of debt, as proxied by the interest expenses over debt. The approach taken by the latter studies relies on an approximation for the cost of debt and due to the aggregation it can be influenced both by increases in the expenses (numerator) and a reduction the debt (denominator). Our approach using granular data allows us not only

to remove demand-side influences, but also to examine the channel through which women directors influence firms' cost of bank borrowing. When we distinguish between female executives and female independent directors, we observe that the effect is stronger for the latter. Hence, our results suggest a differential effect of female independent directors on the cost of borrowing.

Second, we account for the role of relationship lending in examining the impact of gender diversity on the cost of bank lending. Building relationships is a major way for banks to find out more about their borrowers, cherry-pick good projects and consequently be associated with a lower degree of adverse selection (Boot (2000)). We add to the literature on gender diversity and firm performance by recognizing that gender diversity may not imprint firms' cost of lending, especially as they establish relationships (or track record reputation) with banks through repeated interactions. Exploiting the link between gender diversity and the cost of bank loans, through the relationship lending lens, provides an alternative explanation to the direct link between board gender diversity and the cost of borrowing. In other words, we highlight the lending relationships as a mechanism to mediate the direct impact. To this end, relationship lending presents a unified framework that nests the full spectrum of corporate governance.

Finally, while this study relates to the burgeoning literature on firm heterogeneity and real activities (Whited and Wu (2006) and Campello and Chen (2010)), we focus on the interplay between board diversity and bank dependency. It is now well documented that during the most recent global financial crisis banks have incurred severe losses, which have led them to significantly increase the cost of loans directed towards bank dependent firms (Santos (2011)). Also considering that not all firms' lending costs respond to changes in the board composition in the same way, we set out to examine the loan pricing implications of firms' bank dependency.

Our paper analyzes the link between gender diversity on boards and the cost of bank lending using a sample based on four different data sources, these are the Thomson Reuters

LPC's DealScan database, the Call Reports from the Federal Reserve Board of Governors (FRB), Compustat, and BoardEx over the period 1999 to 2013. Our dataset has two appealing characteristics to study the above questions. First, it disentangles internal from independent directors and enables us to delve deeper into the role of different female directors' attributes. Second, the matching between firms and their corresponding lenders allows us to evaluate the impact of gender diversity taking into account relationship lending.

The empirical challenge to estimate the impact of gender diverse boards on the cost of borrowing lies in dealing with the endogeneity between the various measures of "firm-specific performance" and firms' choices about corporate governance (e.g., see Hermalin and Weisbach (1998), Minnick and Noga (2010), among others). Our research design enables us to significantly mitigate these endogeneity concerns. First, to identify the impact of female directors on the cost of lending, we control not only for firm-specific (e.g., see Anderson et al. (2004)) but also for bank-specific attributes. In this way, we can control for factors that affect both the demand and the supply side. Second, the multi-level structure of our sample stemming from multiple loans provided by the same bank and multiple loans obtained by the same firm allows us to include comprehensive sets of time-invariant and time-varying fixed effects to saturate our empirical identification from omitted factors.

We perform a number of additional tests to corroborate our results. Notably, we focus on a two-stage instrumental variable (IV) analysis that circumvents endogeneity concerns by exploiting the role of the firm's directors' retirement. In doing so, we establish the appropriateness of *Retired director* as an exclusion restriction for female participation, and then, we utilize it to mitigate concerns about simultaneity bias (IV test). In addition, we control for the firms' credit ratings at the time of the loan origination to deal with a major factor that may affect the pricing of loans. The credit rating reflects the probability of default and thus we alleviate credit quality differences on top of the gender diversity, such us expected-losses.

In the first set of estimates, we find evidence that gender board diversity has a negative

and significant effect on firms' cost of lending. More precisely, increasing the fraction of females on the board by 1% would reduce on average the loan spread by 20.8 basis points. However, the effect diminishes by 4.2 basis points for repeated borrowing from the same lender, because the quality of the financial reporting has already been discounted from the bank in the first interaction. Moreover, the effect is more potent for firms characterized by high bank-dependency. Thus, we conclude that gender diversity improves reporting quality and reduces the cost of the loan. However, the bank's acquisition of private information from relationship lending reduces the verification cost and diminishes the discount rate. These results unify the mixed evidence on the board's gender diversity providing new insights from a bank's perspective. Our findings are robust to non-pricing characteristics and respecification models.

The rest of the paper is structured as follows. Section 2 presents an overview of the related literature and develops our testable hypotheses. Sections 3 and 4 contain our methodology and data-set description, respectively. Section 5 presents the empirical results, while Section 6 explains the robustness checks undertaken. Section 7 provides conclusions and policy implications.

2 Conceptual framework and hypotheses

2.1 The link between gender diversity and the cost of bank loans

The broad thrust of the empirical evidence supports the argument that board characteristics affect firm performance either in a direct or in an indirect way through the board's actions (Hermalin and Weisbach (2003)).[2] To begin with the mix of men and women on the board, the direct link is achieved primarily via a reduction of agency costs. Specifically, Gul et al. (2011) show that gender-diverse boards make firms more transparent by increasing

[2]However, the empirical evidence for a direct link between gender diversity and financial performance remains mixed and inconclusive. See Terjesen et al. (2009) for a detailed review of the role of gender diversity in firms' performance.

the disclosure of firm-specific information by managers and by providing incentives for the collection of private information by investors. In addition, gender board diversity can improve the quality of board discussion, ensure that more information circulates from the board to investors, result in more effort being put into oversight and monitoring (Hillman et al. (2007), Adams and Ferreira (2009)), promote better board attendance, and lead to greater accountability being demanded for poor performance. Women can be more vocal than their male counterparts (Carter et al. (2003), Adams and Ferreira (2009)) and Ray (2005) argues that compared with men, women possess many favourable traits in value judgment, risk attitude, and decision-making. In sum, several studies document a positive relationship between gender diversity of the board and corporate performance (see, for example, Gul et al. (2011), Liu et al. (2014), Chen et al. (2016)).

On the other hand, other researchers conclude that gender diversity in the boardroom does not necessarily improve firm outcomes (Gilbert and Ivancevich (2000), Mannix and Neale (2005), Adams and Ferreira (2009), Boone and Hendriks (2009), Sila et al. (2016)).[3] In addition, Ahern and Dittmar (2012) and Matsa and Miller (2013) find that firm value decreased following the introduction of the 40% gender quota for directors in Norway.[4] Motivated by the inconsistent findings for a direct link between women on boards and financial performance, Galbreath (2018) shows that women on boards can enhance firms' financial performance by influencing corporate social responsibility. This finding paves the way for identifying an indirect link between gender diversity and firms' financial performance.

In the present study, we follow the insights of the literature on gender diversity on boards and firm performance. In doing so, we argue that female board representation can improve transparency, by increasing the level of managerial auditing and enhance the financial ac-

[3]Scholars posit that the ability to increase the amount of information available to investors can have a positive effect on firm risk. For instance, several studies find that gender-diverse boards reduce firm risk since men are more likely to engage in risky decisions compared to their female counterparts (Hinz et al. (1997), Byrnes et al. (1999), Barber and Odean (2001)). Adams and Ferreira (2004) also find that firms facing more variability in their stock returns have fewer women on their boards.

[4]Bøhren and Staubo (2014) further show that the mandatory gender balance in Norway may produce firms with inefficient boards.

counting process.[5] Thus, female representation reduces adverse selection, stemming from the firm having private information that banks do not have, which complements the screening and monitoring role of banks and thus reduces the cost of borrowing.[6] This is supported by Francis et al. (2013) who show that female CFOs borrow with better terms from the banks. In addition, L.Paige-Fields et al. (2012) find that firms' board quality and other governance characteristics influence the likelihood that lenders will provide debt covenants and lower cost of bank loans.[7] Finally, Pandey et al. (2019) and Usman et al. (2019) conclude that female presence on the board is negatively related to the cost of debt, which is proxied by the interest expenses over debt. In the present study our main interest lies in understanding how banks perceive diversity on boards when it comes to the cost of lending. In light of the above discussion, we formulate the first hypothesis as follows.

Hypothesis 1a: Firms with more gender diverse boards are likely to command lower loan spreads.

2.2 The mediating role of relationship lending

Having a gender diverse board is likely to have a direct effect on the cost of borrowing, but there might be alternative explanations. Specifically, an alternative approach is that women on board may influence loan spreads indirectly through bank relationships. Bank-firm relationship lending facilitates screening and monitoring because the bank accumulates inter-temporal firm-specific information from repeated interactions with the firm that adds

[5]The boards of directors delegate direct oversight of the financial accounting process to the audit committee, a subcommittee of the full board. Audit committees are responsible for recommending the selection of external auditors to the full board (supervisory or non-executives), ensuring the soundness and quality of internal accounting and control practices, and monitoring external auditor independence from senior management. Board's meet routinely with the firm's accounting staff and external auditors to review financial statements, audit procedures, and internal control mechanisms (Klein (2002)).

[6]In the era of financial technology, banks rely heavily on artificial intelligence and machine learning methods to measure credit banking risk. The usage of high technology is more potent in the syndicated loan market, where the aggregated bank' exposure is, on average, larger than in conventional corporate loans (Pérez-Martín et al. (2018)). Thus, the structure of the board becomes of grave importance for banks who become adversely exposed to new financial products and will price the risks accordingly.

[7]The authors include the percentage of female directors among their board characteristics but find no significant effect.

value (Diamond (1984), Allen (1990), Winton (1995)). It is widely accepted that relationship lending is a key mechanism to mitigate moral hazard and adverse selection problems in loan contracting (Boot (2000)). However, banks' acquisition of private information could effectively "lock-in" firms and make it possible for their banks to extract higher rents (Greenbaum et al. (1989)). Relationship lending banks exploit their privileged information and exert monopolistic rates to compensate for the costly access to and processing of proprietary information that is unavailable to outside lenders.

As already mentioned, female board diversity works as a device to increase the transparency and reliability of firms reducing adverse selection and consequently the cost of borrowing. We argue that once banks create relationship lending, the effect of female board diversity decreases in relationship loans, possibly due to an informational "lock-in". In other words, the impact of female diversity is likely to be short-lived as firms establish relationships with banks through repeated loans. Gender board diversity may be effective in reducing firm risk, and consequently, the cost of borrowing, the first time a firm borrows from a bank, but then this effect diminishes once firms establish bank relationships. Following this discussion, we formulate our next hypothesis.

Hypothesis 1b: The negative association between gender diverse boards and loan spreads is less powerful for relationship borrowers.

2.3 The amplifying role of bank dependency

An implication of the mechanism described in the previous sub-section is that when as lending relationships evolve, for particular firms, there will be attenuation in the decrease in the cost of borrowing and financing their economic activities. The "lock-in" effect is likely to be more prevalent for borrowers with few or no alternative sources of external financing beyond the relationship bank (Bharath et al. (2009)). Therefore, we focus our attention on bank dependent firms. According to Kashyap et al. (1993) bank dependent firms are associated with higher degrees of information asymmetry. That is, bank dependent firms will face

higher agency costs of borrowing - a higher "external premium" - for raising capital from financial markets compared with the cost of internal finance funded from retained earnings as explained by with subsequent effects on real activity Bernanke and Gertler (1995). In the context of the loan market, the cost of obtaining loans for financially constrained firms should be particularly sensitive to female board representation when firms become relationship borrowers. Following Santos and Winton (2008) we classify firms as bank dependent if they have not had access to the public debt markets (bond or equity issuance) within a five-years' time window prior to the current loan issuance.

Our study is motivated by this literature and seeks to examine why financially weak firms, which are associated with a higher degree of informational asymmetry, experience higher loan spreads when they become relationship firms. We postulate that financially constrained firms' business fundamentals are systematically more sensitive to aggregate economic movements than unconstrained firms' fundamentals (Kashyap et al. (1993), Bernanke and Gertler (1995), Campello and Chen (2010) and Whited and Wu (2006)). Consequently, we anticipate the effect of gender diversity to be stronger for firms exhibiting financial constraints compared to their less constrained counterparts. In summary, we expect to find that bank-dependent firms' loans command higher ex-ante excess risk premia when they are "locked-in" lending relationships. Our next hypothesis is as follows.

Hypothesis 2: The effect of board diversity is stronger for firms classified as bank dependent when they become relationship borrowers.

3 Empirical implementation

3.1 Baseline model

To examine the sensitivity of banks' loan spreads to gender diversity we estimate the following model:

$$AISD_{f,b,t} = \lambda_1 Female_{f,t} + \beta_1 L_{l,t} + \beta_2 F_{f,t-1} + \beta_3 B_{b,t} + \theta_f + \phi_{b,t} + \epsilon_{f,b,t}, \tag{3.1}$$

where $AISD_{f,b,t}$ (abbreviated from All-In-Drawn-Spread) is the coupon spread over Libor on the drawn amount plus the facility fee in bps of loans granted by bank b to firm f in year t. $Female$ is the variable we use to measure female participation on a board. Many studies in corporate governance literature, measure board gender diversity with the fraction of females (see for example, Adams and Ferreira (2009), Ahern and Dittmar (2012), Liu et al. (2014) and Sila et al. (2016)). Other studies rely on the number of women directors on a board (Simpson et al. (2010) and Liu et al. (2014)). This approach stems from the idea that female directors need to reach a threshold (otherwise known as a critical mass) before their influence can be felt.[8] Following recent corporate governance literature (see for example Liu et al. (2014), Gul et al. (2011), among others) we utilise both measures. More precisely, we employ the fraction of females on a board for our baseline analysis and the absolute number as an alternative measure of gender diversity. θ_f, $\phi_{b,t}$ denote different levels of time invariant and time varying fixed effects (analyzed later on), while ϵ is a loan-level shock, which captures stochastic disturbances. The coefficient of interest λ_1 reflects the change in the cost of lending for firms with gender diversified boards. If diversified firms have lower spreads compared to less diversified firms, then $\lambda_1 < 0$. This finding would support H1a.

Consistent with previous studies (e.g., Sufi (2007), Ivashina and Scharfstein (2010)), we include several loan level (L) and bank-level (B) control variables to rule out other possible explanations for our results (for more extensive definitions, see Table 1). Loan facilities mainly differ across the maturity, loan scale, purpose, and loan type (term loan vs. revolver). Thus, we control for these differences by adding loan level variables that include a dummy that equals one when has been a relationship lending between bank and firm over the previous five years (Bharath et al. (2009)); a dummy that equals one if the loan is linked with financial covenants to control for unobservable borrower risk factors (Carey and Nini (2007)); the loan duration in months and a dummy that equals one if the loan is a term.

[8]We also note that the actual number of females on board may be important for the composition of the various committees and the allocation assignments' among members (see for example Anderson et al. (2004)).

Concerning the bank-level control variables, we use the natural logarithm of total assets (*Bank size*) and a dummy equal to one if the lead arranger is one of the top three arranger, namely Bank of America, Citigroup, or JPMorgan Chase, in the syndicated loan market.

In vector F we use a number of firm-level variables which have been found to influence loan spreads. First, we use *Firm size*, measured as the natural logarithm of total assets, to control for the fact that larger firms have better access to external finance as they are less financially constrained, while smaller firms are more dependent on short-term bank financing (Bougheas et al. (2006), Almeida and Campello (2010)). Second, we construct a measure of profitability which proxies for the firm's ability to generate profits relative to total assets.[9] Third, we calculate the $Tobin's\ Q$ using the market value of a firm's equity divided by the book value of equity. The literature postulates that firms with greater expansion opportunities are less likely to undertake bond issuance earlier (Hale and Santos (2008)). Finally, we take into account the firm's participation in the New York Stock Exchange ($NYSE$) by generating a dummy variable for whether a firm is listed or not. We argue that quoted firms are likely to command lower loan spreads as they have an alternative source of external finance and can signal their credit quality through previous market participation. The timing of the variables is in line with the idea that firms with certain characteristics at time t-1 will seek to obtain a loan at time t from a bank (or several banks). In addition, banks at time t will check the available financial statements of the firms from the previous period t-1 to decide on the origination of the loan or not).

The key identification challenge is to isolate changes from loan supply and demand. Firms with higher level of gender diversity which borrow from banks are on average bigger, so the cost of lending is likely to be correlated with diversified firms. Due to the granularity of our data (loan-level), we can overcome this issue using several fixed effects. First, bank and industry (at 3 digit SIC) fixed effects are particularly important because we control for time-invariant bank-and-industry characteristics that could lead to correlation between the

[9]More profitable firms have a greater cushion for servicing debt and would be expected to pay lower spreads on their loans (see Güntay and Hackbarth (2010)).

λ_1 and ϵ. The inclusion of year and purpose fixed effects accounts for annual common shocks and insulates our model from differences in syndicate structure due to purpose (Sufi (2007)).

Also, bank*year fixed effects ($\phi_{b,t}$) allow gender diversity to affect each bank at each point in time heterogeneously. We thus control for unobservable time-varying bank fundamentals (such as profitability, risk, and other balance sheet characteristics) to isolate credit supply. Essentially, we are comparing the same bank lending to different firms in a given year, while using only the within variation of each bank-firm combination for estimation (Jiménez et al. (2014)). After absorbing any changes in loan supply our estimates reflect loan demand effects.

3.2 Relationship lending

As argued in subsection 2.2, our focus is on the differential effect of relationship lending on loan spreads for firms with gender diverse boards. Formally we test the following model:

$$AISD_{fbt} = \lambda_1 Female_{f,t} + \lambda_2 REL_{f,b,t} + \lambda_3 Female * REL_{f,b,t} + \beta_1 L_{l,t} + \beta_2 F_{f,t-1} + \beta_3 B_{b,t} + \theta_f + \phi_{b,t} + \epsilon_{f,b,t} \quad (3.2)$$

where REL is a measure of relationship strength that equals one if bank lent to the same borrower in the last five years before the present loan and zero otherwise (Bharath et al. (2009)).[10] To support H1b we should observe negative coefficients for both λ_1 and λ_2 and a positive coefficient on the double interaction term λ_3. This would imply that loan spreads and gender diversity are negatively related, but less so for relationship borrowers.

3.3 Bank-dependency

Finally, we take into account the impact of bank dependency on the relationship between the cost of lending and gender diversity. Following Santos and Winton (2008) we generate

[10] Also, in section 6.3 we calculate continuous measures of relationship lending.

a dummy variable for bank dependent firms that takes the value 1 if they have not had access to the public debt markets (bond or equity issuance) within a five-years' time window prior to the current loan issuance. The intuition is this group of firms is more likely to face binding financing constraints and is associated with higher levels of information asymmetry. Thus, they are likely to suffer more from capital markets imperfections than their less bank-dependent counterparts. With reference to the "lock-in" effect, the greater the information opacity, the greater will be the borrower lock-in effect (Bharath et al. (2009)).

Therefore, we estimate equation (3.1) for two sub-samples. These specifications capture the impact of firm-level heterogeneity, as measured by firms' reliance on bank financing, on the response of loan spreads to the gender diversity for firms more and less likely to suffer from financial constraints. To support H2 we would expect changes in the gender diversity to exert a stronger impact on the cost of lending in the case of bank dependent firms, especially for relationship borrowers.

4 Data and summary statistics

4.1 Data description

We construct a unique dataset using information from four different data sources. Our data sources are the Thomson Reuters LPC's DealScan database, the Call Reports from the Federal Reserve Board of Governors (FRB), Compustat, and BoardEx. These are combined to cast light on the role of gender diversity in the cost of borrowing in the US. The data are recorded on a loan frequency and the time period covered is 1999 to 2013.

We begin with a brief description of the syndicated loan market, as it has already been extensively analysed (e.g., Sufi (2007); Delis et al. (2017) for further details). Syndicated loans are granted by a group of banks to a single borrower. Loan syndication allows banks to compete with capital markets in the generation of relatively large transactions that a sole lender would not otherwise be able (or willing) to undertake due to internal and regulatory

restrictions. These loans combined represents a hybrid instrument bringing together features of relationship and transaction lending (Dennis and Mullineaux (2000)). They allow the sharing of credit risk between financial institutions without the disclosure and marketing burden that bond issuers face.

We obtain data on syndicated loans from Dealscan. This database provides detailed information on the characteristics of the loan deal's (amount, maturity, collateral, borrowing spread, performance pricing, etc.), as well as more limited information for the members of the syndicate, the lead bank, the share of each bank in the syndicate and the firm receiving the loan.[11] We categorize loans as a credit line, term A, B, C, D, and E and exclude term loans B because banks hold none of these loans after the syndication. Term loans B are structured specifically for institutional investors and almost entirely sold off in the secondary market. Also, following Roberts (2015), we drop loans that are more likely to be amendments to existing loans, because these are misreported in Dealscan as new loans, but they do not necessarily involve new money.

To obtain information for the financial statements of banks, we match these data with the Call Reports. We hand-match Dealscan's lender ID with the commercial bank ID (RSSD9001) from the Call Reports. This process yields a unique identity for each lender. In turn, we link the lenders at their top holding company level (RSSD9348) to avoid losing observations. Because these reports are available on a quarterly basis, we match the origination date of the loan deal with the relevant quarter. For example, we match all syndicated loans that were originated from April 1st to June 30th with the second quarter of that year

[11] We apply two selection rules to avoid bias in our sample. This is an essential part of the sample-selection process that is absent from most empirical studies using the Dealscan database (for a similar strategy see Lim et al. (2014)). First, we disentangle banks from non-banks. We consider a loan facility to have a non-bank institutional investor if at least one institutional investor that is neither a commercial nor an investment bank is involved in the lending syndicate. Non-bank institutions include hedge funds, private equity funds, mutual funds, pension funds and endowments, insurance companies, and finance companies. To identify commercial bank lenders, we start from lenders whose type in Dealscan is *US Bank*, *African Bank*, *Asian-Pacific Bank*, *Foreign Bank*, *Eastern Europe/Russian Bank*, *Middle Eastern Bank*, *Western European Bank*, or *Thrift/S&L*. We manually exclude the observations that are classified as a bank by Dealscan but actually are not, such as the General Motors Acceptance Corporation (GMAC) Commercial Finance. We went through all the syndicated loans manually, one-by-one. Second, we exclude loans granted to utilities or to financial companies.

of the Call Reports. Similarly, we obtain annual information for the financial statements of firms from Compustat using the link provided by Chava and Roberts (2008).

The BoardEx database contains data on college education, graduate education, past employment history, current employment status, and social activities. In this study we are interested in gender information. To this end, we utilize two widely used measures for females' board participation: the absolute number of females, and the fraction of females. We then apply these two measures in four different categories. We examine: (i) the total number of female directors on board ($\#female\ on\ BD$), and the fraction of the total females on board ($\%female\ on\ BD$), (ii) the number of female executive (internal) directors ($\#\ ED\ female\ on\ BD$), and the fraction of female executive (internal) directors on board ($\%\ ED\ female\ on\ BD$), (iii) the number of female non-executive (external) directors ($\#\ SD\ female\ on\ BD$), and the fraction of female non-executive (external) directors on board ($\%\ ED\ female\ on\ BD$), (iv) the number of female independent non-executive directors ($\#\ indep.\ NED\ female\ on\ BD$), and the fraction of female independent non-executive directors on board ($\%\ indep.\ NED\ female\ on\ BD$).

Due to the fact that BoardEx provides data for each director and year, we collapse this information calculating the average per firm and year. We hand-match firms in BoardEx to Compustat. Specifically, we match the firm's name in BoardEx to the name as it appears in Compustat. This proved to be one of the most challenging and time-consuming tasks of the entire sample construction. In addition, we had to clean the initial data received by BoardEx. Each time a company acquires another company, BoardEx stops using the initially provided company ID and supplies a new one after the acquisition. This leads us to the same company name with different ID for before and after the acquisition. We apply a fuzzy merge and hand-match one by one the same company before and after the acquisition by keeping the initially provided BoardEx company ID.

Following normal selection criteria used in the literature, we control for the potential influence of outliers, by excluding observations in the 1 percent from upper and lower tails

of the distribution of the regression variables. The matching process yields a maximum of 13,714 loans originated by 386 banks involving 2,432 non-financial firms spanning from 1999 to 2013. This sample is a so-called 'multi-level' data set, which has observations on banks and firms (lower level) and loan deals (higher level).

4.2 Sample analysis

In Table 1 we formally define all variables of the empirical analysis and provide the data sources. In Table 2 we present information about the variables used in the empirical models. More precisely, in Panel A we provide the descriptive statistics for the dependent and independent variables we utilize in this study. We find that firms have on average 10 directors (executive and non-executive). Of those firms, we observe on average 1.2 female directors on the board, which translates to an average of 11.3% female board representation. The above statistics are in line with other studies in the relevant literature (e.g., Sila et al. (2016), Gul et al. (2011), Liu et al. (2014), Chen et al. (2016), Conyon and He (2017), Bennouri et al. (2018)) whose samples indicate around one female directors per board and female board participation of between 9.4% and 11%. The cost of borrowing, as calculated by the *AISD*, has a mean of 145.59 bps, while the *Relationship dummy* informs us that 51.7% of our sample consists of firms which have received loans at least once in the last five years.

Our data allows us to analyze how the cost of bank borrowing may have changed over time for firms in our sample, as female board representation has evolved at different rates. In Panel B of Table 2, we show that the cost of borrowing is much lower for those firm with female representation on their boards. We observe that firms with female directors pay AISD on average at 130 basis points as opposed to 183 basis points for firms with no female directors. This difference, which is significant at a one percent level, implies that firms with women on the board command significantly lower loan spreads compared to firms that are dominated by male directors. The picture is similar for the rest of the measures of cost of borrowing utilized in this study (i.e., AISU, Commitment fee, Letter of credit

fee). In summary, our univariate analysis suggests a negative association between female participation on boards and the cost of borrowing. It remains to be examined whether this relation continues to hold when employing our identification strategy and whether it can be interpreted as causal. Also, we document firm-level differences for boards without and with female directors. We observe that larger, listed and better-rated firms have a higher female representation on boards.

The Pearson correlation matrix in Table A1 shows the bivariate relationships of the main variables of this study. Importantly, we continue to observe a negative association between loan spreads and female board presence. Our statistics also suggest that the above negative association between the total number or the percentage of female directors and the cost of borrowing derives not from female executive directors but rather from external non-executive and independent non-executive female directors.

As said above, regression analysis will determine whether these bivariate relationships carry over to a multivariate framework, and that is where we now turn our attention. Our empirical analysis proceeds in two steps. First, we examine whether and to what extent gender diversity matters for the cost of borrowing once firms have built relationships with banks. Second, we consider how banks perceive firms based on a number of board and firm-specific indicators.

5 Results

5.1 Baseline model

We begin our enquiry with a basic model of loan spreads determination as shown in Equation (3.1). We test the main hypothesis: firms with more gender diverse boards, as measured by the number and fraction of females on the board, are more likely to command lower spreads.

Table 3 presents the results when we incorporate time invariant fixed effects.[12] In columns I and II we report the results for the number and fraction of females. The remaining columns vary in terms of how the female variable is measured. Specifically, in columns III and IV we report executive females on the board, in columns V and VI we show the number and percentage of non-executive- female directors on boards, and finally in columns VII and VIII we distinguish the number and the fraction of independent non-executive female directors.

The results show that the coefficients for female board representation are negative and highly significant in specifications I to II. That is, more gender-diverse boards, as measured by both the number and percentages of females on the board, are associated with lower costs of bank lending, which is in line with H1a. This finding is statistically significant but also economically meaningful. Taking the point estimate in column II, increasing the fraction of females on the board by 1% would reduce the loan spreads by 20.8 basis points, representing around 14% of the sample mean. Our finding highlights the role of gender board diversity in reducing information asymmetry between firms and "arms-length" lenders, and this is reflected on banks charging lower spreads to their customers with gender–diverse boards.

When we delve deeper into the definition of female board representation, we uncover significant differences. We find in columns III and IV that the impact of the number and fraction of executive female directors is quantitatively insignificant and economically unimportant. This result echoes Liu et al. (2014), who document that independent female directors have no effect on firm performance. We further find in the remaining specifications that the effect of female directors on the loan spreads is driven primarily by the non-executive (external) females on the board and by independent non-executive female directors. This result complements the earlier work carried out by Chen et al. (2016), who show that the dividend payout increases with the fraction of female directors, especially female independent directors. In addition, Anderson et al. (2004), and Bhojraj and Sengupta (2003) find a negative association between the proportion of outside directors and bond borrowing costs. In our

[12]In Table A2, in the appendix section, we provide benchmark results for running OLS regression that we add sequentially fixed effects. The findings provide initial evidence backing our testable H1a.

context, we show that independent directors maintain their independent status and strongly influence the cost of lending through the monitoring channel (L.Paige-Fields et al. (2012) and Liu et al. (2014)).

Judging from the signs of the estimated coefficients on the control variables, we find that an increase in $Firm\ size$, $Profitability$ and $Tobin's\ Q$, which are typically interpreted as a sign of better balance sheet position, reduce the cost of bank lending. In addition, listed firms also attract lower spreads consistent with the notion that presence in the stock market reduces information asymmetry and costs of external finance. Similarly, the point estimates for the loan and bank control variables are in line with the literature. We find that loans with covenant intensity and higher maturity increase the cost of lending because higher covenants are usually linked with riskier borrowers and higher exposure, (Dennis and Mullineaux (2000)). We pay special attention to the variable capturing relationship lending. We find that repeated borrowing from the same lender translates into a 4.2 basis points lowering of loan spreads. This result supports the Boot and Thakor (1994) model, which shows that relationships lower spreads.

Next, we present more restrictive models of the baseline specification by controlling for unobservable time-varying bank fundamentals to isolate credit supply and by accounting for industry demand. The firm and loan controls employed in the previous models remain unchanged. The combination of bank*time and industry (SIC3) fixed effects allows female representation to affect each bank at each point in time heterogeneously and account for any changes in loan supply while we control for time-invariant industry fixed effects (Khwaja and Mian (2005)). Table 4 explores the variation between firms with different level of gender diversity while controlling for the within bank-year variation. We report our results in Table 4 and find that our results are upheld both quantitatively and qualitatively.

The AISD considers the sum of the spread over LIBOR plus the facility fee while ignoring other fee components, such as the commitment fee and letter-of-credit fee. As noted in Berg et al. (2016), fees are an important component of the syndicated loan market because about

60% of the syndicated loans contain at least one fee type in the Dealscan database. Consider, for example, the case of a credit line: In the syndicated loan market, only around 60% of borrowers' credit lines is actually drawn down, and the rest is often used for letters of credit or remains undrawn. Therefore, for a typical credit line loan, the total price can be higher or lower than the AISD, depending on the various fees on the drawn or undrawn components. In Table 5, we identify different spread and fee types that characterize the cost of borrowing to further support our baseline results. In particular, we use the All-In-Spread-Undrawn (*AISU*), the fee paid on the unused amount of the loan commitments (*Commitment fee*), and the fee paid on amounts drawn on the letter-of-credit sub-limit (*Letter of credit fee*). The results show a negative association between the females board participation and the cost of borrowing that provide support for our baseline results.[13]

Overall, the baseline specifications suggest that loan spreads decrease with the number and fraction of female directors. The evidence seems to suggest that gender diversity helps to reduce the cost of lending. We point out, however, that the baseline model ignores one important characteristic of the lending process and of borrowers that are charged the relevant spreads. Specifically, the empirical model does not allow for the distinction between "relationship" and "transactional" borrowers that has been shown to be a significant factor in the relationship between firm characteristics and access to credit through bank lending. This distinction can be critically important since our explanatory variables have disproportionate effects for different types of firms classified by this criterion, as shown in Table 3. In the next sub-section, we interact dummies for relationship borrowers with the number and fraction of female directors to assess whether relationship lending is a dimension which is taken into account by financial markets.

[13]In appendix, Table A5, we report results controlling for information on collateral, refinancing and covenants intensity. This is to ensure that our findings remain unchanged when we disentangle secure from unsecured loans. The results are qualitatively and quantitatively similar with Table 4.

5.2 The role of relationship lending

We now turn to our H1b, relating gender diversity to relationship finance. The results of estimating equation (3.2) are presented in Table 6. Each column of the Table 6 corresponds to one of the alternative indicators that underlies the characterization of firms' gender diversity. For instance, columns I and II present the results exploring the number and percentage of female directors, while the remaining columns explore different attributes. In all models the dummy variable for relationship lending is interacted with the variable capturing gender diversity to gauge the change in the response relative to transactional borrowing and the net response under relationship lending is found by summing the coefficients.

According to the results reported in columns I and II, the female variable, measured both by the number and fraction of female directors, and the relationship dummy are negative and highly significant. Increasing the fraction of females on a board by one percent would reduce spreads by 46 basis points, as can be seen from column II. In addition, the relationship dummy variable attains a negative and significant coefficient. Holding everything else equal, the cost of borrowing from a relationship lender is lower by 14.2 basis points compared to borrowing from a non-relationship lender. Hence, we find evidence that establishing bank relationships helps to reduce spreads. However, when we observe the interaction between relationship lending and female diversity, this effect is muted by 34 basis points for borrowers with bank relationships. In other words, while we show that gender board diversity reduces the cost of lending, this effect diminishes once firms establish bank relationships and are "locked-in" with their lenders. As firms become more gender diverse, which implies more transparency and smaller information opacity, the effect of relationship lending declines. The mechanism that underlies this findings is as follows. Female representation is crucial in screening the accuracy of financial reporting and thus reducing adverse selection issues based on hard information (accounting reports). However, in repeated interactions between the bank and the firm (relationship lending), the verification cost for the true quality of financial reporting has already been discounted in the first loan. This finding concurs with

Bharath et al. (2009), who shows that more informationally opaque firms benefit less from relationship lending in terms of loan spreads. We find that this is the case for gender diversity as a device to signal more information transparency.

Next, we examine the effect of relationship lending by accounting for the characteristics of female directors. Columns III to VIII show, once again, that the effect of female directors on the cost of lending is driven primarily by female independent directors, as opposed to other categories. However, this effect is less potent for high-relationship borrowers. We document a significantly different response to gender diversity of firms' loan spreads, when relationship lending is accounted for, with respect to independent board characteristics. These results provide support for H1b as the creation of more diverse boards leads to lower loan spreads, but this is less the case for relationship borrowers. This finding is robust when we analyze the composition of the board.

To further coroborate our finding, we directly examine the bank dependent companies. In Table 7, we focus on how the pricing of bank loans varies with female representation on the board when firms rely heavily on bank financing. Specifically, following Santos and Winton (2008) we create a dummy variable *Bank Dependent* which is equal to one for firm i in year t if firm i has not had access to the public debt markets (bond or equity issuance) within a five-years' time window prior to the current loan issuance, and zero otherwise. Our subsample consists of 10,373 loans that were taken out from 841 firms that are categorized as bank dependent.

In the spirit of Kashyap et al. (1993), bank dependency is associated with higher degrees of information asymmetry. In other words, bank dependent firms lack transparency and availability of public information that can influence the cost of borrowing. During the most recent global financial crisis banks have incurred severe losses, which have led them to change their risk appetite and resulted in increased cost of lending towards bank dependent firms (Santos (2011)). In other words, the variable on bank dependency measures whether the firm has an alternative source of finance over and above bank financing. In line with our

expectations, we find that all else equal, bank-dependent firms pay a higher spread on their loans compared to firms with access to public markets. Our results suggest that banks increase lending rates for bank-dependent firms more than the rates for firms with access to public markets because they can utilize the soft informational power that they collect from repeated interactions.[14]

5.3 Gender diversity and loan purposes

In Table 8, we dig deeper into the role of gender diversity in determining the Firms' cost of lending. Specifically, we introduce interaction terms between the female representation (measured both by the number and the fraction of female directors) and loans' purpose that characterize the ex-ante level of information asymmetries. The relationship between gender diversity and cost of lending is likely to be influenced by differences in the lenders' ability to extract higher rates of return for different use of proceeds. The purpose of the loan has useful information content beyond the signals about creditworthiness that are conveyed in loan origination. In Table 8, following Angbazo et al. (1998), we create three dummy variables to reflect the designated purposes, namely general corporate, commercial paper (cp) back up and debt repayment.[15] Loans for back up or refinancing prior debt obligations are likely to be associated with higher spreads compared to general corporate loans because lenders are able to charge higher rates for providing immediacy Denis (1990). General corporate, cp backup and debt repayment loans represent on average 48%, 10% and 21% of the sample, respectively.

According to the results reported in Table 8, both female indicators are negative and

[14]To further check the robusness of our findings, we follow the relevant empirical literature (e.g., see Fazzari et al. (1988), Gilchrist et al. (2009)), and we classify firms as more or less likely to be financially constrained. To this end, we utilise the size, cash flow and credit ratings as sorting devices. Tables A3 - A4 present these tests. The results are qualitatively similar to the ones in Table 7.

[15]Corporate Purposes: General corporate loans are a catch-all purpose loan category that can be used for various activities related to general operations, purchases or working capital (inventory purchases). A unique characteristic of these loans is the lack of security. Commercial Paper Back up: A commitment to back a company's commercial paper program. It is typically a revolving credit, a 364-day facility, or a letter of credit. The commitment may be drawn down if the borrower is unable to roll-over or refinance maturing commercial paper. Debt Repayment: A loan to refinance or consolidate existing debt prior to maturity.

highly significant, and the economic significance is quantitatively similar to those reported in Table 6. All loan-purpose dummy variables are negative, apart from debt repayment, and statistically significant at 1%. The negative signs for general corporate and bank up are consistent with the evidence in Denis (1990) because these loans can be viewed as a letter of credit which provide positive signals about the borrower's prospects. While, on the contrary, the coefficient of debt repayment supports the view that these loans are negative NPV investments that banks can extract higher yields to compensate for higher risk exposure. Most importantly, the coefficient of the interaction term in columns I-VI is positive and highly significant indicating that these specific loan purposes diminish the negative impact of the female variables on the cost of lending. In addition, in columns V-VI, we observe qualitatively similar results but quantitatively stronger because loans for debt refinancing are viewed as negative NPV investments since they are usually utilized for defensive purposes in corporate control contests Angbazo et al. (1998). In summary, we find that the higher a loan's systemic risk exposure, the higher the ex-ante cost of the loan, given the same transparency on account practices arising from gender diversity. The coefficients of the marginal effect on the female variables provide useful insights for heterogeneous effects on gender diversity with respect to differences in the purpose of the granted loans.

6 Robustness checks

6.1 Instrumental variable estimation

Our evidence thus far suggests that gender diversity reduces the cost of lending due to better transparency, but this effect attenuates once firms have established a relationship with a bank. One may raise doubts about the extent to which our results are solely driven by gender diversity, as unobserved firm factors such as bank-firm board connectedness, may drive gender diversity and the loan spread simultaneously. Thus, lower spreads on loans might not be due to the incremental benefits of female representation as we have argued

thus far but may simply be the result of the female variable proxying for the borrower's unobservable quality. To address this potential concern, we introduce an instrumental-variables (IV) methodology.

The identification of gender diversity requires an exogenous variable, which is correlated with the female participation, but does not directly impact on the loan spread except through diversity. To this end, we use director retirements as an exogenous instrument for gender diversity that addresses endogeneity of board composition. Relying on Boardex, we are able to define a director departure as retirement if the director is at or beyond the company's mandatory retirement age. In our sample, there are 172 firms with retirements of directors. Our identification strategy is to compute changes in board composition that are not due to the firm's conditions. One way that retirements could be correlated with the cost of lending is through common industry developments that tend to move together. We thus control for industry fixed effects in our empirical specification. The identifying assumption in our IV analysis is that after controlling for time-varying industry (demand-side) effects, time-varying bank (supply-side) effects, and loan characteristics, director retirements enter exogenously in gender diversity (Fracassi and Tate, 2012). This allows us to interpret our findings as arising from a change in gender diversity.

We conduct the IV analysis using a two-stage least squares model with Bank*Year, Industry*Year, and Bank*Industry FE, separately. In Table 9, columns I-VI, we replicate the baseline specification of Table 3 using our instruments. The first stage point estimates in panel A confirm that the retirement of directors leads to a significant increase to the female participation on boards. This result suggests that firms replace retired directors with female directors. In addition, the over-and-weak identification tests show that there are no concerns regarding instrument validity. Panel B presents the second stage estimates using the estimated value of the total number of females on the board of directors. The estimates are qualitatively and quantitatively similar compared to those obtained in our baseline specification. Moreover, the statistical significance and inference on the coefficients

of interest are very similar. In sum, we conclude that our findings are robust to endogenous regressors.

6.2 Effects of non-pricing characteristics

Overall the results in the previous subsection indicate that, ceteris paribus, firms with gender diverse boards borrow at a lower cost. In this subsection, we explore how non-price terms are affected by changes in the composition of the board. The *Facility amount*, *Fixed charge coverage*, *Financial covenants* and *Performance pricing* provision are considered key loan contract features. The motivation for performing this test stems from the fact that the above indicators are more enhanced at lowering a loan's riskiness in the case of adverse developments for the borrower. In our set up, gender diversity is used as a proxy that is adverse to a firm's riskiness. So, we would expect a positive effect on the *Facility amount* and *Performance pricing* and a negative effect on higher needs for the *Fixed charge* (source of general covenant) and *Financial covenants*.[16] General covenants restrict a borrower's actions, such as the amount of acquisitions or debt issuance while financial covenants require borrowers to maintain a minimum level of financial ratio or value, such as a maximum debt ratio.

In Table 10, column I, the coefficient of interest is positive and statistical significant at the 1% level. Clearly, a firm with a higher number of females on the board will increase the loan amount by $2.8M in contrast to firms that are less diversified. Equally, this will decrease the probability of having higher contract strictness such as fixed charge coverage and financial covenant (Murfin (2012)). Performance pricing is a relatively new provision in loan contracts. There are two types of performance pricing: interest decreasing and interest increasing. In our analysis, we consider the interest decreasing which is a relatively new modification on payment option.[17] In column IV, we observe that firms with higher female

[16]Borrower covenants such as fixed charge coverage is chosen as controls as opposed to alternative accounting measures to most closely match the variables that banks are contracting on.

[17]Interest-decreasing performance pricing provisions automatically decreases the interest rate on the loan

representation have a 1.5% higher probability of being linked with a interest decreasing performance pricing provision.

6.3 Other robustness tests

In Table 11 we conduct a number of additional robustness tests. To start with, we report the results only for the total number of female directors on boards but we also obtain similar results for the fraction of females. In columns I and II we conduct an equivalent analysis with the baseline (Table 3), but we replace the relationship lending variable with continuous measures of relationship strength such as the total number (column I) and amount of loans (column II). This is a powerful test because we take into account the dynamic nature of relationship lending and compare relationship lending borrowers with the full spectrum of borrowers that a bank serves. We follow Bharath et al. (2009), who use a similar approach to measure the intensity of relationship lending. Let $Number\ of\ Loan^{b \to f}$ in the last five years be the number of loans lent by bank b to firm f at time t and $Total\ number\ of\ Loan^{b}$ in the last five years be the total number of loans that bank b has lent during the same year to the total number of borrowers. For each possible bank-firm pair, we compute the normalized continuous relationship lending as follows:

$$REL(number)_{b,f,t} = \frac{Number\ of\ Loan^{b \to f} \text{ in the last 5 years}}{Total\ number\ of\ Loan^{b} \text{ in the last 5 years}}$$

The second continuous measure of relationship strength is REL($M). For bank b lending to borrower f, at time t, it is calculated as follows:

$$REL(\$M)_{b,f,t} = \frac{\$M\ of\ Loan^{b \to f} \text{ in the last 5 years}}{Total\ \$M\ of\ Loan^{b} \text{ in the last 5 years}}$$

For both variables, higher values reflect higher relationship lending intensity.

when the borrower's creditworthiness improves. It thereby reduces adverse selection problems when asymmetric information between the borrower and lender results in a misclassification of credit risk.

We find that the effect of continuous relationship lending is qualitatively similar to the baseline but the economic significance is higher (8 and 12 bps in columns I and II, respectively). This is expected for the continuous measures of the relationship strength because they capture the relative importance of the relationship borrower vis-a-vis other borrowers for each bank. In columns III and IV we replicate the baseline regression by using data at the loan deal level and lead-arrangers only, respectively. The results remain qualitatively similar to those in our benchmark specification. In column V, we drop loans in which the lead arranger is one of the largest three U.S. banks (J.P. Morgan Chase, Bank of America, and Citigroup) based on the number of deals in which they participate. This analysis allows us to examine whether results are driven solely by the efficiency of the very large banks in originating large loan deals. In column VI we estimate the equation controlling for term loans (up until now we have controlled for the loan purpose, by using purpose fixed effects).

In column VII, we exclude loans originated for leveraged buyouts (LBOs) and mergers and acquisitions (M&As) because these loans reduce the asymmetric information between the bank and the borrowing firm (Ivashina and Kovner (2011)). However, the results are almost identical to those reported in the baseline specifications. In column VIII, we control for firm credit ratings as a measure of opaqueness and examine the effect of gender diversity on the loan spread. Finally, in column IX we exclude NBER recessions which equal one if the U.S. economy has been in a downturn as defined by the NBER's Business Cycle Dating Committee. Results are similar to the baseline specifications.

Finally, Table 12 provides further sensitivity tests using corporate governance controls. It could be argued that a firm obtains loans with a lower spread not because of female board participation, but due to better corporate governance quality. For example, Anderson et al. (2004) find that factors such as board independence, board size, and audit committee size reduce the cost of debt for a company. To reduce endogeneity concerns for omitted variable bias, we test the robustness of our baseline results of Table 4, utilizing various boardroom characteristics. To this end, we follow previous studies (e.g., Anderson et al.

(2004), Liu et al. (2014)) and control for *Board size*, *Board independence*, *Audit committee size*, *# Ind. NED with audit experience*, *Mean # of board directorships*, and *Mean board age*. Consistent with our previous results, we find that female directors' impact is still present and strong. More precisely, throughout all the specifications of Table 12 (see columns I-VIII), our estimations show a negative and statistically significant relationship at 1% and 5% between female participation on boards and the cost of loans.

7 Conclusion

Empirical investigation of firm performance has considered the effects of gender diversity producing seemingly mixed results. In this paper we have examined the effect of gender diversity on the cost of lending, paying special attention to relationship lending and the degree to which some firms face credit constraints from financial markets and financial intermediaries, which are relaxed less quickly than for other types of firms.

Our results based on matched firm-bank data in the US over the period 1999-2013 suggest that the sensitivity of loan spreads to gender diversity is significantly higher for independent female directors. Therefore, gender diversity has an impact through the reduction of information asymmetry and improvement of transparency, and could have operated alongside the relationship lending channel to exert an influence over the cost of lending. Yet, when we allow for the interaction between gender diversity and relationship lending, we show that the beneficial effect of gender diversity diminishes with relationship lending. Finally, we uncover significant firm-level heterogeneity since the loan spreads of small firms and those that face high volatility in their cash flows are most affected by changes in gender diversity. Our findings are of interest to policy makers who should take into account the response of firms to gender diversity when they contemplate policies that will make external finance for companies more readily available.

References

Adams, R. and Ferreira, D.: 2004, Diversity and incentives in teams: Evidence from corporate boards, *Technical report*.

Adams, R. and Ferreira, D.: 2009, Women in the boardroom and their impact on governance and performance, *Journal of Financial Economics* **94**, 291–309.

Ahern, K. and Dittmar, A.: 2012, The changing of the boards: The impact on firm valuation of mandated female board representation, *Quarterly Journal of Economics* **127**, 137–197.

Allen, F.: 1990, The market for information and the origin of financial intermediation, *Journal of Financial Intermediation* **1**(1), 3–30.

Almeida, H. and Campello, M.: 2010, Financing frictions and the substitution between internal and external funds, *Journal of Financial and Quantitative Analysis* **45**, 589–622.

Anderson, R., Mansi, S. and Reeb, D.: 2004, Board characteristics, accounting report integrity, and the cost of debt, *Journal of Accounting and Economics* **37**, 315–342.

Angbazo, L.A., Mei, J. and Saunders, A.: 1998, Credit spreads in the market for highly leveraged transaction loans, *Journal of Banking and Finance* **22**, 1249–1282.

Barber, B. and Odean, T.: 2001, Boys will be boys: gender, overconfidence, and common stock investment, *Quarterly Journal of Economics* **116**, 261–292.

Bear, S., Rahman, N. and Post, C.: 2010, The impact of board diversity and gender composition on corporate social responsibility and firm reputation, *Journal of Business Ethics* **97**, 207–221.

Bennouri, M., Chtioui, T., Nagati, H. and Nekhili, M.: 2018, Female board directorship and firm performance: what really matters?, *Journal of Banking and Finance* **88**, 267–291.

Berg, T., Saunders, A. and Steffen, S.: 2016, The total cost of corporate borrowing in the loan market: Don't ignore the fees, *The Journal of Finance* **71**(3), 1357–1392.

Bernanke, B. and Gertler, M.: 1995, Inside the black box: The credit channel of monetary policy transmission, *Journal of Economic Perspectives* **9**, 27–48.

Bharath, S. T., Dahiya, S., Saunders, A. and Srinivasan, A.: 2009, Lending relationships and loan contract terms, *The Review of Financial Studies* **24**(4), 1141–1203.

Bhojraj, S. and Sengupta, P.: 2003, Effects of corporate governance on bond ratings and yields: the role of institutional investors and outside directors, *Journal of Business* **76**, 455–475.

Bøhren, Ø. and Staubo, S.: 2014, Does mandatory gender balance work? Changing organizational form to avoid board upheaval, *Journal of Corporate Finance* **28**, 152–168.

Boone, C. and Hendriks, W.: 2009, Top management team diversity and firm performance: Moderators of functional-background and locus-of-control diversity, *Management Science* **55**, 165–180.

Boot, A.: 2000, Relationship banking: what do we know?, *Journal of Financial Intermediation* **9**, 7–25.

Boot, A. and Thakor, A.: 1994, Moral hazard and secured lending in an infinitely repeated credit market game, *International Economic Review* **35**, 899–920.

Bougheas, S., Mizen, P. and Yalcin, C.: 2006, Access to external finance: Theory and evidence on the impact of firm-specific characteristics, *Journal of Banking and Finance* **30**, 199–227.

Bradley, M. and Roberts, M.: 2015, The structure and pricing of corporate debt covenants, *Quarterly Journal of Finance* **5**, 1–37.

Byrnes, J., Miller, D. and Schafer, W.: 1999, Gender differences in risk taking: A meta-analysis, *Psychological Bulletin* **125**, 367–383.

Campello, M. and Chen, L.: 2010, Are financial constraints priced? Evidence from firm fundamentals and stock returns, *Journal of Money, Credit and Banking* **42**, 1185–1198.

Carey, M. and Nini, G.: 2007, Is the corporate loan market globally integrated? a pricing puzzle, *The Journal of Finance* **62**(6), 2969–3007.

Carter, D., Simkins, B. and Simpson, W.: 2003, Corporate governance, board diversity, and firm value, *Financial Review* **38**, 33–53.

Chava, S. and Roberts, M. R.: 2008, How does financing impact investment? the role of debt covenants, *The Journal of Finance* **63**(5), 2085–2121.

Chen, J., Leung, W. and Goergen, M.: 2016, The impact of board gender composition on dividend payouts, *Journal of Corporate Finance* **43**, 86–105.

Cheng, B., Ioannou, I. and Serafeim, G.: 2014, Corporate social responsibility and access to finance, *Strategic Management Journal* **35**, 1–23.

Conyon, M. and He, L.: 2017, Firm performance and boardroom gender diversity: A quantile regression approach, *Journal of Business Research* **79**, 198–211.

Cumming, D., Leung, T. and Rui, O.: 2015, Gender diversity and securities fraud, *Academy of Management Journal* **58**, 1572–1593.

Delis, M. D., Kokas, S. and Ongena, S.: 2017, Bank market power and firm performance, *Review of Finance* **21**(1), 299–326.

Denis, D.J.: 1990, Defensive changes in corporate payout policy: Share repurchases and special dividends, *The Journal of Finance* **45**(5), 1433–1456.

Dennis, S. A. and Mullineaux, D. J.: 2000, Syndicated loans, *Journal of Financial Intermediation* **9**(4), 404–426.

Diamond, D. W.: 1984, Financial intermediation and delegated monitoring, *The Review of Economic Studies* **51**(3), 393–414.

Fazzari, S., Hubbard, G. and Petersen, B.: 1988, Financing constraints and corporate investment, *Brookings Papers on Economic Activity* **2**, 141–195.

Francis, B., Hasan, I. and Wu, Q.: 2013, The impact of cfo gender on bank loan contracting, *Journal of Accounting, Auditing and Finance* **28**, 53–78.

Galbreath, J.: 2018, Is board gender diversity linked to financial performance? the mediating mechanism of CSR, *Business and Society* **57**, 863–889.

Galbreath, J. and Shum, P.: 2012, Do customer satisfaction and reputation mediate the CSR–FP link? evidence from Australia, *Australian Journal of Management* **37**, 211–229.

Gilbert, J. and Ivancevich, J.: 2000, Valuing diversity: a tale of two organizations, *The Academy of Management Executive* **14**, 93–105.

Gilchrist, S., Yankov, V. and Zakrajsek, E.: 2009, Credit market shocks and economic fluctuations: Evidence from corporate bond and stock markets., *Journal of Monetary Economics* **56**, 471–493.

Greenbaum, S. I., Kanatas, G. and Venezia, I.: 1989, Equilibrium loan pricing under the bank-client relationship, *Journal of Banking & Finance* **13**(2), 221–235.

Gul, F., Srinidhi, B. and Ng, A.: 2011, Does board gender diversity improve the informativeness of stock prices?, *Journal of Accounting and Economics* **51**, 314–338.

Güntay, L. and Hackbarth, D.: 2010, Corporate bond credit spreads and forecast dispersion, *Journal of Banking and Finance* **34**, 2328–2345.

Hale, G. and Santos, J.: 2008, The decision to first enter the public bond market: The role of reputation, funding choices, and bank relationships, *Journal of Banking and Finance* **32**, 1928–1940.

Hermalin, B. and Weisbach, M.: 1998, Endogenously chosen boards of directors and their monitoring of the ceo, *The American Economic Review* **88**, 96–118.

Hermalin, B. and Weisbach, M.: 2003, Boards of directors as an endogenously determined institution: A survey of the economic literature, *Economic Policy Review* **9**, 7–26.

Hillman, A., Shropshire, C. and Cannella, A.: 2007, Organizational predictors of women on corporate boards, *Academy of Management Journal* **50**, 941–952.

Hinz, R., McCarthy, D. and Turner, J.: 1997, Positioning pensions for the twenty-first century, *in* M. Gordon, O. Mitchell and M. Twinney (eds), *Are Women Conservative Investors? Gender Differences in Participant-directed Pension Investments*, University of Pennsylvania Press, Philadelphia, PA.

Ivashina, V. and Kovner, A.: 2011, The private equity advantage: Leveraged buyout firms and relationship banking, *The Review of Financial Studies* **24**(7), 2462–2498.

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

Jiménez, G., Ongena, S., Peydró, J.-L. and 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., Stein, J. and Wilcox, D.: 1993, Monetary policy and credit conditions: Evidence from the composition of external finance, *American Economic Review* **83**, 78–98.

Khwaja, A. I. and Mian, A.: 2005, Do lenders favor politically connected firms? rent provision in an emerging financial market, *The Quarterly Journal of Economics* **120**(4), 1371–1411.

Klein, A.: 2002, Audit committee, board of director characteristics, and earnings management, *Journal of ccounting and conomics* **33**(3), 375–400.

Lim, J., Minton, B. A. and Weisbach, M. S.: 2014, Syndicated loan spreads and the composition of the syndicate, *Journal of Financial Economics* **111**(1), 45–69.

Liu, Y., Wei, Z. and Xie, F.: 2014, Do women directors improve firm performance in china?, *Journal of Corporate Finance* **28**, 169–184.

L.Paige-Fields, Fraser, D. and Subrahmanyam, A.: 2012, Board quality and the cost of debt capital: The case of bank loans, *Journal of Banking and Finance* **36**, 1536–1547.

Mannix, E. and Neale, M.: 2005, What differences make a difference?, *Psychological Science in the Public Interest* **6**, 31–55.

Matsa, D. and Miller, A.: 2013, A female style in corporate leadership? evidence from quotas, *American Economic Journal: Applied Economics* **5**, 136–169.

Minnick, C. and Noga, T.: 2010, Do corporate governance characteristics influence tax management?, *Journal of Corporate Finance* **16**, 703–718.

Murfin, J.: 2012, The supply-side determinants of loan contract strictness, *The Journal of Finance* **67**(5), 1565–1601.

Pandey, R., Biswas, P., Ali, M. and Mansi, M.: 2019, Female directors on the board and cost of debt: evidence from australia, *forthcoming in Accounting and Finance* .

Pérez-Martín, A., Pérez-Torregrosa, A. and Vaca, M.: 2018, Big data techniques to measure credit banking risk in home equity loans, *Journal of Business Research* **89**, 448–454.

Ray, D.: 2005, Corporate boards and corporate democracy, *Journal of Corporate Citizenship* **20**, 93–105.

Roberts, M. R.: 2015, The role of dynamic renegotiation and asymmetric information in financial contracting, *Journal of Financial Economics* **116**(1), 61–81.

Santos, J. and Winton, A.: 2008, Bank loans, bonds, and information monopolies across the business cycle, *The Journal of Finance* **63**, 1315–1359.

Santos, J.: 2011, Bank corporate loan pricing following the subprime crisis, *Review of Financial Studies* **24**, 1916–1943.

Sila, V., Gonzalez, A. and Hagendorff, J.: 2016, Women on board: Does boardroom gender diversity affect firm risk?, *Journal of Corporate Finance* **36**, 26–53.

Simpson, W., Carter, D. and D'Souza, D.: 2010, What do we know about women on boards?, *Journal of Applied Finance* **20**, 27–39.

Sufi, A.: 2007, Information asymmetry and financing arrangements: Evidence from syndicated loans, *The Journal of Finance* **62**(2), 629–668.

Tanaka, T.: 2014, Gender diversity in the boards and the pricing of publicly traded corporate debt: evidence from japan, *Applied Financial Economics* **24**, 247–258.

Terjesen, S., Sealy, R. and Singh, V.: 2009, Women directors on corporate boards: A review and research agenda, *Corporate Governance: An International Review* **17**, 320–337.

Usman, M., Farooq, M., Zhang, J., Makki, M. and Khan, M.: 2019, Female directors and the cost of debt: does gender diversity in the boardroom matter to lenders?, *Managerial Auditing Journal* **34**, 374–392.

Whited, T. and Wu, G.: 2006, Financial constraints risk, *Review of Financial Studies* **19**, 531–539.

Winton, A.: 1995, Delegated monitoring and bank structure in a finite economy, *Journal of Financial Intermediation* **4**(2), 158–187.

Wood, D.: 2010, Measuring corporate social performance: A review, *International Journal of Management* **12**, 50–84.

8 Tables

Table 1: Variable definitions and sources

A. Dependent variables		
AISD	All-in-spread-drawn (bps), defined as the sum of the spread over LIBOR plus the facility fee.	DealScan
AISU	All-in-spread-undrawn (bps), defined as the sum of the facility fee and the commitment fee.	DealScan
Commitment fee	Commitment fee (bps) paid on the unused amount of loan commitments.	DealScan
Letter-of-credit fee	Fee (bps) paid on drawn amounts on the letter-of-credit sublimit.	DealScan
Facility amount	The loan (facility) amount in M$ weighted by the bank's share.	DealScan
Fixed charge coverage	Firm's ability to pay its fixed charge obligations (expenses) from its income before interest and taxes.	DealScan
Financial covenants	The total number of g financial covenants in the loan contract.	DealScan
Performance pricing	Dummy variable equal to 1 if the loan has performance pricing provisions, 0 otherwise.	Dealscan
B. Main Explanatory variables		
# female on BD	The number of total female directors in the board.	Boardex
% female on BD	The fraction of the female directors in the board.	Boardex
# ED female on BD	The number of executive (internal) female directors in the board.	
% ED female on BD	The fraction of executive (internal) female directors in the board.	Boardex
# SD female on BD	The number of non-executive (external) female directors in the board.	Boardex
% SD female on BD	The fraction of non-executive (external) female directors in the board.	Boardex
# indep. NED female on BD	The number of independent non-executive (external) female directors in the board.	Boardex
% indep. NED female on BD	The fraction of independent non-executive (external) female directors in the board.	Boardex
High_female	Dummy variable equal to 1 if the board of directors has at least 1 female director, 0 otherwise.	Boardex
C. Control variables		
Relationship dummy	Dummy equal to 1 if the bank lent to the same borrower in the five years before the current loan, 0 o/w.	Own calculation

Relationship number	The number of loans that the bank lent to the same borrower in the past five years over the total number of loans that bank lent to the total number of borrowers.	Own calculation
Relationship amount	The amount ($M) of loans that the bank lent to the same borrower in the past five years over the total amount ($M) of loans of loans that bank lent to the total number of borrowers.	Own calculation
Covenant dummy	Dummy equal to 1 if the loan has covenants, 0 o/w.	DealScan
Maturity	Loan duration in months.	DealScan
LBO and M&A's	Dummy equal to 1 if the loan's primary purpose is for Leverage BuyOut or Merger and Acquisitions.	DealScan
Term loan	Dummy equal to 1 if the loan is a term loan, 0 o/w. A loan is a term loan if a firm borrows a certain amount for a certain length of time.	DealScan
Firm size	The natural logarithm of total assets.	Compustat
NYSE	Dummy equal to 1 if the firm is listed in the New York stock exchange, 0 o/w.	Compustat
Profitability	The ratio of pre-tax profits to total assets.	Compustat
Tobin's Q	The natural logarithm of market-to-book value.	Compustat
Company rating	Company S&P credit rating	DealScan
Board size	The total number of directors in a board	Boardex
Audit committee size	The number of directors who participate in audit committee	Boardex
# Ind. NED with audit experience	The number of independent non-executive (external) directors with functional audit experience in the board.	Boardex
Mean # of board directorships	The mean number of directorships held by the directors of a board.	Boardex
Mean board age	The mean age of the directors in a board.	Boardex
Bank size	The natural logarithm of total assets.	Call Reports
Lead bank	Dummy equal to 1 if the bank is acting as a mandated arranger, arranger, lead manager or agent, 0 o/w.	DealScan
Top 3 banks	Dummy equal to 1 if lead arranger is one of the top 3 arrangers, namely Bank of America, Citigroup, or JPMorgan Chase, 0 o/w.	DealScan
Collateral		
Refinancing		
General covenant intensity		
Financial covenants intensity		
Bank dependent financing dummy		
Corporate purpose		
Debt repayment		

CP backup

D. Instrumental variables		
Retired director	The number of (males-females-total: we need to check which one was used) directors per firm and year who reached the age of 67 (i.e., the retirement age in USA)	BoardEx

Table 2: Summary statistics

Panel A: Descriptive statistics

Variables	Obs	Mean	Std	Min	Max
AISD	53,302	145.587	117.326	0.000	1405
AISU	53,302	17.280	19.555	0.000	305
Commitment fee	53,302	13.009	20.035	0.000	250
Letter-of-credit fee	53,302	54.765	92.795	0.000	713
# female on BD	53,302	1.202	1.037	0.000	7.000
% female on BD	53,302	0.113	0.093	0.000	0.625
# ED female on BD	53,302	0.053	0.228	0.000	2.000
% ED female on BD	53,302	0.005	0.024	0.000	0.400
# SD female on BD	53,302	1.149	1.014	0.000	6.000
% SD female on BD	53,302	0.108	0.090	0.000	0.545
# indep. NED female on BD	53,302	1.019	0.969	0.000	6.000
% indep. NED female on BD	53,302	0.096	0.087	0.000	0.545
Facility amount	53,302	57.369	148.188	0.000	12,250
Fixed charge coverage	53,302	0.198	0.399	0.000	1.000
Financial covenants	53,302	1.538	1.318	0.000	7.000
Performance pricing provision	53,302	0.577	0.494	0.000	1.000
Relationship dummy	53,302	0.517	0.500	0.000	1.000
Relationship number	53,302	0.080	0.237	0.000	1.000
o Relationship amount	53,302	0.059	0.212	0.000	1.000
Covenant dummy	53,302	0.491	0.500	0.000	1.000
Maturity	53,302	46.832	21.300	-0.033	240
LBO and M&A's	53,302	0.150	0.357	0.000	1.000
Term loan	53,302	0.193	0.395	0.000	1.000
Firm size	53,302	8.232	1.741	0.855	14.608
NYSE	53,302	0.766	0.423	0.000	1.000
Profitability	53,302	0.135	0.088	-1.691	0.897
Tobin's Q	53,302	1.696	0.958	0.478	16.970
Company rating	53,302	13.178	6.524	1.000	23.000
Board size	53,302	10.008	2.794	2.000	33.000
Audit committee size	53,267	3.993	1.092	0.000	11.000
# Ind. NED with audit experience	53,267	0.539	0.706	0.000	4.000
Mean board age	53,274	60.064	3.957	41.750	76.750
Mean # of board directorships	53,289	3.240	1.271	1.000	10.571
Bank size	53,302	18.743	2.068	4.927	21.605
Lead bank	53,302	0.278	0.448	0.000	1.000
Top 3 banks	53,302	0.281	0.450	0.000	1.000
NBER recessions	53,302	0.113	0.316	0.000	1.000
Collateral	53,302	0.319	0.466	0.000	1.000
Refinancing	53,302	0.817	0.387	0.000	1.000
General covenant intensity	53,302	2.980	2.749	0.000	9.000
Financial covenants intensity	53,302	1.538	1.318	0.000	7.000
Bank dependent financing dummy	53,302	0.195	0.396	0.000	1.000
The number of retired directors	53,302	0.027	0.164	0.000	2.000
Corporate purpose	53,302	0.485	0.500	0.000	1.000
Debt repayment	53,302	0.038	0.191	0.000	1.000
CP backup	53,302	0.102	0.302	0.000	1.000

Panel B: Univariate analysis

	Boards without female directors	Boards with female directors	Differences	
Variable	Mean	Mean	Mean	Significance
AISD	183.458	130.630	52.827	***
AISU	20.840	15.874	4.966	***
Commitment fee	18.603	10.800	7.802	***
Letter of credit fee	76.935	46.010	30.924	***
Firm size	7.174	8.650	-1.476	***
NYSE	0.591	0.835	-0.244	***
Profitability	0.137	0.134	0.003	***
Company rating	16.604	11.826	4.778	***

The table reports summary statistics. Panel A reports summary statistics for the variables used in the empirical analysis. All variables are defined in Table 1. Panel B reports differences of the various dependent variables used in this study between boards without female directors and boards with female directors. Stars, ***, **, and *, indicate significance levels at the 1%, 5%, and 10%, respectively.

Table 3: Cost of lending and gender diversity

	I	II	III	IV	V	VI	VII	VIII
	# female on BD	% female on BD	# ED female on BD	% ED female on BD	# SD female on BD	% SD female on BD	# indep. NED female on BD	% indep. NED female on BD
Female variable	-2.847***	-20.790***	1.580	18.917	-3.076***	-23.792***	-4.704***	-40.493***
	(-4.414)	(-3.240)	(0.720)	(0.888)	(-4.665)	(-3.578)	(-7.276)	(-5.906)
Relationship dummy	-4.271***	-4.225***	-4.222***	-4.222***	-4.259***	-4.215***	-4.248***	-4.199***
	(-4.008)	(-3.980)	(-3.984)	(-3.983)	(-3.998)	(-3.970)	(-3.983)	(-3.947)
Covenant dummy	25.129***	25.248***	25.332***	25.333***	25.096***	25.226***	24.911***	25.077***
	(15.866)	(15.924)	(15.989)	(15.991)	(15.853)	(15.914)	(15.791)	(15.864)
Maturity	0.364***	0.367***	0.368***	0.368***	0.363***	0.366***	0.361***	0.365***
	(10.160)	(10.234)	(10.258)	(10.249)	(10.142)	(10.215)	(10.104)	(10.201)
Firm size	-19.338***	-19.749***	-20.057***	-20.046***	-19.280***	-19.691***	-18.935***	-19.451***
	(-29.149)	(-30.812)	(-31.577)	(-31.527)	(-29.002)	(-30.639)	(-28.737)	(-30.431)
NYSE	-7.899***	-7.985***	-8.380***	-8.379***	-7.903***	-7.955***	-7.715***	-7.711***
	(-4.656)	(-4.709)	(-4.908)	(-4.904)	(-4.656)	(-4.693)	(-4.535)	(-4.529)
Profitability	-190.440***	-190.905***	-191.113***	-191.011***	-190.100***	-190.549***	-189.291***	-189.899***
	(-13.599)	(-13.614)	(-13.590)	(-13.584)	(-13.560)	(-13.573)	(-13.527)	(-13.546)
Tobin's Q	-11.411***	-11.448***	-11.515***	-11.520***	-11.423***	-11.460***	-11.337***	-11.372***
	(-10.482)	(-10.502)	(-10.525)	(-10.529)	(-10.487)	(-10.503)	(-10.438)	(-10.454)
Bank size	1.440	1.453	1.489	1.494	1.453	1.465	1.410	1.423
	(0.820)	(0.826)	(0.850)	(0.853)	(0.827)	(0.833)	(0.802)	(0.807)
Observations	53,062	53,062	53,062	53,062	53,062	53,062	53,062	53,062
Adjusted R-squared	0.471	0.471	0.470	0.470	0.471	0.471	0.471	0.471
F-stat	283	283.3	282.9	283.5	283.2	282.8	283.8	283.5
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Purpose FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999-2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 4: Cost of lending and gender diversity with time varying fixed effects

	I	II	III	IV	V	VI	VII	VIII
	# female on BD	% female on BD	# ED female on BD	% ED female on BD	# SD female on BD	% SD female on BD	# indep. NED female on BD	% indep. NED female on BD
Female variable	-4.643***	-34.743***	-2.938	-19.716	-4.608***	-34.988***	-6.137***	-52.365***
	(-6.477)	(-4.831)	(-1.253)	(-0.858)	(-6.306)	(-4.680)	(-8.502)	(-6.865)
Relationship dummy	-11.712***	-11.670***	-11.710***	-11.705***	-11.696***	-11.661***	-11.657***	-11.627***
	(-10.096)	(-10.089)	(-10.145)	(-10.137)	(-10.076)	(-10.077)	(-10.020)	(-10.021)
Observations	52,749	52,749	52,749	52,749	52,749	52,749	52,749	52,749
Adjusted R-squared	0.431	0.430	0.430	0.430	0.431	0.430	0.431	0.431
F-stat	355.9	355.4	353.8	355.2	355.7	354.5	357.4	357.9
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999-2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 5: Fees and lender diversity

	I	II	III	IV	V	VI
Dependent variable	AISU	Commitment fee	Letter of credit fee	AISU	Commitment fee	Letter of credit fee
# female on BD	-0.559***	-1.108***	-1.073**			
	(-6.107)	(-11.864)	(-2.214)			
% female on BD				-4.377***	-9.795***	-9.572*
				(-4.271)	(-9.604)	(-1.776)
Relationship dummy	-0.320*	-0.868***	-8.254***	-0.312*	-0.854***	-8.241***
	(-1.737)	(-5.100)	(-9.113)	(-1.697)	(-4.999)	(-9.086)
Observations	52,914	52,914	52,914	52,914	52,914	52,914
Adjusted R-squared	0.139	0.174	0.208	0.139	0.174	0.208
F-stat	258.7	250.8	312.4	259.7	253.1	313
Loan controls	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999 to 2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 6: Gender diversity and relationship lending

	I	II	III	IV	V	VI	VII	VIII
	# female on BD	% female on BD	# ED female on BD	% ED female on BD	# SD female on BD	% SD female on BD	# indep. NED female on BD	% indep. NED female on BD
Female variable	-5.681***	-46.333***	-25.954	38.644	-6.046***	-52.140***	-8.165***	-75.830***
	(-5.603)	(-4.398)	(-1.292)	(1.237)	(-5.827)	(-4.747)	(-7.797)	(-6.796)
Relationship * Female variable	2.027**	22.791*	-1.310	-119.593***	2.784***	33.216***	3.909***	45.154***
	(2.032)	(1.948)	(-0.059)	(-2.833)	(2.706)	(2.690)	(3.637)	(3.573)
Relationship dummy	-14.182***	-14.281***	-4.261***	-11.078***	-14.946***	-15.291***	-15.693***	-15.997***
	(-7.219)	(-7.030)	(-4.038)	(-9.530)	(-7.608)	(-7.442)	(-8.253)	(-8.136)
Margin effect (Female)	-4.632***	-34.543***	-26.632	-23.224	-4.606***	-34.957***	-6.143***	-52.471***
	(-6.472)	(-4.822)	(-1.051)	(-1.025)	(-6.300)	(-4.681)	(-8.507)	(-6.896)
Observations	52,749	52,749	52,745	52,749	52,749	52,749	52,749	52,749
Adjusted R-squared	0.431	0.430	0.480	0.430	0.431	0.431	0.432	0.431
F-stat	320.9	320.7	241	323.3	321.1	320.8	322.9	323.9
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999-2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 7: Cost of lending and gender diversity for bank dependent borrowers

	I	II	III	IV	V	VI	VII	VIII
	# female on BD	% female on BD	# ED female on BD	% ED female on BD	# SD female on BD	% SD female on BD	# indep. NED female on BD	% indep. NED female on BD
Female variable	-7.733***	-70.638**	17.261	97.661	-9.034***	-84.039***	-13.851***	-110.754***
	(-2.762)	(-2.527)	(1.203)	(1.237)	(-3.182)	(-2.902)	(-4.977)	(-3.824)
Relationship * Female variable	6.204**	68.863**	-28.690*	-200.202	7.954***	89.463***	7.410**	75.476**
	(2.113)	(2.186)	(-1.752)	(-1.345)	(2.704)	(2.789)	(2.371)	(2.246)
Relationship dummy	-16.570***	-17.324***	-9.328***	-9.611***	-17.825***	-18.836***	-16.794***	-16.838***
	(-4.469)	(-4.437)	(-3.296)	(-3.385)	(-4.929)	(-4.932)	(-4.817)	(-4.641)
Margin effect (Female)	-5.076**	-41.146*	4.973	11.919	-5.628**	-45.724**	-10.678***	-78.429***
	(-2.286)	(-1.945)	(0.661)	(0.190)	(-(-2.427)	(-2.018)	(-4.583)	(-3.375)
Observations	10,171	10,171	10,171	10,171	10,171	10,171	10,171	10,171
Adjusted R-squared	0.406	0.406	0.406	0.405	0.407	0.407	0.409	0.407
F-stat	37.52	37.34	40.75	40.12	39.69	39.57	39.82	38.55
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999-2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 8: Gender diversity and loan purpose

	I	II	III	IV	V	VI
	Corporate purpose		Back up		Debt repayment	
	#female	%female	#female	%female	#female	%female
Female variable	-6.382***	-49.308***	-5.393***	-40.088***	-4.974***	-35.989***
	(-6.990)	(-5.052)	(-7.240)	(-5.471)	(-7.104)	(-5.028)
Relationship dummy	-10.788***	-11.073***	-11.566***	-10.787***	-11.036***	-11.540***
	(-9.369)	(-9.649)	(-10.030)	(-9.403)	(-9.646)	(-10.034)
Corporate purpose	-16.098***	-15.363***				
	(-6.882)	(-6.499)				
Corporate purpose * Female variable	3.782***	33.616***				
	(3.598)	(2.793)				
CP backup			-45.657***	-42.417***		
			(-20.038)	(-17.896)		
CP backup * Female variable			6.653***	56.280***		
			(6.518)	(4.133)		
Debt repayment					19.385***	23.585***
					(5.710)	(6.857)
Debt repayment * Female variable					10.591***	62.506**
					(3.253)	(1.968)
Margin Effect (Female)	-4.549***	-33.017***	-4.716***	-34.363***	-4.571***	-33.609***
	(-6.275)	(-4.561)	(-6.694)	(-4.905)	(-6.555)	(-4.758)
Observations	52,749	52,749	52,749	52,749	52,749	52,749
Adjusted R-squared	0.433	0.432	0.436	0.436	0.433	0.432
F-stat	314.9	311.9	356.8	356.5	319.9	320.7
Loan controls	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Bank*Year FE	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999-2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 9: Cost of lending and gender diversity: 2SLS model

	I	II	III	IV	V	VI
	Panel A: First-stage results					
Retired director	0.540***	0.427***	0.299***	0.046***	0.033***	0.024***
	(14.724)	(12.180)	(8.462)	(12.802)	(11.296)	(7.541)
F-stat	633.4	627.5	449.2	307.7	358.2	276.5
	Panel B: Second-stage results					
# female on BD	-19.272***	-29.329***	-28.601**			
	(-3.657)	(-3.339)	(-2.556)			
% female on BD				-225.695***	-375.035***	-357.610**
				(-3.564)	(-3.184)	(-2.453)
Relationship dummy	-13.302***	-11.182***	-15.467***	-13.110***	-10.770***	-14.976***
	(-10.902)	(-8.089)	(-10.396)	(-10.564)	(-7.640)	(-9.751)
Covenant dummy	28.723***	23.967***	16.624***	29.308***	24.386***	16.946***
	(16.720)	(11.582)	(8.280)	(17.066)	(11.877)	(8.534)
Maturity	0.643***	0.489***	-0.062	0.658***	0.501***	-0.037
	(16.182)	(10.995)	(-1.030)	(16.396)	(11.402)	(-0.644)
Firm size	-15.242***	-14.276***	-14.357***	-16.810***	-16.090***	-16.322***
	(-10.891)	(-6.133)	(-5.176)	(-15.956)	(-8.452)	(-7.598)
NYSE	-10.154***	-9.113***	-8.564***	-9.177***	-6.767**	-6.777*
	(-4.490)	(-3.600)	(-2.830)	(-3.707)	(-2.135)	(-1.837)
Profitability	-134.707***	-199.338***	-176.640***	-135.671***	-202.133***	-178.832***
	(-10.252)	(-10.546)	(-10.785)	(-10.391)	(-10.702)	(-10.968)
Tobin's Q	-13.316***	-9.588***	-16.404***	-13.083***	-9.405***	-16.501***
	(-13.641)	(-6.754)	(-10.333)	(-13.145)	(-6.459)	(-10.255)
Bank size		0.028	52.155***		0.139	54.730***
		(0.097)	(10.147)		(0.465)	(9.641)
Observations	52,914	53,008	51,091	52,914	53,008	51,091
Adjusted R-squared	0.359	0.514	0.385	0.351	0.496	0.370
F-stat	432.8	454.5	211.7	418.9	446.9	207.2
P-value for under identification	0.000	0.000	0.000	0.000	0.000	0.000
F-stat for weak identification	216.8	148.3	71.60	163.9	127.6	56.86
Bank*Year FE	Y	N	N	Y	N	N
Industry*Year FE	N	Y	N	N	Y	N
Bank*Industry FE	N	N	Y	N	N	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999 to 2013. The first stage regressions are given in Panel A and the dependent variable is *# female on BD* and *% female on BD* in columns I-III and IV-VI, respectively. Under identification: H_0: Under-identified; Weak identification: H_0: Weakly-identified. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 10: Non pricing characteristics and gender diversity

	I	II	III	IV
Dependent variable	Facility amount	Fixed charge coverage	Financial covenants	Performance pricing
# female on BD	2.806***	-0.006**	-0.038***	0.015***
	(2.733)	(-2.577)	(-5.385)	(5.113)
Relationship dummy	-9.125***	0.016***	-0.006	-0.039***
	(-3.928)	(4.036)	(-0.522)	(-5.504)
Observations	52,749	52,749	52,749	52,914
Adjusted R-squared	0.132	0.345	0.529	0.232
F-stat	32.02	277	574.1	299
Loan controls	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The dependent variable is noted in the first row. The sample consists of loan-bank-firm observations from 1999 to 2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 11: Sensitivity analysis

	I	II	III	IV	V	VI	VII	VIII	IX
	Relationship number	Relationship amount	Deal level	Lead -only	Exclude TOP3	Term loan	Exclude LBO and M&A's loan	Credit Rating	Exclude NBER recessions
# female on BD	-4.316***	-4.311***	-4.929***	-5.600***	-3.356***	-3.703***	-4.498***	-3.872***	-3.156***
	(-6.954)	(-6.945)	(-7.638)	(-4.653)	(-3.802)	(-5.708)	(-6.107)	(-5.488)	(-4.674)
Relationship dummy			-8.475***	-11.284***	-11.309***	-9.645***	-8.655***	-10.923***	-3.655***
			(-7.863)	(-4.165)	(-8.227)	(-8.931)	(-6.968)	(-9.673)	(-3.354)
Relationship number	-8.048**								
	(-2.478)								
Relationship amount		-11.859***							
		(-3.649)							
Term loan						64.243***			
						(33.333)			
Credit rating								2.461***	
								(12.778)	
Observations	52,914	52,914	39,495	14,667	34,849	52,749	44,766	52,749	47,091
Adjusted R-squared	0.369	0.369	0.428	0.341	0.454	0.470	0.413	0.438	0.474
F-stat	417.2	406.9	392.2	129.2	210.9	397.6	270.4	328.5	271.7
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999 to 2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table 12: Cost of lending and gender diversity controlling for boardroom characteristics

	I	II	III	IV	V	VI	VII	VIII
	# female on BD	% female on BD	# ED female on BD	% ED female on BD	# SD female on BD	% SD female on BD	# indep. NED female on BD	% indep. NED female on BD
Female variable	-1.618**	-19.212***	1.787	15.803	-1.835***	-21.838***	-3.750***	-39.127***
	(-2.358)	(-2.878)	(0.817)	(0.744)	(-2.628)	(-3.198)	(-5.475)	(-5.543)
Relationship dummy	-4.335***	-4.328***	-4.335***	-4.337***	-4.324***	-4.315***	-4.285***	-4.285***
	(-4.083)	(-4.076)	(-4.085)	(-4.086)	(-4.075)	(-4.066)	(-4.031)	(-4.029)
Covenant dummy	24.564***	24.558***	24.622***	24.627***	24.547***	24.543***	24.400***	24.406***
	(15.822)	(15.823)	(15.880)	(15.881)	(15.814)	(15.818)	(15.761)	(15.772)
Maturity	0.342***	0.343***	0.344***	0.344***	0.342***	0.342***	0.340***	0.341***
	(9.620)	(9.634)	(9.671)	(9.666)	(9.612)	(9.618)	(9.568)	(9.600)
Firm size	-18.931***	-18.907***	-19.146***	-19.142***	-18.908***	-18.875***	-18.665***	-18.676***
	(-25.655)	(-25.654)	(-26.219)	(-26.215)	(-25.643)	(-25.604)	(-25.439)	(-25.504)
NYSE	-7.349***	-7.228***	-7.595***	-7.589***	-7.348***	-7.211***	-7.154***	-6.969***
	(-4.362)	(-4.293)	(-4.486)	(-4.479)	(-4.359)	(-4.285)	(-4.235)	(-4.124)
Profitability	-185.701***	-185.768***	-186.008***	-185.967***	-185.480***	-185.442***	-184.609***	-184.728***
	(-13.325)	(-13.336)	(-13.322)	(-13.324)	(-13.300)	(-13.297)	(-13.262)	(-13.264)
Tobin's Q	-11.898***	-11.895***	-11.928***	-11.930***	-11.906***	-11.910***	-11.858***	-11.850***
	(-10.733)	(-10.733)	(-10.720)	(-10.724)	(-10.736)	(-10.736)	(-10.724)	(-10.714)
Bank size	1.294	1.305	1.335	1.336	1.299	1.316	1.253	1.278
	(0.738)	(0.744)	(0.763)	(0.764)	(0.741)	(0.749)	(0.714)	(0.727)
Board size	-0.921***	-1.087***	-1.118***	-1.112***	-0.898***	-1.080***	-0.734***	-1.063***
	(-3.324)	(-4.014)	(-4.126)	(-4.098)	(-3.225)	(-3.985)	(-2.641)	(-3.917)
Audit committee size	-3.259***	-3.255***	-3.389***	-3.388***	-3.243***	-3.237***	-3.091***	3.122***-
	(-6.235)	(-6.234)	(-6.441)	(-6.439)	(-6.216)	(-6.209)	(-5.896)	(-5.962)
# Ind. NED with audit experience	-1.521**	-1.498**	-1.618**	-1.617**	-1.519**	-1.494**	-1.393*	-1.377*
	(-2.098)	(-2.064)	(-2.244)	(-2.242)	(-2.099)	(-2.063)	(-1.926)	(-1902)
Mean # of board directorships	2.878***	2.873***	2.846***	2.845***	2.898***	2.896***	2.966***	2.956***
	(5.720)	(5.722)	(5.663)	(5.669)	(5.747)	(5.763)	(5.879)	(5.874)
Mean board age	-1.051***	-1.057***	-1.003***	-1.003***	-1.051***	-1.057***	-1.089***	-1.089***
	(-6.075)	(-6.143)	(-5.989)	(-5.985)	(-6.105)	(-6.173)	(-6.367)	(-6.387)
Observations	52,987	52,987	52,987	52,987	52,987	52,987	52,987	52,987
Adjusted R-squared	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473
F-stat	200.6	200.3	197.6	197.7	200	199.6	198.9	199.5
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Purpose FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999 to 2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Appendix

Table A1: Correlogram

	AISD	AISU	ComFee	LOCF	#Fem	%Fem	#EDF	%EDF	#SDF	%SDF	#INEDF	%INEDF	Rel/ship	Covenant	Mat/ty	FirmSize	NYSE	Prof/ty	Q	BankSize
AISD	1.000																			
AISU	0.333*	1.000																		
ComFee	0.362*	0.836*	1.000																	
LOCF	0.283*	0.591*	0.580*	1.000																
#Fem	-0.214*	-0.120*	-0.171*	-0.150*	1.000															
%Fem	-0.143*	-0.085*	-0.124*	-0.105*	0.931*	1.000														
#EDF	-0.006	-0.004	-0.003	0.008	0.210*	0.237*	1.000													
%EDF	0.014*	0.009	0.015*	0.022*	0.181*	0.238*	0.965*	1.000												
#SDF	-0.218*	-0.122	-0.174*	-0.155*	0.976*	0.898*	-0.010	-0.032*	1.000											
%SDF	-0.151*	-0.090*	-0.131*	-0.114*	0.909*	0.966*	-0.013*	-0.022*	0.933*	1.000										
#INEDF	-0.213*	-0.118*	-0.168*	-0.145*	0.904*	0.832*	-0.024*	-0.041*	0.930*	0.867*	1.000									
%INEDF	-0.153*	-0.087*	-0.127	-0.105*	0.836*	0.885*	-0.026*	-0.032*	0.860*	0.920*	0.939*	1.000								
Rel/ship	-0.116*	-0.043*	-0.053*	-0.081*	0.053*	0.045*	-0.010	-0.012*	0.057*	0.050*	0.064*	0.057*	1.000							
Covenant	0.213*	0.221*	0.0236*	0.375*	-0.220*	-0.151*	0.020*	0.034*	-0.230*	-0.165*	-0.228*	-0.170*	-0.029*	1.000						
Mat/ty	0.200*	0.031*	0.103*	0.110*	-0.138*	-0.070*	-0.015*	0.003	-0.138*	-0.072*	-0.105*	-0.044*	-0.038*	0.219*	1.000					
FirmSize	-0.347*	-0.172*	-0.233*	-0.246*	0.475*	0.322*	0.014*	-0.031*	0.483*	0.339*	0.460*	0.326*	0.114*	-0.351*	-0.237*	1.000				
NYSE	-0.229*	-0.057*	-0.132*	-0.116*	0.269*	0.211*	0.004	-0.021*	0.274*	0.223*	0.259*	0.213*	0.083*	-0.112*	-0.121*	0.4407*	1.000			
Prof/ty	-0.126*	-0.063*	-0.062*	-0.029*	-0.038*	-0.007	0.020*	0.019*	-0.043*	-0.012*	-0.038*	-0.007	0.013*	0.035*	0.052*	-0.210*	-0.036*	1.000		
Q	-0.158*	-0.103*	-0.089*	-0.070*	-0.029*	-0.008	0.050*	0.053*	-0.041*	-0.015*	-0.034*	-0.007	0.004	0.005	-0.004	-0.192*	-0.103*	0.563*	1.000	
BankSize	-0.023*	-0.051*	-0.045*	-0.056*	0.077*	0.077*	0.005	0.001	0.077*	0.079*	0.083*	0.083*	0.037*	-0.081*	0.012*	0.102*	0.036*	-0.004	0.009	1.000

The table reports Pearson correlations.For exposition brevity *ComFee* is commitment fee, *LOCF* is the Letter-of-credit fee,*#EDF* is the # ED female on BD, *%EDF* is the % ED female on BD, *#SDF* is the # SD female on BD, *%SDF* is the % SD female on BD, *#INEDF* is the # indep. NED female on BD, *%INEDF* is the % indep. NED female on BD, *Rel/ship* is the Relationship dummy, *Covenant* is the Covenant dummy, *Mat/ty* is the Maturity, *NYSE* is the NYSE Dummy, *Prof/ty* is the Profitability, *FMTB* is the Tobin's Q,. The * mark denote the statistical significance at the 1% level.

Table A2: Baseline with time invariant fixed effects

	I	II	III	IV	V	VI
# female on BD	-4.521***	-3.321***	-2.847***			
	(-7.496)	(-6.042)	(-4.414)			
% female on BD				-32.307***	-24.259***	-20.790***
				(-5.332)	(-4.394)	(-3.240)
Relationship dummy	-13.856***	-5.853***	-4.271***	-13.787***	-5.784***	-4.225***
	(-11.306)	(-5.282)	(-4.008)	(-11.269)	(-5.227)	(-3.980)
Covenant dummy	30.210***	28.120***	25.129***	30.482***	28.300***	25.248***
	(17.587)	(17.999)	(15.866)	(17.758)	(18.150)	(15.924)
Maturity (months)	0.727***	0.488***	0.364***	0.733***	0.491***	0.367***
	(17.497)	(12.689)	(10.160)	(17.649)	(12.773)	(10.234)
Firm size	-18.926***	-17.681***	-19.338***	-19.598***	-18.158***	-19.749***
	(-31.561)	(-29.136)	(-29.149)	(-34.070)	(-30.856)	(-30.812)
NYSE Dummy	-15.718***	-12.654***	-7.899***	-15.924***	-12.792***	-7.985***
	(-8.433)	(-7.597)	(-4.656)	(-8.515)	(-7.679)	(-4.709)
Profitability	-149.739***	-150.139***	-190.440***	-150.551***	-150.673***	-190.905***
	(-10.518)	(-11.304)	(-13.599)	(-10.572)	(-11.346)	(-13.614)
Tobin's Q	-13.953***	-13.466***	-11.411***	-14.011***	-13.505***	-11.448***
	(-13.673)	(-13.588)	(-10.482)	(-13.716)	(-13.622)	(-10.502)
Bank size	-0.282	-0.054	1.440	-0.283	-0.052	1.453
	(-0.735)	(-0.167)	(0.820)	(-0.734)	(-0.163)	(0.826)
Observations	53,302	53,299	53,062	53,302	53,299	53,062
Adjusted R-squared	0.335	0.397	0.471	0.334	0.397	0.471
F-stat	615.7	420	283	599.2	410.3	283.3
Time FE	Y	Y	Y	Y	Y	Y
Purpose FE	N	Y	Y	N	Y	Y
Industry FE	N	N	Y	N	N	Y
Bank FE	N	N	Y	N	N	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999 to 2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table A3: Sub-samples for the cost of lending and females on board

Categories	Size				Cash flow volatility/Total assets				Credit rating			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
# female on BD	-3.746**	-5.726***			-6.128***	-3.518***			-3.674*	-1.162		
	(-2.489)	(-4.255)			(-4.070)	(-3.038)			(-1.934)	(-1.170)		
Relationship *	3.518*	-1.314			3.226**	2.674**			5.646**	-2.353***		
# female on BD	(1.949)	(-1.022)			(2.119)	(2.185)			(2.492)	(-2.482)		
% female on BD			-29.284**	-53.294***			-56.772***	-24.020*			-25.728	-11.090
			(-2.086)	(-3.273)			(-3.478)	(-1.821)			(-1.490)	(-1.032)
Relationship *			34.712**	-15.096			41.152**	22.251			54.189***	-31.345***
% female on BD			(2.053)	(-0.905)			(2.248)	(1.541)			(2.703)	(-2.829)
Relationship dummy	-13.893***	-8.227***	-14.086***	-8.233***	-13.124***	-14.912***	-13.746***	-14.248***	-17.981***	-6.155***	-18.220***	-5.502***
	(-5.878)	(-2.953)	(-5.785)	(-2.813)	(-4.438)	(-6.700)	(-4.592)	(-5.935)	(-6.296)	(-3.522)	(-6.379)	(-3.183)
Margin effect	-2.096**	-6.468***	-13.003*	-61.820***	-4.440***	-2.157**	-35.241***	-12.695	-1.047	-2.469***	-0.518	-28.500***
	(-1.979)	(-6.839)	(-1.950)	(-5.768)	(-4.099)	(-2.483)	(-3.005)	(-1.414)	(-0.782)	(-3.486)	(-0.042)	(-3.808)
Observations	26,042	26,473	26,042	26,473	24,241	28,998	24,241	28,998	22,228	30,314	22,228	30,314
Adjusted R-squared	0.381	0.473	0.381	0.473	0.451	0.477	0.451	0.477	0.329	0.487	0.329	0.487
F-stat	136.9	138.9	136.2	137.5	116.3	257.9	116.3	257.5	79.66	184.1	80.59	184
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999 to 2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

Table A4: Sub-samples for the cost of lending and independent NED females on board

Categories	Size				Cash flow volatility/Total assets				Credit rating			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
# indep. ED female on BD	-7.520***	-6.505***			-6.911***	-7.158***			-5.807***	-3.142***		
	(-4.889)	(-4.683)			(-4.848)	(-5.810)			(-2.852)	(-3.063)		
Relationship *	4.928***	1.100			4.186***	4.377***			7.395***	-0.181		
# indep. ED female on BD	(2.773)	(0.810)			(2.739)	(3.212)			(2.987)	(-0.175)		
% indep. ED female on BD			-61.485***	-64.967***			-69.109***	-63.407***			-46.702**	-37.750***
			(-4.246)	(-3.763)			(-4.351)	(-4.557)			(-2.500)	(-3.342)
Relationship *			40.191**	20.065			52.963***	43.277***			69.925***	-0.965
% indep. ED female on BD			(2.352)	(1.140)			(2.834)	(2.683)			(3.132)	(-0.078)
Relationship dummy	-14.269***	-11.887***	-13.880***	-12.804***	-13.487***	-16.142***	-14.121***	-15.899***	-18.344***	-9.432***	-18.493***	-9.540***
	(-6.171)	(-4.472)	(-5.858)	(-4.574)	(-4.846)	(-7.533)	(-4.958)	(-6.933)	(-6.469)	(-5.418)	(-6.483)	(-5.411)
Margin effect	-5.209***	-5.883***	-42.635***	-53.634***	-4.721***	-4.931***	-41.399***	-41.381***	-2.367	-3.242***	-14.171	-38.286***
	(-4.474)	(-6.423)	(-3.862)	(-4.879)	(-4.844)	(-5.555)	(-3.800)	(-4.395)	(-1.595)	(-4.520)	(-1.027)	(-4.796)
Observations	26,042	26,473	26,042	26,473	24,241	28,998	24,241	28,998	22,228	30,314	22,228	30,314
Adjusted R-squared	0.382	0.473	0.382	0.472	0.452	0.478	0.451	0.478	0.329	0.487	0.329	0.488
F-stat	138.9	139	137.9	137.7	114.5	261.1	114.4	260.9	80.88	187.3	81.63	186.1
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank*Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999 to 2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.

In Table A5, we explore whether the existence of collateral, refinancing indicator and financial covenants intensity can alternate the effect of board composition. Admittedly, one drawback of Dealscan is that there is limited information on the pledged asset. Therefore, we create a dummy variable to indicate whether the loan is linked with collateral or not. If a loan is secured, then the expected monetary loss for lenders should be lower and the resulting agency problems should, therefore, be less severe. In addition, Dealscan has a refinancing indicator variable that tracks the amended and restated agreements that replaces the previous contract and incorporates all amendments up to the point. When firms refinancing a loan then they face the risk that changes in market conditions could result in refinancing at a higher interest rate. However, these loans can be viewed as renewals which provide positive signals about the borrower's prospects. Finally, financial covenants intensity serves as a discipline device that can enhance the flexibility and efficiency of loan contraction. Higher covenants intensity assumes a higher monitoring effort to observe violations and to gather soft information. In Table A5, we use the same specification with the benchmark analysis, but we add the collateral variable (columns I-II), the refinancing dummy (columns III-IV) and the financial covenant intensity (columns V-VI). The coefficient estimates of the female variable are similar in magnitude as in the baseline results and highly significant at the 1%. Also, the coefficients on the collateral variable and the refinancing dummy are both negative and statistically significant at the 1% level, while the coefficient on the financial covenant intensity is positive and highly significant at 1%.

Table A5: Cost of lending and gender diversity: Secured vs unsecured loans

	I	II	III	IV	V	VI
Categories	Collateral		Refinancing		Financial covenants intensity	
	#female	%female	#female	%female	#female	%female
Female variable	-4.717***	-35.844***	-4.725***	-35.382***	-4.427***	-32.906***
	(-6.609)	(-4.997)	(-6.587)	(-4.903)	(-6.152)	(-4.570)
Collateral	-13.288***	-13.294***				
	(-8.593)	(-8.589)				
Refinancing dummy			-9.508***	-9.418***		
			(-5.502)	(-5.444)		
Financial covenants intensity					5.726***	5.776***
					(7.365)	(7.442)
Observations	52,749	52,749	52,749	52,749	52,749	52,749
Adjusted R-squared	0.433	0.432	0.432	0.431	0.433	0.432
F-stat	314.9	311.9	356.8	356.5	319.9	320.7
Loan controls	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Bank*Year FE	Y	Y	Y	Y	Y	Y
Clustered standard errors	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year	Bank*Year

The table reports coefficients and t-statistics (in parentheses). The sample consists of loan-bank-firm observations from 1999-2013. All variables are defined in Table 1. All specifications include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Standard errors are robust and clustered at the bank-year level. The *,**,*** marks denote the statistical significance at the 10, 5, and 1% level, respectively.