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Do women directors impact the cost of bank financing? Evidence from Australia

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ABSTRACT

We investigate the effect of women directors on the cost of bank loans for a sample of Australian listed firms during the period 2002-2017. More women on both boards and committees are associated with lower loan spreads, reduced default risk, and improved financial reporting quality. The reduction in loan spread is seen from when the first female director joins the board, and the effect of that is stronger than the effects of additional (second and subsequent) women joining the board. Moreover, womens leadership status reinforces this effect. Our results are consistent with the idea that female directors exhibit greater risk aversion than male directors, that women are not treated as tokens and are influentialeven as a minority group on the boardand that they enhance corporate governance and reporting quality.

¿Influyen las mujeres directivas en el coste de la financiación bancaria? La experiencia de Australia

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RESUMEN

Investigamos el efecto de las mujeres consejeras en el coste de los préstamos bancarios para una muestra de empresas australianas que cotizan en bolsa durante el período 2002-2017. Un mayor número de mujeres tanto en los consejos de administración como en los comités se asocia con menores diferenciales de los préstamos, un menor riesgo de impago y una mejor calidad de los informes financieros. La reducción del diferencial de los préstamos se observa desde la primera mujer consejera, y resulta más intensa que los efectos asociados a las siguientes (segunda y siguientes) mujeres incorporadas al consejo. Además, el estatus de liderazgo de la mujer refuerza este efecto. Nuestros resultados son coherentes con las nociones de que las mujeres consejeras muestran una mayor aversión al riesgo que los hombres consejeros, que las mujeres no son tratadas como simbolo siendo influyentes incluso como grupo minoritario en el consejo y que mejoran el gobierno corporativo y la calidad de la información.

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1. Introduction

Studies demonstrate that gender diversity in the boardroom affects the quality of corporate governance, improving monitoring and performance[1]. Our study addresses one aspect of gender diversity in the boardroom that has not attracted as much academic attention as other issues: the effect of gender diversity on firms' cost of capital. Utilizing loan-level data for Australian firms from 2002 to 2017, we present evidence indicating that firms with gender-diverse boards and committees borrow at lower interest rates.

In addition to considering female directors per se, we also provide evidence that the leadership status of female directors due to experience and top positions such as chair of the board or its committees increase reductions in the firms' cost of contracting new loans. Also, in contrast to the idea of tokenism (Kanter, 1977), our results indicate that the effects of female directors are present from when the very first women director joins the board. Additional women are also beneficial, although the observed effects are stronger for the first woman director than for subsequent, additional female directors. This result is consistent with female directors' willingness to express opinions and exert influence as a minority outgroup (Moscovici, 1985; García-Izquierdo et al., 2018).

Our paper presents several methodological improvements and extends the scant evidence on the effect of board gender diversity on the cost of financing. Previous work by Pandey et al. (2020) presents evidence of the negative effect of female directors on the accounting-based average cost of debt in the Australian market. However, in the first place, these authors limit their analysis to the board of directors, and in the second, they fail to consider demographic or statutory heterogeneity among female directors which affects their monitoring effectiveness (Gull et al., 2018). Unlike Pandey et al. (2020), who limit their analysis to the presence and independence of female board directors, we delve further into the importance of gender diversity by exploring two additional matters: the effect of gender diversity on board committees and the influence of female directors' leadership status.

The effect of female board committee members on the cost of debt might differ from that observed at the board level and thus remain an empirical question. Firms form committees to handle the complexity of board tasks (Lawrence & Lorsch, 1967), such as designing executive pay, recruiting new directors and top executives, and supervising financial reporting. Because they are small and have a specific focus on certain matters, board-committee dynamics might differ substantially from board dynamics. Smaller groups are less likely to have a diversity of perspectives and therefore might benefit more from the inclusion of female directors. Also, given the specific tasks assigned to committees, the value of female directors' capital is likely to be reflected differently on the board and its committees. For instance, on the one hand, audit and remuneration committees' monitoring activity might benefit from female directors' higher ethical standards (Lai et al., 2017) and lower tolerance to opportunistic behaviour in organizational decisions (Krishnan & Parsons, 2008). On the other hand, female directors' networks may have less social capital (i.e. information, influence, and status) than their male counterparts' "old boys' networks", which may hinder a nomination committee's recruitment of high-quality directors and top executives (McDonald, 2011). Consequently, using loan spreads, we capture lenders' opinions about gender diversity both on the board and its committees.

In relation to the effect of female directors' leadership status, the input that women bring to the boards' activities might be hindered if female directors have difficulties in making their voice heard because of gendered roles and expectations, which can weaken woment's influence (Mendelberg et al., 2014). However, female directors' leadership status—represented by their expertise as board members, or a position as chair of the board or its committees—helps female directors have a voice and influence board decisions.

Furthermore, we add to the current debate on tokenism by providing evidence suggesting that female directors are significant influencers from the very first woman appointed to the board. Unlike Pandey et al. (2020) we find no evidence suggesting the existence of a critical mass of female directors to trigger the reduction in the cost of new loans.

Additionally, our paper contributes to the literature on gender diversity by exploring the channels through which board gender diversity contributes to a reduction in the cost of bank loans. We find evidence of a positive association of female directors with enhanced financial reporting quality and lower firm default risk, both of which are consistent with a lower cost of debt.

Also, by analysing the spread of individual loans contracted by the firms, we overcome several limitations of the accounting-based average cost of debt measures. The evidence from Pandey et al. (2020) is based on the average cost of debt calculated as the ratio of annual interest cost to total interest-bearing debt, which suffers from staleness, meaning that a portion of the year's interest rate corresponds to debts contracted before the observation year. This average cost of debt is therefore determined by the historical conditions in which the company accessed the financial markets. A firm's corporate governance state at a certain time may be different from the one evaluated by creditors when they determined the interest rates of past loan deals. This temporal mismatch becomes especially significant in the case of the specific governance feature being analysed (i.e. female board presence), which in Australian firms has undergone a marked change over recent years. The average cost of debt for a given company is probably derived from a mix of loans contracted in periods when they did not have women on their board and from when they did. Conversely, the spread on new loans conveys the market's assessment of the firm's corporate governance structure and risk at a specific time and therefore allows a more fine-tuned evaluation of the effect of gender diversity. Furthermore, the average cost of a firm's debt is a noisy proxy for the firm's interest rate (Minnis, 2011), strongly affected by extreme observations[2] corresponding to accounting ratios calculated with very small denominators (Dechow, 1994) and does not correctly capture the capital structure of firms with rapidly changing debt levels (Pittman & Fortin, 2004; Aldamen & Duncan, 2013).

Finally, since there is evidence indicating that both issue and issuer features influence the cost of debt (Bhojraj & Sengupta 2003; Pittman & Fortin 2004), it is important to control for both types of features to alleviate endogeneity problems

[1] See, for example, Adams & Ferreira (2009) on boards' monitoring performance and governance. Examples of studies finding an association between the inclusion of female directors with better financial performance include Carter et al. (2003); Erhardt et al. (2003); Smith et al. (2006); Campbell & Mínguez-Vera, (2008); Khan & Vieito, (2013); Lückerath-Rovers, (2013); Liu et al. (2014); Terjesen et al. (2016). Bear et al. (2010) find an association between women directors and corporate social responsibility (CSR). Miller & Triana (2009) and Torchia Calabrò & Huse (2011) find a positive association between women directors and innovation.

[2] For instance, the extreme values of this accounting-based measure of the cost of debt (minimum 0.11% and maximum 51.72%) reported by Pandey et al. (2020) show the limitations of the ratio of interest cost to total interest bearing debt as a proxy for the cost of debt.

linked to omitted variables. This would not be possible when analysis of the cost of debt is performed at the aggregated firm level—as it is for accounting-based average cost of debt. Overall, by analysing the spreads of new loans we can relate debt cost to a firm's gender diversity and other firm characteristics at the time the loan was negotiated and also control for other contract terms that affect its cost.

Prior research on the relationship between corporate governance and the cost of debt has been conducted mainly in the US market, using publicly traded debt as the object of interest (Sengupta, 1998; Bhojraj & Sengupta, 2003; Anderson et al., 2004; Mansi et al., 2004; Ashbaugh-Skaife et al., 2006; Bradley & Chen, 2011). In contrast, the Australian corporate debt market is dominated by intermediated or private debt, and it presents relatively low levels of non-intermediated (public) debt (Reserve Bank of Australia, 2005). Compared to typical US bondholders, who rely on public information, banks enjoy a monitoring advantage as insiders who have access to private information (Fama, 1985). Banks' superior monitoring performance is also reinforced by economies of scale and cost advantages in information processing (Diamond, 1984, 1991). Moreover, in the specific case of syndicated loans, a designated lead arranger is responsible for performing prior due diligence before, and subsequent monitoring after, loan issuance, further increasing the monitoring advantage in comparison with public bondholders.

In addition, the Australian debt market enjoys lower information asymmetry due to the continuous disclosure regulations which ensure private lenders have greater access to financial information (Gray et al., 2009). Under the regime of continuous disclosure, Australian listed firms have to immediately disclose all price-sensitive information to the public. The US Regulation of Fair Disclosure focuses on equal access to the information that the listed companies choose to communicate. The Australian regulation is, therefore, more ambitious in terms of reducing information asymmetry, since it not only precludes selective disclosure of information, but also makes immediate dissemination of price-sensitive information compulsory. Taken together, the distinct features of the Australian market make it difficult to extrapolate the US-based evidence on the relationship between good corporate governance and low cost of debt to this market. It remains an empirical question to analyse whether banks that enjoy a significant monitoring advantage over public debtholders see the positive role of internal corporate governance measures such as board gender diversity.

Australia is one of several countries that have recommended, rather than regulated, gender diversity on corporate boards, but it has some distinct features. The Australian Securities Exchange (ASX) recommends that listed companies should establish a diversity policy and disclose their plans to reach measurable targets of gender diversity (ASX, 2010). ASX recommendations on gender diversity are known as the "if not, why not" rule suggesting that this rule contains more of an imperative than the regular "comply or explain" rules in other countries. In addition, the Australian Institute of Company Directors (AICD) has maintained a mentoring program since 2010 that includes a sponsoring plan in which company chairmen pledge to mentor a female candidate and place her on a public company board within one year.

According to AICD data, the presence of women on the boards of Australia's largest (ASX200) companies increased from 8.3% in 2009 to 29.5% in September 2019, nearly achieving the 30% target advocated by the AICD. However, small and mid-caps have been less successful in their adherence to this target (Fernandez-Mendez & Pathan, 2022). Our findings support the benefits of this policy in bringing about measurable economic outcomes. As such, they will be of interest to small and mid-cap Australian listed firms following in the footsteps of large Australian listed firms and also to countries other than Australia which still have a poor record of board gender diversity[3].

The structure of this paper is as follows. Section 2 presents a review of the literature on board gender diversity and develops our hypotheses. In Section 3, we describe the data and empirical framework to test the effect of women directors on the cost of bank loans. Section 4 presents our empirical results while Section 5 provides additional analysis. Finally, section 6 presents a discussion of our results and concludes the paper.

2. Related literature and hypothesis development

2.1. Gender diversity, board monitoring and cost of debt

Since the Higgs Report (2003) warned about the discriminatory criteria used for board selection, there has been an ongoing debate about the need to increase boards' gender diversity. Apart from a standpoint of social justice, there are arguments in favour of gender diversity derived from the different inputs and capabilities brought to the board by women and men.

Gender socialization theory, proposed by Dawson (1997), suggests that children's socialization processes are the determinant factor of gender differences in ethical attitudes and behaviour. The economic psychology literature points out that the existence of distinct stereotypically female values and traits modulates how men and women are socialized. Stereotypical gendered values permeate the family environment which excuses the aggressive behaviour of boys but expects nurturing and caring attitudes from girls. Chodorow (1978) suggested how the mother-child relationship, which is experienced differently by boys and girls contributes to the determination of the major personality traits that arise during infancy. In addition, differences in the patterns of children's traditional games accentuate gender differences in personality, with girls' games being turn-based and less competitive than boys' games (Lever, 1978). By playing these types of games, girls learn to respect inclusion and avoid harm, while boys assimilate respect for rules, often required to resolve disputes arising from direct game competition. These internalized expectations are manifested later in professional attitudes and behaviours that shape differences between men's and women's work-related decisions (Dawson, 1997).

Mental schemes, beliefs, and attitudes vary systematically with demographic variables such as gender (Robinson & Dechant, 1997). Thus, gender diversity brings a wider range of experiences to the board and adds variety to decision-making (Letendre, 2004). The variety of perspectives gender diversity produces enhances boards' problem-solving capabilities by making decision-makers explore more alternatives and evaluate their consequences. On the whole, gender diversity improves governance (Fondas & Sassalos, 2000) and enhances the boards' monitoring and advising roles (Daily & Dalton, 2003). There is multiple evidence of improved board functioning in gender-diverse boards. These boards meet more frequently (Adams & Ferreira, 2004) and have

[3]For instance, according to The Global Gender Gap Reports published by the World Economic Forum, in 2018 the three largest world economies—the United States, China and Japan—reached a meagre 16.4%, 9.4% and 3.4% of female directors respectively.

a better working environment (Bilimoria, 1997), which contributes to an improvement in the deliberation process (Eagly & Johnson 1990; Kravitz, 2003). Gender-diverse boards are also more likely to exhibit independent thinking and stronger monitoring activity (Adams & Ferreira, 2009; Carter et al., 2003).

There is an ample body of literature examining differences in risk aversion between men and women and how these differences can affect firms' risk exposure. This line of study provides evidence suggesting that women exhibit greater risk aversion than men (Byrnes et al., 1999, Charness & Gneezy, 2012) especially in financial decision-making environments (Powell & Ansic, 1997). Women are less likely than men to succumb to overconfidence (Barber & Odean, 2001; Niederle & Vesterlund, 2007). In the specific context of boards, Farrell & Hersch (2005) find an inverse link between firm risk and female directors while Lenard et al. (2014) show that more gender diversity on the board of directors is associated with lower variability of stock market return. Hutchinson et al. (2015) show that greater board gender diversity alleviates firms' excessive risk-taking. Faccio et al. (2016) find that firms run by female CEOs have higher survival rates compared to similar firms run by male CEOs and that the succession of a male by a female CEO was followed by reductions in the firm's risk.

The terms of debt contracting, specifically interest rate spread, are primarily influenced by the borrower's ability to pay the debt service promptly (Bhojraj & Sengupta, 2003). Considering that lenders impose higher loan spreads to compensate for a borrower's default risk (Duffee 1999) we expect female board representation to be negatively associated with the cost of debt.

The cost of debt depends not only on the level of the firm's default risk, but also on information risk—considered as the differences in both the level of information (Easley & O'Hara 2004) and its accuracy (Lambert et al., 2007) across investors. Information asymmetry between borrower and lender (Wittenberg-Moerman, 2008) and poor accounting quality result in higher cost of debt. Lenders use accounting information to make predictions about the probability that borrowers' future cash flow generation will be high enough to meet debt servicing obligations. Poor quality borrower accounting information increases the variability in expectations about future cash flows, which in turn increases the cost of debt contracts (Bharath et al., 2008).

Several studies indicate that female directors increase financial information quality, reducing information risk. Female directors are considered less overconfident than their male counterparts (Huang & Kisgen, 2013) and are highly sensitive to the risk of lawsuits and loss of reputation (Srinidhi et al., 2011), which in turn makes them more demanding in terms of the quality of financial information issued by the firm (Lai et al., 2017). Ahmed et al. (2017) illustrate that gender-diverse boards are associated with more frequent and lengthy disclosure of corporate information. Clatworthy & Peel (2013) and Srinidhi et al. (2011) report that female board members increase the accuracy of financial information and the quality of earnings by improving board oversight functions, while Ittonen et al. (2010), show that female members of the audit committee lower the probability of issuing erroneous financial information. Additionally, Heminway, (2007) finds that women are less likely than men to take action in their own personal interest, such as manipulating financial information to boost their compensation. In Australia, Capezio & Mavisakalyan (2016) demonstrate a negative relationship between female directors and the probability of committing fraud. Thus, the evidence of better financial reporting quality suggests a negative relationship between female directors and the cost of debt.

Following the preceding arguments on women directors' risk aversion and their negative influence on information risk, we pose the following hypothesis:

Board and committee gender diversity is negatively associated with the firm's cost of new loans.

3. Data and empirical framework

3.1. Data

Data on bank loans were drawn from the Loan Pricing Corporation DealScan database. DealScan includes information on several loan contract terms for public and private firms such as signing date, all-in drawn spread, maturity, the identity of lenders and borrowers, and purpose and type of loans. Our initial sample covered loans to Australian-listed companies from 2002 to December 2017. Borrowers occasionally enter more than one loan tranche on the same date. In this case, in line with previous papers (Qian & Strahan, 2007; Bae & Goyal 2009), our unit of analysis was each loan tranche instead of aggregating multiple tranches into a single loan deal. We collected data on the board structure of Australian listed firms from the Connect4 Boardroom and SIRCA databases and financial data were obtained from Capital IQ. The initial sample from DealScan comprised 671 facilities contracted by Australian listed firms between 2002 and 2017 for which the loan spread information was available. We then applied several filters to build our final sample for further analysis. This meant losing observations: 125 observations were eliminated because they corresponded to financial companies; 11 observations were deleted because of missing information on the facility amount or maturity; 15 observations were deleted because of missing financial or market price information and finally, 105 observations were removed because of missing board or committee level information. With all those filters, our final sample consisted of 415 loan tranches to 78 companies.

3.2. Measures of variables

In this study, we analysed the effect of female directors on the interest rate spread of new loans. The interest rate spread is measured as the natural logarithm of the basis points spread of the loan interest over the London Interbank Offered Rate (LIBOR) or LIBOR equivalent (Loan spread).[4]

Our variable of interest is the presence of female directors on the board and its three supervisory committees – audit, remuneration, and nomination. We measured female influence on the firm's corporate governance system by the number of female directors scaled by the total number of directors on the board (Female ratio board), the audit committee (Female ratio audit comm.), the remuneration committee (Female ratio remuneration comm.) and the nomination committee (Female ratio nomination comm.). Alternatively, we used a set of dummy variables that take the value of one when there is at least one female director on the board (Dummy female on board), the audit committee (Dummy female on audit

[4]The proxy for debt cost is the natural logarithm of all-in-spread drawn, which measures the interest rate spread on a loan plus any associated fees in originating the loan (Qian & Strahan, 2007; Graham Li & Qiu, 2008; Chava Livdan & Purnanandam, 2009; Lin et al., 2011).

comm.), the remuneration committee (Dummy female on remuneration comm.) and the nomination committee (Dummy female on nomination comm.)[5].

We controlled for loan and borrower characteristics in the estimations. As for loan characteristics, we considered the size of the bank loan proxied by the natural logarithm of the amount borrowed measured in Australian dollars (Loan amount) as larger loans might be priced at higher interest rates due to higher risk of default (Datta et al., 1999; Francis et al., 2018). We also controlled the natural logarithm of loan maturity expressed in months (Maturity), since creditors might impose liquidity premiums for long-term loans (Lian, 2018). Also, as the purpose of a loan is likely to partially determine its cost (Gong et al., 2022), we included a set of binary variables indicating whether the purpose of the loan was to finance an acquisition (Acquisition); corporate (corporate purposes); repayment of existing debt (Debt repay); working capital (Working capital); project financing (Project financing); or purchase of securities (Securities purchase).

We controlled for the possible effects of a firm's size in all models by incorporating the natural logarithm of the book value of total revenue (Firm size). Large firms enjoy decreased loan spreads due to lower information asymmetry problems in credit markets (Lin et al., 2013). Other factors that could determine the firm's risk level and therefore the cost of debt are financial leverage, performance and growth opportunities. We proxied the firm's financial leverage and performance using the ratio of the total liabilities to total assets (Leverage) and the ratio of EBIT to total assets (ROA). High leverage ratios are associated with high default risk and therefore larger loan spreads, the opposite is expected for profitable firms, which are safer and consequently can borrow at lower cost (Graham et al., 2008). We proxied the firm's growth opportunities using the market value of equity scaled by its book value (Q). Firms with better growth opportunities might enjoy lower borrowing costs as high market-to-book represents the additional value over book assets that creditors can use in case of default (Graham, et al., 2008). The models accounted for the possible effects of changes in general economic conditions by including year dummies. As economic risk varies across industries, we also included Standard Industrial Classification (SIC) industry dummies to control for this effect.

The definitions of all the variables used in the analysis are presented in Table 1, while their descriptive statistics (Panel A), correlations (Panel B) and univariate analysis of the variables of interest (Panel C) are in Table 2. The average loan spread is 164 basis points, with a minimum of 5.5 and a maximum of 750 basis points. On average, the loans are long-

[5]We also conducted additional analysis using the Blau gender diversity index for the board and its committees. The results reported as an online appendix show that the coefficients' sign and statistically significance are like those reported in Table 3.

Table 1. Definition of variables

This table presents the definition of the variables used in our empirical analysis.

Name	Definition	Source
DEPENDENT VARIABLES		
Loan spread	The natural logarithm of all-in-spread drawn, which measures the interest rate spread on a loan (over the LIBOR) plus any associated fees in originating the loan.	DealScan
Z	Altmans Z score	S&P Capital IQ
Discretionary accruals	Absolute value of discretionary accruals generated from the modified Jones model.	S&P Capital IQ
FEMALE BOARD AND COMMITTEE REPRESENTATION VARIABLES		
Female ratio board	Number of female directors scaled by the total number of board directors	Boardroom
Female ratio audit comm.	Number of female audit committee members scaled by the total number of audit committee directors.	Boardroom
Female ratio remuneration comm.	Number of female remuneration committee members scaled by the total number of remuneration committee directors.	Boardroom
Female ratio nomination comm.	Number of female nomination committee members scaled by the total number of nomination committee directors.	Boardroom
Dummy female on board	A dummy variable that takes the value of one if there are female directors on the board and zero otherwise	Boardroom
Dummy female on audit comm.	A dummy variable that takes the value of one if there are female directors on the audit committee and zero otherwise	Boardroom
Dummy female on remuneration comm.	A dummy variable that takes the value of one if there are female directors on the remuneration committee and zero otherwise	Boardroom
Dummy female on nomination comm.	A dummy variable that takes the value of one if there are female directors on the nomination committee and zero otherwise	Boardroom
Ratio of males with female connections	Proportion of male directors who have a seat on another board with female directors.	Boardroom
Female ratio industry	Aggregate ratio of female directors at the two-digit SIC industry level.	Boardroom
BORROWER FIRM CONTROL VARIABLES		
Firm size	The natural logarithm of the total revenues in thousands of AU Dollars.	S&P Capital IQ
ROA	The ratio between earnings before interest and taxes and total assets.	S&P Capital IQ
Leverage	The ratio between the book value of Total liabilities and the book value of total assets.	S&P Capital IQ
Q	The ratio of the market value of equity to the book value of equity.	S&P Capital IQ
LOAN CHARACTERISTICS CONTROL VARIABLES		
Loan amount	The natural logarithm of the loan in AUD.	DealScan
Maturity	The natural logarithm of the loan maturity expressed in months.	DealScan
Acquisition	A dummy variable that takes the value of one if the bank loan is for an acquisition and zero otherwise.	DealScan
Corporate purposes	A dummy variable that takes the value of one if the bank loan is for Corporate purposes and zero otherwise.	DealScan
Debt repay	A dummy variable that takes the value of one if loan is to repay existing debt	DealScan
Working capital	A dummy variable that takes the value of one if the bank loan is for financing working capital and zero otherwise.	
Project financing	A dummy variable that takes the value of one if loan is for project financing	DealScan
Securities purchase	Dummy variable that takes the value of one if loan is for Securities purchase	DealScan

Table 2. Descriptive statistics, correlations, and univariate tests

This table presents descriptive statistics in Panel A, pair-wise correlation matrix in Panel B, and univariate tests in Panel C. All variables are defined in Table 1 except for Loan spread, Loan amount and Maturity that for the sake of clarity are not log transformed. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

Panel A. Descriptive statistics

Variable	# observations	Mean	Median	Std Deviation	Min	Max
Loan spread	415	164.1279	150.0000	109.3813	5.5000	750.0000
Female ratio board	415	0.1111	0.1111	0.0982	0.0000	0.4444
Female ratio audit comm.	409	0.1501	0.1000	0.1732	0.0000	1.0000
Female ratio remuneration comm.	367	0.1292	0.0000	0.1704	0.0000	1.0000
Female ratio nomination comm.	308	0.1634	0.1250	0.1949	0.0000	1.0000
Dummy female on board	415	0.6771	1.0000	0.4681	0.0000	1.0000
Dummy female on audit comm.	409	0.5061	1.0000	0.5006	0.0000	1.0000
Dummy female on remuneration comm.	367	0.4523	0.0000	0.4984	0.0000	1.0000
Dummy female on nomination comm.	308	0.5519	1.0000	0.4981	0.0000	1.0000
Loan amount (million)	415	454	247	675	1.96	6510
Maturity (months)	415	49.9976	46.0000	29.6413	6.0000	180.0000
Corporate purposes	415	0.1735	0	0.3791	0	1
Debt repay	415	0.5566	1	0.4974	0	1
Acquisition	415	0.1349	0	0.3421	0	1
Working capital	415	0.0169	0	0.1289	0	1
Project financing	415	0.0217	0	0.1458	0	1
Securities purchase	415	0.0217	0	0.1458	0	1
Firm size	415	7.4850	7.6473	1.8632	-2.9732	10.8914
ROA	415	0.1630	0.1051	1.5942	-27.5649	10.4930
Leverage	415	0.7069	0.6807	0.2936	0.0036	2.5154
Q	415	2.5385	1.5576	2.8884	-0.8346	22.3428
Discretionary accruals[6]	9750	0.1236	0.0703	0.1578	0.0010	1.2999
Z[7]	8870	3.4883	2.1762	10.7390	-14.7771	62.6714

Panel C. Differences in loan spreads between gender-diverse and all-male boards or committees

Variable	With female directors	Without female directors	Difference	t-stats
BOARD	140.79	213.05	-72.26***	-6.61
AUDIT COMMITTEE	142.32	187.80	-45.47***	-4.28
REMUNERATION COMMITTEE	150.38	185.16	-34.78**	-3.03
NOMINATION COMMITTEE	134.56	190.10	-55.53***	-4.75

- [6]To explore the possible general effects of female directors on abnormal accruals and default risk, we used a complete panel made up of Australian listed firms from 2004 to 2017 to analyse these two aspects.
- [7]To explore the possible general effects of female directors on abnormal accruals and default risk, we used a complete panel made up of Australian listed firms from 2004 to 2017 to analyse these two aspects.

Panel B. Correlation matrix

	Loan spread	Female ratio board	Female ratio audit comm.	Female ratio remuneration comm.	Female ratio nomination comm.	Loan amount	Maturity	Corporate purposes	Debt repay	Acquisition	Working capital	Project financing	Securities purchase	Firm size	ROA	Leverage	VIF
Female ratio board	-0.235***																2.33
Female ratio audit comm.	-0.116***	0.528***															1.83
Female ratio remuneration comm.	-0.221***	0.479***	0.285***														1.5
Female ratio nomination comm.	-0.032	0.507***	0.102***	0.539***													1.7
Loan amount	0.231***	-0.117***	-0.147***	0.016	0.039*												1.5
Maturity	0.096**	0.015	0.051**	0.022	0.037	0.146***											1.23
Corporate purposes	-0.583***	0.256***	0.254***	0.006	-0.135***	-0.425***	0.006										3.56
Debt repay	0.363***	-0.055**	-0.1***	0.105***	0.182***	0.408***	0.049**	-0.677***									4.96
Acquisition	0.112***	-0.211***	-0.216***	-0.142***	-0.08***	0.183***	-0.138***	-0.275***	-0.147***								3.12
Working capital	0.045	-0.049**	-0.049**	-0.092***	-0.077***	-0.009	0.003	-0.207***	-0.11***	-0.045**							1.43
Project financing	0.15***	-0.207***	-0.14***	-0.075***	-0.063***	-0.033*	0.047**	-0.143***	-0.076***	-0.031	-0.023						1.82
Securities purchase	0.084**	-0.075***	-0.049**	-0.032	-0.013	0.063***	0.019	-0.114***	-0.061***	-0.025	-0.019	-0.013					1.72
Firm size	-0.273***	0.412***	0.388***	0.22***	0.017	-0.122***	0.012	0.347***	-0.218***	-0.165***	-0.033*	-0.253***	-0.022				2.58
ROA	0.03	-0.113***	-0.011	-0.015	0.007	0.018	-0.034*	-0.071***	0.041**	0.074***	-0.006	-0.012	0.029	-0.047**			1.14
Leverage	-0.584***	0.191***	0.241***	-0.075***	-0.078***	-0.483***	-0.045**	0.556***	-0.502***	-0.232***	0.04**	-0.159***	-0.092***	0.276***	-0.045**		2.7
Q	-0.027	-0.052**	-0.161***	-0.077***	-0.042*	0.03	-0.093***	-0.006	-0.092***	0.126***	0.001	0.133***	0.05**	0.083***	0.012	-0.058***	1.5

term and large, as the average loan size is A$ 454 million, with an average maturity of 50 months. Companies receiving this type of loan are highly profitable (average ROA=16%), present value-increasing investment opportunities (average Q=2.53) and are highly leveraged (average Leverage= 70%). As for the variable of interest, the presence of female directors on the board and its committees, the proportion of female directors ranges between 11% on the board and 16% on the nomination committee. The board includes female directors in 67% of cases, while for the committees the percentages are 50% (audit), 45% (remuneration), and 55% (nomination).

The correlation matrix for our main variables in Panel B of Table 2 indicates statistically significant negative correlations between our proxies of female directors (Female ratio board, Female ratio audit comm., and Female ratio remuneration comm. Female ratio nomination comm.) and the loan spread (Loan spread). These univariate results support our main conjecture that the cost of bank loans decreases with female directors. We also find significant negative correlations between Loan spread and firm size (Firm size), the availability of profitable growth opportunities (Q), and financial leverage (Leverage). We show in the last column of Table 2 that all the variance inflation factors are far below 10, with a maximum value of 4.96 for the dummy variable indicating debt repayment as the purpose of the loan.

Panel C in Table 2 shows the univariate tests of mean differences in Loan spread between gender-diverse and all-male boards or committees. There are statistically significant negative differences when we compare Loan spread between gender-diverse and all-male boards or committees. The differences are economically significant, with the mean loan spreads 72.26 basis points lower for firms with gender-diverse boards than firms with all-male boards. Firms with gender-diverse audit, remuneration and nomination committees also exhibit lower mean loan spreads by 45.47, 34.78 and 55.53 basis points respectively. Overall, our univariate test results of lower loan spreads for gender-diverse boards or committees lend support to the proposition of a negative association between female directors and the cost of bank loans.

3.3. Empirical framework

The following regression equation is used to empirically test the effect of female directors on loan spreads:

$$(\text{Loan spread})_{i,t} = \alpha_j + \beta_1(\text{FEMALE})_{i,t} + \sum_{j=1}^{12}\mu_j(\text{CONTROLS})_{i,t} + \sum_{t=1}^{2002-2017}\omega_t(\text{YEAR})_t + \sum_{k=1}^{10}\delta_k(\text{INDUSTRY})_k + \varepsilon_{i,t} \quad (1)$$

where subscript i denotes individual firms and subscript t represents the time period (t = 2002, …, 2017). The coefficients α, β, μ, ω and δ are the parameters to be estimated, while ε is a disturbance term. Our proxies of FEMALE are the proportion of female directors on the board (Female ratio board), the audit committee (Female ratio audit comm.), the remuneration committee (Female ratio remuneration comm.), the nomination committee (Female ratio nomination comm.) and the binary indicators of female presence on the board (Dummy female on board), the audit committee (Dummy female on audit comm.), the remuneration committee (Dummy female on remuneration comm.) and the nomination committee (Dummy female on nomination comm.). CONTROL comprises twelve variables, as discussed in sub-Section 3.2. In addition, year dummies (YEAR) and SIC industry dummies (INDUSTRY) are used to control for time fixed-effects and industry fixed-effects, respectively. We estimate equation (1) using the ordinary least squares (OLS) technique with robust standard errors and we also use two stage least squares analysis with instrumental variables (2SLS-IV) to account for potential endogeneity biases from reverse causality and sample selection.

4. Main results

4.1. OLS estimations

Table 3 reports the OLS estimation of a regression equation (1) to determine the influence of female directors on firms' cost of debt proxied by the natural logarithm of the basis points spread of the bank loan interest (Loan spread).

We find significant negative coefficients on all our proxies of female directors. Particularly, these coefficients are all statistically significant at the 1% level or better for the proportion of female directors on the board (Female ratio board), on the audit committee (Female ratio audit comm.), on the remuneration committee (Female ratio remuneration comm.), and on the nomination committee (Female ratio nomination comm.). We also observe significant negative coefficients on the dummy variables indicating the presence of female directors on the board or board committees. These results strongly support our premise that the costs of contracting new bank debt decrease with female directors. The coefficients are all economically significant as well. For example, the coefficient on Dummy female on board in column 2 indicates that a firm with at least one female director experiences approximately a 20% reduction in average loan spread compared to a firm with an all-male board.[8] With a geometric average of 134 basis points for the loan spreads in our sample, a firm with at least one female director on the board experiences an average reduction of 27 basis points in the cost of new loans in comparison to a firm with an all-male board. The exponential of the coefficient in the first column for the proportion of female directors (Female ratio board) indicates that having 10% of the board being women is associated with a reduction of 16 basis points on the average loan spread. The results for board committees are of similar economic magnitude.

Regarding our estimates for the control variables, we find positive coefficients for loan size and maturity of the loan, and negative coefficients for firm size. These results are logical, as risk is perceived to be higher for large loans as well as for loans with longer maturity, reflected in higher loan spreads. Larger firms borrow at lower interest rates, which is consistent with the notion that small firms experience greater informational asymmetries between shareholders and lenders while large borrowers have easy access to both internal and external financing, and lower default risk because they are more diversified. High leverage is also associated with higher loan spread, which could indicate that firms with high leverage face higher levels of financial risk and the moral hazard problem is greater in these firms. Finally, we observe lower debt costs in loans for corporate purposes and working capital.

[8] Note that the dependent variable is log transformed. We calculate the percentage change in the geometric average of the original (not log transformed) loan spread as follows: [exp(-0.219)*100]-100=-19.66%.

Table 3. Impact of female directors on loan spread - Robust OLS

This table presents the results of regression equation (1) using pooled-OLS with standard errors clustered by borrower firm level. The dependent variable Loan spread is the natural logarithm of interest rate spread on a loan (over the LIBOR) plus any associated fees in originating the loan. All variables are defined in Table 1. Firm industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female ratio board	**-1.369*** (-4.55)**							
Dummy female on board		**-0.219*** (-3.78)**						
Female ratio audit comm.			**-0.368** (-2.36)**					
Dummy female on audit comm.				**-0.196*** (-3.72)**				
Female ratio remuneration comm.					**-0.613*** (-4.19)**			
Dummy female on remuneration comm.						**-0.227*** (-4.25)**		
Female ratio nomination comm.							**-0.560*** (-3.68)**	
Dummy female on nomination comm.								**-0.209*** (-3.61)**
Loan amount	0.0758***	0.0748***	0.0720***	0.0718***	0.0622***	0.0671***	0.0632***	0.0609**
	(3.81)	(3.73)	(3.50)	(3.53)	(2.93)	(3.18)	(2.60)	(2.50)
Maturity	0.256***	0.260***	0.237***	0.233***	0.194***	0.204***	0.199***	0.206***
	(7.15)	(7.21)	(5.97)	(5.95)	(4.69)	(4.95)	(4.44)	(4.60)
Firm size	-0.127***	-0.125***	-0.138***	-0.127***	-0.115***	-0.109***	-0.112***	-0.102***
	(-7.64)	(-7.16)	(-7.91)	(-7.19)	(-6.81)	(-6.32)	(-6.02)	(-5.38)
ROA	-0.00663	-0.00460	-0.00189	0.00118	-0.0451	-0.0472*	-0.0362	-0.0418
	(-0.51)	(-0.35)	(-0.14)	(0.09)	(-1.62)	(-1.70)	(-1.13)	(-1.31)
Leverage	0.303***	0.228**	0.282**	0.270**	0.0645	0.0981	0.00931	-0.0644
	(2.80)	(2.07)	(2.51)	(2.42)	(0.56)	(0.85)	(0.06)	(-0.43)
Q	-0.0105	-0.0128	-0.0103	-0.0121	0.0000272	-0.00425	0.00237	0.00178
	(-1.28)	(-1.54)	(-1.22)	(-1.44)	(0.00)	(-0.49)	(0.19)	(0.14)
Corporate purposes	-0.263***	-0.257***	-0.283***	-0.307***	-0.268**	-0.249**	-0.331***	-0.289***
	(-2.73)	(-2.65)	(-2.84)	(-3.11)	(-2.57)	(-2.42)	(-2.96)	(-2.61)
Debt repay	-0.0956	-0.0829	-0.133	-0.150*	-0.0492	-0.0397	-0.0895	-0.0712
	(-1.10)	(-0.95)	(-1.47)	(-1.68)	(-0.54)	(-0.44)	(-0.88)	(-0.70)
Acquisition	-0.156	-0.132	-0.153	-0.188*	-0.0893	-0.0618	-0.137	-0.117
	(-1.56)	(-1.32)	(-1.46)	(-1.81)	(-0.84)	(-0.59)	(-1.10)	(-0.94)
Working capital	-0.419**	-0.363**	-0.374**	-0.408**	-0.415**	-0.426**	-0.428**	-0.432**
	(-2.34)	(-2.02)	(-2.04)	(-2.24)	(-2.25)	(-2.30)	(-2.22)	(-2.24)
Project financing	-0.508***	-0.483***	-0.323	-0.416*				
	(-2.84)	(-2.68)	(-1.29)	(-1.67)				
Securities purchase	-0.103	-0.0643	-0.0861	-0.123	-0.0139	0.0161	-0.0565	-0.0133
	(-0.59)	(-0.37)	(-0.48)	(-0.69)	(-0.08)	(0.09)	(-0.27)	(-0.06)
CONSTANT	3.663***	3.491***	3.763***	3.619***	3.813***	3.549***	3.889***	3.894***
	(8.01)	(7.61)	(7.74)	(7.66)	(7.81)	(7.33)	(7.03)	(7.03)
No. of Obs.	415	415	409	409	367	367	308	308
R-Squared	0.696	0.691	0.682	0.688	0.702	0.703	0.702	0.701

4.2. 2SLS-IV estimations

We used a two-stage least squares analysis with instrument variables (2SLS-IV) technique to address the potential problem of endogeneity in female directors due to biases from self-selection and reverse causality. Female directors might not be randomly assigned to firms. If female directors diverge from male directors in their attitudes towards risk-taking, firms might favour the inclusion of female directors in line with their desired level of risk appetite. Moreover, female directors might prefer to join firms that match their preferences in features such as risk, industry, or performance. Given the relatively scarce number of experienced female directors and the current trend towards the formation of gender-diverse boards, experienced female directors might have the leverage to choose firms that match their specific preferences. To address these issues, we used 2SLS estimations with instrumental variables.

Table 4 shows our 2SLS-IV estimations. We used two instruments to predict the presence of female directors. Following Adams & Ferreira (2009) and Upadhyay & Zeng (2014), we used the proportion of male directors with a directorial position on other boards with female directors (Ratio of males with female connections) and following Liu et al. (2014) and Gyapong et al. (2016), we used the aggregate ratio of female directors at the two-digit SIC industry level (Female ratio industry) as instruments of the proportion of female directors on the board and its committees. The odd-numbered columns, i.e., columns 1, 3, 5 and 7, present the first stage predictions of female directors' presence on the board and its committees and the even-numbered columns, i.e., columns 2, 4, 6 and 8, show the second-stage estimations of firms' cost of debt using the predictions of female director proxy from the respective first stage regressions. We provide the diagnostic statistics of the relevance, validity and strength of our instruments. Anderson canonical correlation LM tests of under-

Table 4. Impact of female directors on loan spread - 2SLS-IV estimations

This table presents the 2SLS robust estimates of equation (1) predicting interest rate spreads on a sample of new loans contracted between 2002 and 2017. Odd numbered columns (i.e., columns 1, 3, 5 and 7) present the first stage estimations of female board and committee membership, while even numbered columns (i.e., columns 2, 4, 6 and 8) present the second stage estimations of female directors effect on loans spread. We use Ratio of males with female connections and Female ratio industry as instruments in the first stage regressions. Ratio of males with female connections is the proportion of male directors who have a seat on another board with female directors. Female ratio industry is the aggregate ratio of female directors at the two-digit SIC industry level. The dependent variable Loan spread is the natural logarithm of interest rate spread on a loan (over the LIBOR) plus any associated fees in originating the loan. All variables are defined in Table 1. Firm industry and year dummies are included in the estimations. T statistics are shown in parentheses. The following tests are provided: Sargan Hansen J test of over-identification for joint instruments, Cragg-Donald Wald F statistic test for weak instruments, Anderson canon. corr. LM statistic for under-identified instruments. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
Dependent var.	Female ratio board	Loan spread	Female ratio audit comm.	Loan spread	Female ratio remuneration comm.	Loan spread	Female ratio nomination comm.	Loan spread
Ratio of males with female connections	**0.215*** **		**0.237*** **		**0.250*** **		**0.257*** **	
	(14.08)		**(6.60)**		**(6.05)**		**(5.15)**	
Female ratio industry	**0.578*** **		**1.018** **		**0.986***		**2.40*** **	
	(2.83)		**(2.09)**		**(1.74)**		**(3.28)**	
Female ratio board		**-1.685*** **						
		(-3.52)						
Female ratio audit comm.				**-1.514*** **				
				(-3.27)				
Female ratio remuneration comm.						**-1.537*** **		
						(-3.45)		
Female ratio nomination comm.								**-1.452*** **
								(-3.47)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	415	415	409	409	367	367	308	308
R-Squared	0.699	0.695	0.470	0.635	0.340	0.667	0.421	0.664
F-statistics	27.04***	26.99***	10.79***	22.19***	6.243***	22.78***	7.211***	19.17***
Under-int. test	150.09***		48.451***		40.161***		40.479***	
Weak ident. test	106.80***		24.928***		20.275***		20.503***	
Over-ident. test	1.141		0.303		0.321		1.126	
p-value of Sargan test	0.2854		0.5818		0.5708		0.2887	

identification are statistically significant in all models, indicating that the instruments are relevant (i.e. correlated with the endogenous variable). The statistically significant Cragg-Donald tests reject the null hypothesis of weak instruments, indicating that at least one instrument is strong. Therefore, our models are neither under-identified nor weakly-identified. Finally, the insignificant Sargan Hansen J statistics of overidentification validate the chosen instruments.

The coefficients for our two instruments, the Ratio of male directors with female connections and the Female ratio industry, in the odd-numbered columns are all significantly positive at the 1% level or better. The coefficients for female proxies in the even-numbered columns are all negative and statistically significant at the 1% level or better and hence resemble the OLS estimates in Table 3. Thus, our OLS results that the cost of bank loans decline with female directors remain robust to addressing endogeneity with the 2SLS-IV approach.

We also tested whether our results are robust to alternative measures of the dependent variable (cost of debt) and the variable of interest (board and committee's gender diversity). We estimated equation (1) using the average cost of debt (Average debt cost) as a dependent variable. The average cost of debt is calculated as the ratio of annual interest cost from the profit and loss account to the average total value of the interest-paying debt taken from the balance sheet. To avoid the results being driven by extreme values, we winsorized it at the 1% level and selected companies that finance at least 5% of their assets with interest-bearing debt. We show the results in an online appendix.

Table A.1 in the online Appendix shows the effect of female directors on the average cost of debt proxied by the ratio of interest cost to total interest-paying debt. Like our results in Table 3, we find that female directors are negatively related to the firms' cost of debt. Our results indicate that the proportion of female directors on the board (Female ratio board), the audit committee (Female ratio audit comm.), the remuneration committee (Female ratio remuneration comm.) and the nomination committee (Female ratio nomination comm.) are all negatively related to the average cost of debt. These results are economically significant as well. For instance, the coefficient in the first column indicates that a firm with a board made up of 10% female directors will experience a 50 basis point decrease in the average cost of debt. We also find a negative coefficient for the dummy variables indicating the presence of female directors on the board and its committees. The results in column 2 indicate that a firm with a gender-diverse board will enjoy a decrease of 150 basis points in the cost of debt compared to a firm with an all-male board.

To test that our results are robust to alternative measures of boards' gender diversity, we performed the analysis shown in Table 3 using Blaus (1977) index of gender diversity. This analysis is presented in Table A.2 in the online appendix. Our results are similar to those in Table 3 and indicate that gender diversity on the board and committees results in lower loan spreads and lower average cost of debt.

5. Additional analysis

5.1. Female directors as a minority

According to the concept of tokenism (Kanter, 1977), in groups such as boards of directors showing a disproportionate proportion of a certain demographic class—for instance, men—the majority controls the group and its culture while the minority "token" members end up representing the stereotypes of their group. With the increase in the relative number of female directors, women's views are perceived as more legitimate, and their voice is considered individual, rather than as representative of an entire demographic group (Kanter, 1977). As the imbalance between men and women narrows, members of the minority group—who are potential allies—can form coalitions which will promote their influence on the board's decision-making. Also, female board members who are in a minority do not identify with the board as long as there is less than a certain proportion in the group (Jonsdottir et al., 2015). Social identity and tokenism theories indicate that moving from an all-male board to one with a single woman does not have an important impact on the organizational culture (Terjesen & Sealy, 2016). The "first and only" woman on these boards may be treated as tokens, lowering their impact on board deliberations (Schwartz-Ziv, 2017).

In this regard, we test this concept of tokenism. Table 5 shows our estimations testing whether the first women director has any notable effect on the cost of loans and whether additional women provide any incremental effect. We estimated piecewise regressions of the effect of female directors over the cost of bank loans (Loan spread). The variables # Female board1, # Female audit comm. 1, # Female remuneration comm. 1 and # Female nomination comm. 1 are defined as the number of female directors on the board, the audit committee, the remuneration committee and the nomination committee respectively if the number of female directors is below 2 and 1 if the number of female directors is two or more. These variables represent the effect of the first female director on the board or its committees. # Female board 2, # Female audit comm. 2, # Female remuneration comm. 2 and # Female nomination comm. 2 represent the additional number of female directors over the first one on the board, the audit committee, the remuneration committee and the nomination committee respectively. These variables are equal to zero if the number of female directors on the board or its committees is less than two or the number of female directors-1 when there are at least two female directors on the board, the audit committee, the remuneration committee and the nomination committee respectively. These variables represent the effect of the additional female directors after the first one on the board or its committees.

The coefficients of the variables representing the effect of the first female director (# Female board 1, # Female audit comm. 1, # Female remuneration comm. 1 and # Female nomination comm. 1) are negative and statistically significant across all columns. These results suggest that the beneficial effect of gender diversity in terms of lower loan spreads is visible with the inclusion of the first female director on the board or its committees. We also find a negative and statistically significant coefficient for the variable representing the effect of additional female board directors after the first (# Female board 2). In terms of the economic magnitude of the estimates, the coefficients for # Female board 1 and # Female board 2 in column 1 indicate that the inclusion of the first female director is associated with an average reduction of 21 basis points in the cost of new loans and a further reduction of 16 basis points for any additional female director. In contrast to the idea of tokenism, these results suggest that women directors are influential even as a minority group on the board. Banks perceive the influence of female board representation from the very first woman director and firms enjoy further, albeit smaller, loan cost reductions with the inclusion of additional female directors after the first one.

Table 5. Piecewise regression for the effect of the first and additional female directors on the loan spread

This table shows the estimation of regression equation (1) using OLS with standard errors clustered by borrower firm level. The dependent variable Loan spread is the natural logarithm of interest rate spread on a loan (over the LIBOR) plus any associated fees in originating the loan. The variables Female ratio board1, Female ratio audit comm.1, Female ratio remuneration comm.1 and Female ratio nomination comm.1 are the numbers of female directors on the board, on the audit committee, on the remuneration committee or on the nomination committee respectively if the number of female directors is below 2 and one if the number of female directors is two or more. Female ratio board2, Female ratio audit comm.2, Female ratio remuneration comm.2 and Female ratio nomination comm.2 represent the additional number of female directors over the first one at the board, the audit committee, the remuneration committee and the nomination committee respectively. Is equal to zero if the number of female directors is below two or number of female directors-1 when there are at least two female directors. All models include the same control variables as in Table 3, also defined in Table 1. Firm industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

	(1)	(4)	(3)	(1)
# Female board1	**-0.171****			
	(-2.47)			
# Female board2	**-0.129****			
	(-2.32)			
# Female audit comm. 1		**-0.196*****		
		(-3.31)		
# Female audit comm. 2		0.00170		
		(0.03)		
# Female remuneration comm. 1			**-0.205*****	
			(-3.42)	
# Female remuneration comm. 2			-0.155	
			(-1.42)	
# Female nomination comm. 1				**-0.189****
				(-2.45)
# Female nomination comm. 2				-0.143
				(-1.01)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
No. of Obs.	415	409	367	308
R-Squared/Pseudo R Squared	0.698	0.689	0.708	0.706
F|X^2 test statistics	39.32	35.72	24.94	46.70
p-value	0.0000	0.0000	0.0000	0.0000

5.2. Results for leadership

The effect of female directors on a firm's affairs might be more pronounced if they hold specific leading positions, such as chair of the board or committee chair, or if they have acquired specific board experience through a long tenure. The chair of the board is responsible for managing board dynamics and running the board effectively by fostering board directors' participation in deliberations (Machold et al., 2011). Thus as the board leader, the chairperson can greatly influence board meetings (Gabrielsson et al., 2007) and consequently affect its monitoring efficiency. Directors' experience also affects their monitoring effectiveness as it takes three to five years to gain suitable knowledge of a firm (Bacon & Brown, 1973). Directors' experience brings improved advisory abilities and better quality strategic decision-making (Kroll et al., 2008; McDonald et al., 2008). Therefore, female directors in (top) chair positions and those who have substantial experience as board members can be especially

Table 6. Impact of female directors leadership on the cost of bank loans

This table presents estimations of equation (1) predicting the effect of female directors leadership on the cost of bank loans. Female directors leadership is proxied by their status as chair of the board or its committees (Panel A) and by their tenure as directors (Panel B). Equation (1) is estimated using robust OLS regressions. The dependent variable (LN_SPREAD) is the natural logarithm of interest rate spread on a loan (over the LIBOR) plus any associated fees in originating the loan. FEM_(non-chair) is the proportion of female directors which does not chair the board or any of its committees, or specifically the audit committee FEM_(non-chair_AC), the remuneration committee FEM_(non-chair_RC) or the nomination committee FEM_(non-chair_NC). FEM_CHAIR, is the proportion of female board directors who hold any chair position, or specifically the chair position of the audit committee (FEM_CHAIR_AC), the remuneration committee (FEM_CHAIR_RC) or the nomination committee (FEM_CHAIR_NC). DFEM_(non-chair), is dummy variable that takes the value of one if there is at least one female director that do not chair the board or any or its committees or specifically the chair position of the audit committee DFEM_(non-chair_AC), the chair position of the remuneration committee, DFEM_(non-chair_RC) or the chair position of the nomination committee DFEM_(non-chair_NC). DFEM_CHAIR, is a dummy variable that takes the value of one if the board or any of its committees are chaired by a female director, or specifically if the audit committee is chaired by a woman (DFEM_CHAIR_AC), the remuneration committee (DFEM_CHAIR_RC) is chaired by a woman, or the nomination committee is chaired by a woman (DFEM_CHAIR_NC). All models include the same control variables as in Table 3, also defined in Table 1. Firm SIC industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

Panel A. Impact of female directors as Chair on the cost of bank loans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FEM_(non-chair)	**-1.052*** **							
	(-3.12)							
FEM_CHAIR	**-2.133*** **							
	(-4.04)							
FEM_(non-chair_AC)		**-1.320*** **						
		(-3.70)						
FEM_CHAIR_AC		**-2.000*** **						
		(-3.05)						
FEM_(non-chair_RC)			**-1.039*** **					
			(-3.24)					
FEM_CHAIR_RC			**-2.659*** **					
			(-3.89)					
FEM_(non-chair_NC)				**-1.292*** **				
				(-3.55)				
FEM_CHAIR_NC				**-4.091*** **				
				(-4.35)				
DFEM_(non-chair)					**-0.0961***			
					(-1.79)			
DFEM_CHAIR					**-0.195*** **			
					(-3.72)			
DFEM_(non-chair_AC)						**-0.139** **		
						(-2.23)		
DFEM_CHAIR_AC						**-0.156***		
						(-1.94)		
DFEM_(non-chair_RC)							**-0.164*** **	
							(-2.79)	
DFEM_CHAIR_RC							**-0.230*** **	
							(-3.13)	
DFEM_(non-chair_NC)								**-0.208*** **
								(-2.86)
DFEM_CHAIR_NC								**-0.316*** **
								(-3.25)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	415	409	367	308	415	409	367	308
R-Squared	0.699	0.694	0.704	0.712	0.693	0.685	0.702	0.706

ln_tenure is the log transformation of the average female directors board tenure in months. To avoid the loss of observations with all-male boards, we add a constant 0.00001 to the average female directors tenure. Tenure_1 is a binary variable that takes the value of one if on average female directors are in their first year of board service or above. Tenure_2 - Tenure_5 are defined similarly for the second, third, fourth, or fifth years of service. Tenure_5+ is defined as the average years of service of female directors minus 5 if the average years of service of female directors is above 5 and zero otherwise. All models include the same control variables as in Table 3, also defined in Table 1. Firm SIC industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

Panel B. Impact of female directors tenure on the cost of bank loans

	(1)	(2)
Ln female tenure	**-0.0151*** **	
	(-3.53)	
Female tenure 1		0.0127
		(0.09)
Female tenure 2		0.0168
		(0.14)
Female tenure 3		**-0.273** **
		(-2.58)
Female tenure 4		**-0.256*** **
		(-3.67)
Female tenure 5		**-0.282*** **
		(-2.78)
Female tenure 5+		**-0.302*** **
		(-3.53)
Controls	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
No. of Obs.	407	407
R-Squared	0.754	0.730
F	44.63	39.06
p	0.0000	0.0000

influential in the determination of the cost of new loans.

Table 6 displays the effect of these two aspects of female directors' leadership status on the spread of new loans. Estimations in columns one to four of Panel A include indicators of the weight represented by the chairwoman of the board (FEM_CHAIR_BD) or its committees (DFEM_CHAIR_AC, DFEM_CHAIR_RC, DFEM_CHAIR_NC) about their total size. Alternatively, columns five to eight proxy the effect of female directors in top positions by including a group of dummies identifying a female as the chair of the board (DFEM_CHAIR_BD), or its committees (DFEM_CHAIR_AC, DFEM_CHAIR_RC, DFEM_CHAIR_NC). We estimate the effect of "regular" female directors, those that do not chair the board or its committees, by including the ratio of this type of director to total board size in columns one to four and a dummy variable indicating their presence in the board in columns five to eight. In panel B, we estimate the effect of female directors' tenure using the log transformation of the average female directors' tenure (Ln female tenure) and a piecewise regression indicating the effect of an additional year of female directors' average tenure (Female tenure 1 to Female tenure 5) up to the fifth year and the effect of additional years above the fifth year (tenure_5+).

The results in panel A of Table 6 indicate that the effect of female directors in top (chair) positions is stronger than the effect of regular (non-chair) female directors. For example, the coefficients for the binary indicators of female board chair and regular female directors' presence, in the fifth column, indicate that the presence of a female board chair and "regular" female directors are associated with respective reductions of 23 and 12 basis points in the spread of bank loans. The effect of female directors is also stronger when they hold the chair of the audit, remuneration, or nomination committees than when they occupy a regular directorial position. The significant coefficients for Dummy Female chair audit comm., Dummy Female chair remuneration comm. and Dummy female chair nomination comm. indicate that firms with a female chair of the audit, remuneration, and nomination committees experience a respective reduction in the cost of bank loans by 19, 27 and 36 basis points, all above the effect of regular female directors. In an un-tabulated analysis, we also find further evidence about the effect of directors' leadership by comparing the effects of female directors holding board committee positions (audit, remuneration or nomination) and "regular" female directors that only hold a position as directors of the board. Our results indicate that female directors belonging to any of the committees are associated with higher reductions in the loan spreads compared to "regular" female directors who only hold a position as directors of the board.

Panel B reports the effect of female directors' average tenure as an alternative proxy for female directors' leadership. The coefficient for the variable (ln female tenure) indicates that a 1% increase in the average female directors' tenure is associated with a decrease of 0.0151% in the spread of new bank loans. The coefficients for tenure proxies in the second column indicate that the effect of female directors' tenure is statistically significant after the second year of service. The coefficients for the variables Tenure_3 to tenure_5+ indicate that additional years of female directors' tenure from the third year onwards are associated with reductions in the average loan spread ranging from 23% to 26%, (30 to 34 basis points). In summary, our results suggest that the financial markets see a stronger beneficial role of female directors when they are in key top positions or when they have gained experience by serving on the board for a long time.

5.3. Testing default risk and financial reporting quality as two channels

All of our analyses above demonstrate a robust, strong, negative relationship between having women on boards or committees and the cost of bank financing. This negative relationship might be reasonably attributed to the lower default risk and lower information risk associated with female directors (See Section 2). If creditors consider board and committee gender diversity as a sign of lower default risk and reduced information asymmetry, it is expected that they will impose lower risk premiums. To test these possibilities, we explored the effect of female directors on default risk as measured by Altman's Z score and financial reporting quality as proxied by the absolute value of the discretionary accruals following the modified Jones model (1995). The results are reported in Tables VII and VIII respectively, with both tables providing pooled OLS estimates in Panel A and 2SLS-IV estimations in Panel B[9].

Concerning default risk results in Table 7, the significant positive coefficient for female director proxies in the first three columns provides evidence that firm default risk decreases with the presence of female directors on the board or the audit committee.[10] In terms of economic magnitude, the coefficient in column 2 of Panel A shows that firms with at least one female director are linked to an average 1.05 units increase in their Z score. Similarly, the coefficients in column 1 of Panel A and column 2 of Panel B indicate that a 10% increase in the proportion of female directors is associated with an extra 0.4 and 0.5 average Z score respectively. We also find some evidence that a higher proportion of female directors on the audit committee is linked to reduced default risk.

With regard to the information asymmetry results in Table 8, we find that the presence of female directors on the board and the audit committee is negatively associated with the absolute value of discretionary accruals, suggesting that this is associated with higher quality of financial reporting. Both OLS (Panel A) and the 2SLS-IV estimations (Panel B) substantiate significant negative coefficients for the proportion of female directors on the board (Female ratio board), audit committee (Female ratio audit comm.) and the binary indicators of female directors' presence in the same bodies (Dummy female on board and Dummy female on audit comm.). We also obtain negative coefficients for the variables representing the presence and proportion of female directors on the remuneration and the nomination committees, although these coefficients are statistically significant only for the IV-2SLS estimations shown in Panel B.

Overall, the above findings related to low default risk and reduced information asymmetry are consistent with the negative association between female directors and the cost of bank loans. Lenders who observe a general tendency of female directors towards risk aversion and preference for transparency can discount the presence of female directors as a sign of low default and information risks reflected eventually in low loan spreads.

[9] To the extent that we are trying to explore the general opinion that creditors might infer in relation to the expected effects of women directors on the firms default risk and information risk, our analysis used a complete panel of Australian listed firms made up of 8870 firm-year observations.

[10] Note that by way of construction a larger Z-score indicates lower default risk.

Table 7. Impact of female directors on default risk

This table present the estimations of regression equation (1) using OLS with standard errors clustered at the firm level in Panel A and 2SLS-IV in Panel B. The dependent variable is the firms default risk proxied by Altmans Z score (Z). Columns 1, 3, 5 and 7 of panel B presents the first stage estimations of female board and committee membership. Columns 2, 4, 6 and 8 presents the second stage estimations of female directors effect on the firms default risk. We use Ratio of males with female connections and Female ratio industry as instruments in the first stage regressions of panel B. Ratio of males with female connections is the proportion of male directors who have a seat on another board with female directors. Female ratio industry is the aggregate ratio of female directors at the two-digit SIC industry level. All variables are defined in Table 1. All models include controls of size (Firm size), profitability (ROA), leverage (Leverage) and investment opportunities (Q) as defined in Table 1. Firm SIC industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

Panel A. Pooled OLS estimations								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female ratio board	**4.6928*** **							
	(3.11)							
Dummy female on board		**1.0473*** **						
		(2.75)						
Female ratio audit comm.			**1.2582***					
			(1.83)					
Dummy female on audit comm.				0.3867				
				(1.31)				
Female ratio remuneration comm.					0.6974			
					(1.44)			
Dummy female on remuneration comm.						0.1202		
						(0.59)		
Female ratio nomination comm.							0.7119	
							(1.53)	
Dummy female on nomination comm.								0.0673
								(0.33)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	8870	8870	7469	7469	6195	6195	4560	4560
R-Squared	0.311	0.311	0.308	0.308	0.268	0.267	0.237	0.236
Panel B. 2SLS-IV estimations								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
	Female ratio board	Z	Female ratio audit comm.	Z	Female ratio remunera-tion comm.	Z	Female ratio nomination comm.	Z
Ratio of males with female connections	**0.2559*** **		**0.2790*** **		**0.2659*** **		**0.2262*** **	
	(40.64)		**(27.42)**		**(23.27)**		**(17.32)**	
Female ratio industry	**0.1124*** **		0.0597		**0.1016***		0.0716	
	(3.70)		(1.26)		**(1.93)**		(1.18)	
Female ratio board		**5.6382** **						
		(1.97)						
Female ratio audit comm.				2.5570				
				(1.22)				
Female ratio remuneration comm.						0.1762		
						(0.09)		
Female ratio nomination comm.								-0.8325
								(-0.37)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	8870	8870	7469	7469	6195	6195	4560	4560
R-Squared	0.272	0.311	0.221	0.307	0.199	0.267	0.193	0.235
F-statistics	130.09***	148.9***	81.54***	123.8***	59.06***	84.73***	41.81***	53.21***
Under-ident. test	1413.2 ***		688.15***		505.98***		285.25***	
Weak ident. test	837.73 ***		377.52***		274.20***		151.17***	
Over-ident. test	1.519		2.108		0.638		0.02	
p-value of Sargan test	0.217		0.146		0.424		0.887	

Table 8. Impact of female directors on financial reporting

Regressions are estimated using OLS with standard errors clustered at the firm level (Panel A) and IV-2SLS estimates (Panel B). The dependent variable is the firms financial reporting quality proxied by the absolute value of discretionary accruals (Discretionary accruals) generated from the modified Jones model. Columns 1, 3, 5 and 7 of panel B presents the first stage estimations of female board and committee membership. Columns 2, 4, 6 and 8 presents the second stage estimations of female directors effect on the firms financial reporting quality. We use Ratio of males with female connections and Female ratio industry as instruments in the first stage regressions of panel B. Ratio of males with female connections is the proportion of male directors who have a seat on another board with female directors. Female ratio industry is the aggregate ratio of female directors at the two-digit SIC industry level. All variables are defined in Table 1. All models include controls of size (Firm size), profitability (ROA), leverage (Leverage) and investment opportunities (Q) as defined in Table 1. Firm SIC industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

Panel A. Pooled OLS estimations								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female ratio board	**-0.048*** (-2.96)**							
Dummy female on board		**-0.0113*** (-2.69)**						
Female ratio audit comm.			**-0.0213** (-2.12)**					
Dummy female on audit comm.				**-0.0072* (-1.66)**				
Female ratio remuneration comm.					-0.0148 (-1.37)			
Dummy female on remuneration comm.						-0.0055 (-1.20)		
Female ratio nomination comm.							-0.0149 (-1.36)	
Dummy female on nomination comm.								-0.0053 (-1.12)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	9750	9750	8332	8332	7119	7119	5042	5042
R-Squared	0.138	0.138	0.126	0.125	0.134	0.134	0.143	0.143
Panel B. 2SLS-IV estimations								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
	Female ratio board	ABS_DISC _ACCRUALS	Female ratio audit comm.	ABS_DISC _ACCRUALS	Female ratio remunera-tion comm.	ABS_DISC _ACCRUALS	Female ratio nomination comm.	ABS_DISC _ACCRUALS
Ratio of males with female connections	**0.2474*** (39.06)**		**0.2841*** (28.14)**		**0.2617*** (23.66)**		**0.2268*** (17.31)**	
Female ratio industry	**0.0781*** (2.77)**		0.0640 (1.39)		**0.1508*** (2.92)**		**0.1169* (1.94)**	
Female ratio board		**-0.175*** (-4.78)**						
Female ratio audit comm.				**-0.117*** (-3.75)**				
Female ratio remuneration comm.						**-0.109*** (-3.08)**		
Female ratio nomination comm.								**-0.134*** (-2.97)**
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	9750	9750	8332	8332	7119	7119	5042	5042
R-Squared	0.2706	0.130	0.220	0.114	0.193	0.122	40.80	0.122
F	130.14***	58.80***	84.93***	45.05***	61.89***	41.41***	0.181***	31.62***
Under-ident. test	1334.97***		728.855***		531.23***		289.66***	
Weak ident. test	771.08***		397.97***		285.86***		152.77***	
Over-ident. test	0.911		1.239		0.496		1.255	
p-value of Sargan test	0.340		0.265		0.481		0.262	

6. Discussion and conclusion

Women have traditionally suffered discrimination in the labour market and are still today under-represented in the upper echelons of corporations. Stereotyped views associate men with hard or technical skills which are key to attaining top managerial positions while women are associated with soft skills. Such stereotypical views cause the criteria for access to top corporate positions to be biased against women (Schein, 2007). The discrimination against women and the resulting under-representation in top corporate positions have given rise to academia's increasing interest in gender topics and have triggered legislative action to foster diversity in management teams (Humbert et al., 2019).

In the ongoing general debate on gender equality, we make a business case for the appointment of female directors by providing evidence of measurable benefits derived from

gender diversity on boards and committees. In this paper, we examine the effect of female directors on the spread of bank loans for a sample of Australian listed firms over the period 2002-2017. We find robust evidence that the presence of female directors on boards and committees is associated with lower loan spreads. These results are similar to evidence from the US market presented by Karavitis et al. (2021), who found that firms with gender-diverse boards enjoyed an average reduction of 52 basis points in loan spreads compared to firms with all-male boards.

These results are consistent with predictions on gender diversity from the perspectives of social role theory, agency theory and stakeholder theory. According to social role theory (Eagly, 2007), societal gender expectations shape stereotypically distinct female traits, including higher risk aversion and stronger ethical decision-making, both consistent with the lower loan spreads offered to firms with gender-diverse boards and committees. In addition, from the perspective of agency theory, the stronger monitoring performance of gender-diverse boards (Fondas & Sassalos, 2000; Nielsen & Huse, 2010) results in reduced agency costs in the relationships between managers and the rest of the stakeholders related to the firm. The strong monitoring activity of gender-diverse boards and committees reduces agency costs in the relationship with lenders and therefore the cost of new loans. Finally, stakeholder theory predicts that female directors—who show stronger traits of universalism than their male counterparts (Adams & Funk, 2012)—exhibit greater concern for other stakeholders beyond shareholders (Adams et al., 2011). This reduces the expropriation risk exposure lenders face and therefore the loan spread used to compensate for that risk.

In contrast to the idea of tokenism (Kanter, 1977), we also find evidence suggesting that the reduction in loan spreads is present from the first female director to sit on the board and its committees. Critical mass theory (Dahlerup, 2006) suggests that reaching a certain proportion of female workers in areas where women are underrepresented brings a qualitative change that accelerates equality between the minority group (women) and the majority group (men). The literature on gender diversity presents a wide range of values for this tipping point, with Kanter (1977) indicating a flexible value above 15%, Dahlerup (2006) 30% and Studlar & Mcallister (2002) from 10% to 35%. The expected benefits of gender diversity should be low or non-existent below the tipping point and should increase exponentially after it. Our results indicate not only that reductions in the loan spreads occur from the very first women director, but also that this effect is stronger for the first women and weaker for each additional female director added to the board. These results are in line with evidence from Usman et al. (2018) for the Chinese market, indicating that borrower firms with one, two and three or more female directors borrow at 3%, 5% and 6% lower interest rates than firms with "all-male" boards.

Our results also indicate the beneficial effects of female directors' influence and leadership status. We provide evidence that women exert a stronger positive influence when they hold a chair position than when they hold a regular directorial position. These results are consistent with previous evidence from Schwartz-Ziv (2017), Pucheta-Martínez et al. (2018) and Dobija et al. (2022), who reported stronger supervision by boards chaired by women. We also find that the influence of female directors is stronger when they are long-tenured board members. Firms with tenured female directors experience higher reductions in loan spreads in line with the stronger monitoring performance of long-tenured female directors reported by Bedard et al. (2004) and Gull et al. (2018).

Our findings add valuable insights for regulators and practitioners, given the growing debate about gender diversity on corporate boards. Additionally, our results provide companies with deeper knowledge about the importance of their corporate governance structure in determining the conditions to access external financing. Being aware of the corporate governance features that financial institutions use as a proxy for low risk might allow companies to achieve better outcomes when accessing financial markets.

The present study looked at a single market, Australia, which might constitute a limitation to the scope of the results. Board gender diversity may be the result of institutional features such as regulations, the welfare state, and labour or cultural institutions (Adams & Kirchmaier, 2013; Grosvold & Brammer, 2011), which are also interrelated. These features might also partially determine how board gender diversity is valued by financial market agents and therefore its effect on the cost of debt financing. A multi-country study might overcome this limitation and shed some light on the effect of gender diversity in different institutional settings. In addition, the use of a sample of listed firms subject to ASX rules on gender diversity and constant disclosure makes our results difficult to extrapolate to private firms. It would be extremely interesting to see whether the observed results are also present for small and medium-sized enterprises (SMEs).

As another future line of research, and given the ongoing debate about gender quotas, it would be interesting to consider the effects of the enforceability of the gender policies adopted in different markets. As mentioned in the introduction, Australia opted for the voluntary adoption of corporate gender diversity policies. Australian listed companies are under the "if not, why not" regime while other countries have adopted hard gender quota regulations (for instance Iceland, Italy and Norway) and others are discussing similar proposals. It would be of the utmost interest to make a comparative study of these two different forms of positive actions for reaching gender equality. Using quotas has the effect of achieving a rapid increase in the number of women directors, but it can lead to tensions between directors that might harm board functioning. Board appointees favored by the positive action of a quota regulation might suffer from a lack of legitimacy which would erode their ability to influence the board's deliberations. It would therefore be very useful to analyze whether the effects observed for gender diversity on crucial aspects—such as the cost of business financing—are affected by the form of gender incentives used (quotas or voluntary recommendations).

Finally, although the hypothesis of tokenism is widely established and accepted in the literature on gender diversity, our results call for further analysis of the concepts of tokenism and critical mass. The empirical evidence on the token gender effect and critical mass is inconsistent (Mackey et al., 2019). The magic number of three female directors has often been used in the literature as the critical mass that triggers effective changes in board behaviour. This figure might be related to the 30% tipping point indicated by Dahlerup (2006) in association with the average board size of around 10 members for studies conducted on samples of US-listed firms. However, we must ask ourselves whether this concept can be applied regardless of the size of the group considered. This reflection is particularly important given the significant variation in board size in different markets.

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Conflict of interests

The authors declare no conflict of interest.

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Table A.1. Impact of female directors on the average cost of debt

This table presents the OLS estimates with standard errors clustered at firm level predicting the average cost of debt calculated as the ratio of Interest cost to the average book value of interest paying debt (Average debt cost). Female ratio board is the number of female directors scaled by the total number of board directors. Female ratio audit comm. is the number of female audit committee members scaled by the total number of audit committee directors. Female ratio remuneration comm. is the number of female remuneration committee members scaled by the total number of remuneration committee directors. Female ratio nomination comm. is the number of female nomination committee members scaled by the total number of nomination committee directors. Dummy female board, Dummy female audit comm., Dummy female remuneration comm. and Dummy female nomination comm. are dummy variables that take the value of one if there are female directors at the board, the audit committee, the remuneration committee and the nomination committee respectively and zero otherwise. All models include controls of size (Firm size), profitability (ROA), leverage (Leverage) and investment opportunities (Q) as defined in Table 1. Firm SIC industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female ratio board	**-0.0531*** **							
	(-3.14)							
Dummy female board		**-0.0152*** **						
		(-3.36)						
Female ratio audit comm.			**-0.0275*** **					
			(-2.68)					
Dummy female audit comm.				**-0.0112*** **				
				(-2.73)				
Female ratio remuneration comm.					**-0.018*** **			
					(-2.59)			
Dummy female remuneration comm.						**-0.00752*** **		
						(-2.82)		
Female ratio nomination comm.							**-0.0198*** **	
							(-2.67)	
Dummy female nomination comm.								**-0.00812*** **
								(-2.78)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	6970	6970	5946	5946	5000	5000	3772	3772
R-Squared	0.0483	0.0489	0.0428	0.0430	0.0739	0.0741	0.0874	0.0878
F	8.381	8.772	6.937	7.043	8.638	8.794	6.899	6.997
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table A.2. Results for female board and committee gender diversity (Blau Index) - Loan spread and average cost of debt

Regressions are estimated using OLS with standard errors clustered by borrower firm level. The dependent variable LNLoan spread is the natural logarithm of interest rate spread on a loan (over the LIBOR) plus any associated fees in originating the loan. The variables of interest: BLAU BD, BLAU AC, BLAU RC, BLAU NC, are Blaus indexes proxying gender diversity at the board, the audit committee, the remuneration committee or the nomination committee respectively. All models include controls of size (Firm size), profitability (ROA), leverage (Leverage) and investment opportunities (Q) as defined in Table 1. Panel A includes loan specific controls as in Table 3. Firm SIC industry and year dummies are included in the estimations. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

Panel A: Loan spread (LNLoan spread) on female board and committee gender diversity				
	(1)	(2)	(3)	(4)
BLAU BD	**-0.873*** **			
	(-4.05)			
BLAU AC		**-0.452*** **		
		(-3.44)		
BLAU RC			**-0.513*** **	
			(-3.48)	
BLAU NC				**-0.546*** **
				(-3.42)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
No. of Obs.	415	409	367	308
R-Squared	0.695	0.687	0.699	0.701
F	38.11	37.09	39.79	46.14
p	0.0000	0.0000	0.0000	0.0000
Panel B: Average cost of debt on female board and committee gender diversity				
	(1)	(2)	(3)	(4)
BLAU BD	**-0.0262*** **			
	(-3.86)			
BLAU AC		**-0.0149*** **		
		(-2.73)		
BLAU RC			**-0.0141** **	
			(-2.41)	
BLAU NC				**-0.0187*** **
				(-3.27)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
No. of Obs.	6970	5946	5000	3772
R-Squared	0.104	0.0992	0.114	0.124
F-statistics	13.85	11.63	12.24	9.156
p-value	0.0000	0.0000	0.0000	0.0000