

Does Board Diversity Mitigate Risk? The Effect of Homophily and Social Ties on Risk-Taking in Financial Institutions  
RUNNING TITLE:  
Examining the effect of several aspects of board diversity and social networks on risk in US financial institutions using structural equations models for the 2010-2022 period.



Noora Alzayed, Bernardo Batiz-Lazo, Rasol Eskandari

PII: S0275-5319(24)00099-0

DOI: <https://doi.org/10.1016/j.ribaf.2024.102306>

Reference: RIBAF102306

To appear in: *Research in International Business and Finance*

Received date: 7 January 2023

Revised date: 2 October 2023

Accepted date: 1 March 2024

Please cite this article as: Noora Alzayed, Bernardo Batiz-Lazo and Rasol Eskandari, Does Board Diversity Mitigate Risk? The Effect of Homophily and Social Ties on Risk-Taking in Financial Institutions  
RUNNING TITLE:  
Examining the effect of several aspects of board diversity and social networks on risk in US financial institutions using structural equations models for the 2010-2022 period., *Research in International Business and Finance*, (2024)  
doi:<https://doi.org/10.1016/j.ribaf.2024.102306>

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Does Board Diversity Mitigate Risk? The Effect of Homophily and Social Ties on Risk-Taking in Financial Institutions

**RUNNING TITLE:** Examining the effect of several aspects of board diversity and social networks on risk in US financial institutions using structural equations models for the 2010-2022 period.

Noora Alzayed<sup>1</sup>, Bernardo Batiz-Lazo<sup>3,4\*</sup>, Rasol Eskandari<sup>2</sup>

<sup>1</sup> University of Bahrain, Accounting Department, Kingdom of Bahrain

<sup>2</sup> Salford Business School, University of Salford, Salford, United Kingdom

<sup>3</sup> Newcastle Business School, Northumbria University, United Kingdom

<sup>4</sup> Facultad de Economía y Negocios, Universidad Anáhuac, Mexico

\*Correspondence:

Bernardo Batiz-Lazo, Newcastle Business School, Northumbria University, United Kingdom

Email: bernardo.batiz-lazo@northumbria.ac.uk

**ACKNOWLEDGMENTS:** We appreciate constructive feedback and helpful suggestions from Saeed Akbar, Sergio Castellanos-Gamboa, Niall MacKenzie, Andrew Perchard, Aly Salama, Abdus Sobhan and anonymous reviewers. Also from the participants of the 1st annual Academy of Sustainable Finance, Accounting, Accountability and Governance (ASFAAG) conference.

**CONFLICT OF INTEREST:** The authors report there are no conflict of interests to declare.

## ABSTRACT

**Research Question/Issue:** This study investigates whether greater board diversity and looser social network ties have an impact on board independence and risk-taking in US financial institutions from 2010 to 2022. The econometric strategy involved structural equation models, where risk as a dependent variable was measured by two latent variables and a total of five measures of risk. Several aspects of board diversity were utilized including gender, social, experience and educational backgrounds.

**Research Findings/Insights:** The findings suggested that diversity in nationality had a significant positive effect, while age and gender diversity had a minor effect on mitigating risk. Two measures of educational diversity had mixed results while suggesting that financial education is associated with greater risk. Also, social networks had a significant effect on risk-taking, especially on market risk.

**Theoretical/Academic Implications:** The study highlights the importance of maintaining a sensible level of board diversity across all aspects to avoid issues of cohesion and poor communication. This implication arises from the conclusion that too diverse a board might suffer from the lack of cohesion and communication, while a board with very low diversity will not be able to benefit from diverse backgrounds and expertise.

**Practitioner/Policy Implications:** Results from this study recommend incorporating social networking requirements in defining the independence of directors.

**Keywords:** Board diversity, financial institutions, risk taking, social networks, structural equation model.

## 1. INTRODUCTION

Research in this text suggests that corporate governance arrangements for financial institutions differ from those of non-financial firms. This as financial institution boards of directors are typically larger, more independent, and subject to greater scrutiny (de Andres, Romero-Merino, Santamaria, & Vallelado, 2012; García-Meca, García-Sánchez, & Martínez-Ferrero, 2015). Indeed, the Basel Committee on Banking Supervision (2006, 2015) emphasizes the importance of corporate governance in financial institutions and calls for better understanding of its relationship with risk-taking (Berger, Kick, & Schaeck, 2014; Laeven & Levine, 2009). But despite many corporate governance codes of conduct across the world

assigning the responsibility of monitoring and ensuring the effectiveness of risk management to the board of directors in financial institutions (Basel Committee on Banking Supervision, 2015; Financial Reporting Council, 2018; OECD, 2015), most systematic empirical studies of corporate governance examine performance within the non-financial sector (Bernile, Bhagwat, & Yonker, 2018; Harjoto, Laksmana, & Yang, 2018; Poletti-Hughes & Briano-Turrent, 2019), while only a handful of systematic studies address the impact of board diversity on risk-taking in financial institutions (Akbar Kharabsheh, Poletti-Hughes, & Shah, 2017; Minton, Taillard & Williamson, 2014; Wang & Hsu, 2013).

Research on governance issues resulting from the diversity of boards of directors' dates to the influential contributions of Carter, Simkins, and Simpson (2003) and Fields and Keys (2003). This research marked a departure from the prevailing agency theory perspective focused on shareholder value (e.g. Daily, Dalton, and Cannella (2003) and Hillman and Thomas (2003)). The study of board diversity has since become an important area of investigation in understanding the dynamics and effectiveness of corporate governance practices.

Exploring the heterogeneity of boards can include factors such as directors' age, gender, ethnicity, experience, and education (Anderson, Reeb, Upadhyay, & Zhao, 2011). The existing literature on corporate leadership diversity primarily focuses on gender diversity (Teodósio, 2021), but recent research suggests that other dimensions such as age, nationality, ethnicity, professional background, and cognition should also be considered.

For instance, a review conducted by Kent Baker, Pandey, Kumar, and Haldar (2020) show that studies on board diversity focus mainly on gender diversity, while less attention is given to age, nationality, ethnicity, professional background, and cognition. Studies by Bernile et al. (2018) and Harjoto et al. (2018) are example of some of the few to investigate the multi-

faceted impact of board diversity, including age, gender, ethnicity, education, and experience, on risk-taking. They suggest that gender diversity might not be the most important dimension to explore the link between board diversity and risk-taking. These studies highlight the importance of broadening the study of board diversity and its impact on risk-taking. Indeed, recent research by Bernile et al. (2018) was, to the best of our knowledge, the only study to investigate the multi-sided effect of board diversity. However, this research was limited to non-financial firms, highlighting the need for further exploration within the financial sector.

This paper contributes to the extant literature on corporate governance by examining the impact of board diversity on risk-taking attitudes within the financial sector. Additionally and following Abdelbadie and Salama (2019), the study explores the effect of board diversity and social ties on risk-taking. Case studies in the aluminum industry documented in Perchard and MacKenzie (2020) suggested that the social homogeneity within boards of directors, known as homophily, is detrimental to the long-term performance of firms. Social capital theory suggests that directors with similar educational backgrounds, past experiences, gender and ethnicity are more likely to form ties and appoint individuals with similar background, which can influence individual behavior and the flow and quality of information, ultimately impacting on economic outcomes (Cohen, Frazzini, & Malloy, 2010; Granovetter, 2005; Hwang & Kim, 2009; Westphal, Boivie, & Chng, 2006). In this regard, Berger, Kick, Koetter, and Schaeck (2013) study the impact of board diversity and social networks on executive appointments in banks, but to the best of our knowledge and with the exception of Abdelbadie and Salama (2019), there has been no attempt to explore the impact of board diversity and social ties on risk-taking by financial institutions.

In short, the research discussed in this paper makes a valuable contribution to the ongoing discussions in the field of corporate governance by examining the influence of board diversity and social ties on different measures of risk attitudes within financial institutions. The paper is

structured to provide a contextual background in the following section, followed by a detailed description of the data and variables used in the empirical analysis. The fourth section presents the econometric strategy employed, and the final section offers preliminary conclusions.

## **2. LITERATURE REVIEW**

### **2.1 *Social diversity and Homophily***

Walt and Ingley (2003) state that the concept of diversity in corporate governance relates to board composition and the varied combination of attributes, characteristics and expertise contributed by individual board members in relation to board process and decision-making. Theories behind board diversity include the social categorization framework developed by Turner (1987), which describes the circumstances under which people will classify themselves and others as a group using salient characteristics such as age and gender. This approach also states that people form a social identity by identifying themselves as members of a group (Tajfel & Turner, 1986). The theory predicts that categorizing people into groups could create biases, where people are likely to favor members of the group and perceive non-members as less trustworthy, dishonest, and less cooperative than group members (Tajfel, 1974). In addition, the similarity/attraction theory and the homophily principle (i.e. affinity for similar others) suggest that people are attracted to others who hold similar attributes to themselves such as attitudes and values (Berger et al., 2013; Byrne, Clore, & Worchel, 1966). These theories put forward the idea that diversity affects groups processes and performances by altering communications among members and by creating negative attitudes toward dissimilar individuals (Riordan & Shore, 1997). The homophily principles further suggest that homogeneity among directors has powerful implications for the information they receive, the attitudes they form, and the interactions they experience (Miller, Lynn, & James, 2001).

Homophily is also believed to be the basis of constructing network ties, where social capital theory suggests that people form social ties based on homophily and similarity of attributes such as age, gender or educational background (Berger et al., 2013; Miller et al., 2001). Consequently, social networks along with other aspects of diversity have the potential to have an impact on economic outcomes, individual behaviors and decision-making because they affect the flow and quality of information (Cohen et al., 2010; Granovetter, 2005; Hwang & Kim, 2009; Westphal et al., 2006).

Group diversity in boards of directors has advantages and disadvantages (Berger et al., 2013; Erhardt, Werbel, & Shrader, 2003; Wang & Hsu, 2013; Webber & Donahue, 2001). Diversity is believed to enhance group performance because diverse groups with members from different perspectives have a greater pool of knowledge, skills, experiences and abilities (Anderson et al., 2011; Berger et al., 2013; Webber & Donahue, 2001), have more ability to solve complex issues and are able to come up with creative solutions to tasks (Harjoto et al., 2018). These advantages of diversity affect board performance by contributing to a more thorough decision-making process (Berger et al., 2013) and providing greater access to information which results in better oversight and monitoring (Anderson et al., 2011; Erhardt et al., 2003). In addition, board diversity leads to social heterogeneity among directors which is helpful in bringing diverse social viewpoints and developing new strategies (Anderson et al., 2011).

On the other hand, group diversity might have an adverse impact on board functioning resulting from less cohesion that hinders the decision-making process (Harjoto et al., 2018; Wang & Hsu, 2013), complicated communications, coordination difficulties and increased internal conflict due to different backgrounds of directors (Anderson et al., 2011; Berger *et al.*, 2013; Wang & Hsu, 2013). This suggests that too much diversity on a board of directors might

lead to inability to reach consensus on risk policies and unbalanced decision-making processes which affects corporate outcomes such as risk-taking (Berger et al., 2013; Bernile et al., 2018).

But as mentioned above, board diversity can be reflected in a number of dimensions. Empirical studies that have examined board diversity include Harjoto et al. (2018) who found that diverse boards are more effective in monitoring corporate investment activities than homogeneous boards. In addition, Anderson et al. (2011) and Erhardt et al. (2003) show that board diversity is positively associated with firms' performance, while García-Meca et al. (2015) show that board diversity has less influence on bank performance in contexts of weaker regulatory and lower investor protection. García-Meca et al. (2015) also find that the type of diversity is important in banks. Berger et al. (2013), Bernile et al. (2018) and Abdelbadie and Salama (2019) are the only studies that combine board diversity and board networks to examine their effect on outsider appointment. They found that similarity of age and gender increase the chances of the outsider appointments and that greater social networks also increase the probability of an outside appointment. They also found that diverse boards adopt more persistent and less risky financial policies and have more efficient innovation processes.

These studies include several aspects of board diversity including age, gender, ethnicity, education and experience which are studied in the context of a single index. However, the validity of using a single index to capture a complex concept such as corporate governance has been questioned by researchers (Black, de Carvalho, Khanna, Kim, & Yurtoglu, 2017; Sheikh, 2019). Also, their measurements of the education and experience diversity only account for some aspects of these variables. For education diversity, they measure the diversity of institutions that granted Bachelor's degrees to directors, but ignore the level and number of qualifications and the financial education aspect. For experience diversity, they include two measurements which are the financial experience and the mean number of other boards on which current directors serve. The latter variable only measures current experience and does



not take into account the past experiences of directors, it also does not take into account other professional experiences including legal, executive and consultation.

Table 1 further shows that diversity in the composition of the board of directors has been measured in a number of ways. Table 1 also suggests mixed results from fieldwork. Each of these dimensions is discussed in greater detail below where it will be evident that some of them have received little attention.

*[Table 1 near here]*

## **2.2 Age and Gender**

As noted in Table 1, age as a component of board diversity has received widespread attention. Berger et al. (2014) found that greater board age decreases risk-taking. In addition, Wang and Hsu (2013) show that age heterogeneity results in good operational risk management but has an adverse impact on the monitoring function of the boards. However, Harjoto et al. (2018) found no association between several aspects of board diversity including age and board performance.

Gender diversity of boards is another aspect that has been widely researched. Altunbaş, Gambacorta, Reghezza, and Velliscig (2022) show that gender diversity has mitigating effects on climate change. They believe that the negative effect is due to the pro-environmental traits of female personalities, such as social sensitivity and risk-aversion, which help female managers better contain the environmental impact of their decisions about how to implement the board's strategy.

In addition, García-Meca et al. (2015) provide empirical evidence that gender diversity increases performance in banks and qualified women have unique characteristics that create additional value. Their results also suggest that women on boards of banks enhance governance. Also, Jizi and Nehme (2017) found that the presence of women boards favourably

impact the risk of firms by reducing stock return volatility. However, Berger et al. (2014) justify the negative impact of female presence on portfolio risk by the lower experience of female directors in comparison to their male counterparts. On the other hand, Farag and Mallin (2017) found that female directors are not risk averse in European banks.

### **2.3 Education**

Table 1 also suggest there has been an interest in exploring the effects of formal education background on risk and performance. The Basel Committee recommends banks to have adequate collective knowledge of each of the types of material financial activities the bank intends to pursue. They also recommend the board to have sufficient knowledge and expertise to enable effective governance and oversight (Basel Committee on Banking Supervision, 2006). In addition, the Organisation for Economic Co-operation and Development (OECD) provide a report of the financial crisis. They state that one of the causes of the crisis was boards' limited knowledge and poor understanding of risk managements (Kirkpatrick, 2009).

Education diversity has been measured differently in different studies. Berger et al. (2014) measured education diversity by the presence of executives with doctoral degrees and found that it is associated with a decrease in portfolio risk. They believe that this result implies that educated directors apply better risk management techniques. In addition, Anderson et al. (2011) measure education diversity based on the educational levels and types of degrees the directors have achieved. For education levels, they use education categories; no college degree, a Bachelor's degree only, or a Master's degree or beyond. For the types of degrees, they calculate the percentage of directors with an MBA degree, a technical degree, a law degree, or a liberal arts degree. They found that board diversity including education diversity has a positive relationship with firms' performance. Dionne et al. (2019) study the effect of financial knowledge on risk management. In their study, financial knowledge is measured by financial experience, financial education, or accounting background. Their findings show that directors'

financial knowledge increases a firm's value and that financially educated directors are more effective in hedging activities. They believe that their findings have regulatory implications suggesting that experience and education dimensions should be added to corporate governance regulation for better governance.

#### **2.4 Financial Experience**

The diversity of board experience is a very important board characteristic that has been found to have a significant effect on various aspects of the firm. Harjoto et al. (2018) found that task-oriented diversity including expertise diversity has a negative impact on suboptimal investment, which suggests that boards with diverse experiences are more effective in overseeing corporate investment activities. They categorize board experience as financial, consulting, legal, management, and other expertise. Similarly, Anderson et al. (2011) used four measures of experience which are the percentage of directors that are CEOs of other firms, the functional background of directors, the heterogeneity of director career development, and the number of senior positions that each director has held during their career. They found that board diversity including experience have a positive effect on firm performance. In addition, Cao, Sun & Yuan (2019) found that foreign experience of directors reduces stock prices crash risk and this effect is more pronounced for firms with more agency problems and weaker corporate governance.

For financial institutions, financial experience is more important than the other sectors. The OECD report on the causes of the 2007-2009 financial crisis argued that the lack of financial expertise of directors played a major role in the difficulties endured by financial institutions during the crisis (Kirkpatrick, 2009). The report also explains that financial expertise among directors is low in financial institutions in the US (Kirkpatrick, 2009). Minton et al. (2014) found that the presence of financial experts is positively related to risk-taking using several measures of risk. They explain that this result is due to the fact that financially

experienced directors have a better understanding of complex investments and encourage bank management to increase risk-taking. In their study, a director is considered a financial expert if the director has held an executive position at a banking institution, holds an executive position at a non-bank financial institution, holds a finance-related position, accountant, treasurer of a non-financial firm, holds an academic position in a related field, or works as a hedge fund or private equity fund manager.

## **2.5 Nationality and Ethnicity**

Most studies that investigate board diversity do not include the race, ethnicity or nationality of directors, the empirical studies on the impact of ethnicity and nationality on risk-taking are even more limited. Bernile et al. (2018) is one of the limited studies that incorporates a diversity index to study board diversity's effect on risk-taking in non-financial firms. Their diversity index includes the ethnicity of directors and found that greater board diversity leads to lower risk-taking. In addition, Harjoto et al. (2018) investigate the effect of relation-oriented diversity including race on board performance in corporate investment oversight. Their findings show no association between relation-oriented diversity and board performance. They include five categories of race which are Asian, Black, Caucasian, Hispanic, and Native American.

Studies that investigate the effect of board race and nationality on a firm's performance include Anderson et al. (2011) who measure board diversity along several dimensions including board race, they found that board diversity has a positive effect on a firm's performance. They explain that these results are due to the fact that directors from different cultural backgrounds provide new perspectives and problem-solving skills to board discussions. Similarly, Erhardt et al. (2003) found that ethnic diversity has a positive effect on firms' financial performance. On the other hand, García-Meca et al. (2015) show that diversity in nationality decreases bank performance and explain that this due to the fact that demographic

differences lower cohesion between groups which leads to slowing the decision-making process and eventually reduces bank performance.

Based on the above discussed aspects of board diversity, we distil our main working hypothesis, namely:

*H1: Greater board diversity reduces risk taking in financial institutions.*

## **2.6 Social Ties**

Board networks have been shown to influence strategic decisions and corporate policies. The effect of social networks has been studied across several aspects including merger and acquisition (El-Khatib, Fogel, & Jandik, 2015), bond yield spreads (Qiu, Su, & Xiao, 2019), preferential source of financing (Engelberg, Reed, & Ringgenberg, 2012), both stock option pay and board reform (Yoshikawa, Shim, Kim, & Tuschke, 2020), executive appointments (Berger et al., 2013), credit ratings (Khatami, Marchica, & Mura, 2016) and firm performance (Fan, Boateng, King, & MacRae, 2019; Kim, 2005; Larcker, So, & Wang, 2013; Zona, Gomez-Mejia, & Withers, 2015). However, few studies have examined the effect of board social networks on risk-taking of financial institutions. These studies include Abdelbadie and Salama (2019) who found that well connected directors mitigate their credit and insolvency risk. However, this study focuses on banks only.

Figures 1 and 2 had a preliminary look at the behavior of social ties within the selected sample (details of the sample are provided in the third section below). Figure 1 shows at least eleven clusters of directors' networks that collect 3327 individual interlocks, which suggests high connectedness and possibly indirect ties. While figure 2 visualizes the connections among financial institutions for the period from 2010 to 2022 and suggest that there are at least six clusters of financial institutions' ties.

*[Figure 1 near here]*

*[Figure 2 near here]*

Social networks are believed to provide firms with strategic resources that help in creating competitive advantages (Yoshikawa et al., 2020). However, existing studies have different results on the benefits of social networks. In studying the effect of social networks on firm performance, Larcker et al. (2013) found that firms with well-connected boards earn higher returns. However, Kim (2005) found that while a moderate level of board network enhances firms' performance, too cohesive a board network destroys it. Similarly, Fan et al. (2019) found that social ties tend to destroy firm value whereas professional ties do not.

Qiu et al. (2019) investigate the effect of social networks on the cost of debt capital. They found that networks of top management teams have a negative correlation with bond yield spreads. They also found that top management team networks increases a firm's access to media coverage, political ties, and financial ties, which in turn can help lower bondholder's risk premiums. They believe that these results imply that networks of firms' top management can help obtain more resources due to improved reputation and image. Similarly, Khatami et al. (2016) found that the social connection between firms and the rating agencies has a positive effect on the credit ratings assigned to the company's issues. Finally, Yoshikawa et al. (2020) show that social networks carry information to directors that affects the director's interests and hierarchical power, which in turn affects the actions of adopting new practices.

*H2: Diffused directors' social networks reduce risk taking in financial institutions.*

### **3. EMPIRICAL SUPPORT**

#### **3.1 Sample Data**

The data covers the period from 2010 to 2022. It includes publicly listed financial institutions in US markets. The financial data was collected from Bloomberg, while the data related to the board diversity variables and board networks was obtained from BoardEx. The

selection of financial institutions is based on the Global Industry Classification System (GICS), which includes banks, insurance, and diversified financial companies.

### 3.2 *Dependent Variable: Risk-taking*

Proxies for risk-taking measurements built on prior literature while considering that there were only a handful of studies that explored measures of risk and board characteristics or diversity. Specifically, following Ho, Lai & Lee (2013) estimates of the impact of board composition on alternative risk measures, we included two types of risk-taking measurements, namely market risk and specific risk. Incorporating two types of risk enabled to explore a firm's level and the firm's sensitivity to market.

Two risk measurements approximated market risk, namely: **Stock Return Volatility** (Bernile et al., 2018; Cain & McKeon, 2016; Cassell, Huang, Manuel Sanchez, & Stuart, 2012; Christy, Matolcsy, Wright, & Wyatt, 2013; Deyoung, Peng, & Yan, 2013; Erkens, Hung, & Matos, 2012; Ferris, Javakhadze, & Rajkovic, 2017; Guay, 1999; Hutchinson, Seamer, & Chapple, 2015; Jizi & Nehme, 2017; Minton et al., 2014; Nakano & Nguyen, 2012; Pathan, 2009; Saunders, Strock, & Travlos, 1990; Sheikh, 2019) and **Idiosyncratic Risk** (Akbar et al., 2017; Cassell et al., 2012; Deyoung et al., 2013; Ferreira & Laux, 2007; Pathan, 2009; Sheikh, 2019; Wu, 2016). In our study, Stock Return Volatility was calculated as the annualized standard deviation of the daily stock returns, and the Idiosyncratic Risk was measured as the standard deviation of the residuals derived from regressing daily stock return on market return in each year.

To approximate Specific Risk, we use three risk measurements namely Z-score (Akbar et al., 2017; Berger, Imbierowicz, & Rauch, 2016; Hutchinson et al., 2015; Pathan, 2009), Leverage (Anginer, Demirguc-Kunt, Huizinga, & Ma, 2018; Bernile et al., 2018; Cassell et al., 2012; Ferris et al., 2017; Ho et al., 2013; Minton et al., 2014), and Return on Assets Volatility

(Ferris et al., 2017; Ho et al., 2013; John, Litov, & Yeung, 2008; Laeven & Levine, 2009; Mishra, 2011; Nakano & Nguyen, 2012; Pathan, 2009; Poletti-Hughes & Briano-Turrent, 2019). The Z-score was calculated as the return on assets plus equity to assets ratio divided by the standard deviation of return on assets, and high score of Z-score indicate lower risk. Return on Assets Volatility and Leverage are calculated as the standard deviation of return on assets and the ratio of total debt to total assets respectively.

### **3.3 Independent variables: Board Diversity**

To cover all aspects of board diversity, we include seven measurements to account for five types of board diversity. The first aspect of diversity is gender diversity calculated as the percentage of female directors to the total number of directors. Second, age diversity is measured as the standard deviation of the ages of all directors in the board following Anderson et al. (2011), Bernile et al. (2018) and Wang and Hsu (2013). Third, nationality diversity is measured as the proportion of directors from different countries.

Fourth, we use two measurements of educational diversity; the diversity of qualifications and financial knowledge. For qualification diversity, we calculate the standard deviation of the number of all qualifications held by directors, including professional qualifications. The financial knowledge diversity is calculated as the percentage of directors on a board that hold a financial or accounting degree or certificate.

For experience diversity, we calculate financial experience and professional experience. Financial experience is calculated as the percentage of directors with previous financial experience. To measure professional experience, we use the Herfindahl index based on percentage of directors' expertise within five categories: financial, consulting, legal, management (executives), and other expertise (research, technology, medical, etc.) following Harjoto et al. (2018).



Figures 1 and 2 present a preliminary analysis of institutions' and directors' social ties within the sample. Figure 1 shows 3327 social ties between directors, with at least 11 main clusters. Most clusters in this map are connected to each other, which suggests the presence of indirect networking between directors. Figure 2 shows social networks of 1,912 firms in the sample. There are at least six main clusters with a range between two to six sub-clusters. Unlike the directors' networking map, the institutions' networking map shows that there are isolated clusters that are not connected to other groups. The analysis suggests that social ties is an important aspect and that we can regard our sample as highly connected.

We used two measurements as proxy for board network. The first was inside network size. Following Fan et al. (2019) in studying Board and CEO ties, the first measure was the log of total network size of directors that share professional and/or educational background with another director within the board. The second network measurement is the log of the total outside network size of director measured as the number of overlaps through employment and education as provided by BoardEx.

### **3.4 Control variables**

For the linear regression, we use control variables drawn from the literature on board diversity and board social networks. The most common control variables are the **Firm Size** (Akbar et al., 2017; Altunbaş, Thornton, & Uymaz, 2018; Berger et al., 2013, 2014; Bernile et al., 2018; Cao et al., 2019; Dionne et al., 2019; Erhardt et al., 2003; García-Meca et al., 2015; Harjoto et al., 2018; Ho et al., 2013; Jizi & Nehme, 2017; Khatami et al., 2016; Kim, 2005; Larcker et al., 2013; Minton et al., 2014; Poletti-Hughes & Briano-Turrent, 2019; Wang & Hsu, 2013; Wu, 2016; Yoshikawa et al., 2020) and the **Board Size** (Anderson et al., 2011; Berger et al., 2013, 2014; Bernile et al., 2018; Erhardt et al., 2003; Fan et al., 2019; García-Meca et al., 2015; Jizi & Nehme, 2017; Kim, 2005; Minton et al., 2014; Poletti-Hughes & Briano-Turrent, 2019; Yoshikawa et al., 2020). Other control variables used in board diversity

studies include **Market to Book ratio** (Akbar et al., 2017; Bernile et al., 2018; Cao et al., 2019; Dionne et al., 2019; Jizi & Nehme, 2017; Larcker et al., 2013; Wu, 2016), **Board Independence** (Anderson et al., 2011; Fan et al., 2019; García-Meca et al., 2015; Harjoto et al., 2018; Jizi & Nehme, 2017; Larcker et al., 2013; Minton et al., 2014; Poletti-Hughes & Briano-Turrent, 2019), and **CEO Duality** (Bernile et al., 2018; Fan et al., 2019; García-Meca et al., 2015; Jizi & Nehme, 2017).

#### 4. ECONOMETRIC STRATEGY

##### 4.1 Structural Equation Model

We include two Structural Equation Models (SEM) to examine the effect of board diversity and social ties on risk-taking. Researchers have supported the use of SEM as means of theory testing (Bhaduri & Selarka, 2016; Cliff, 1983; Dolan, Bechger, & Molenaar, 1999; Freedman, 1987). The SEM includes two latent variables which are Stand Alone Risk (that loads three measurements of risk), and Market Risk (which loads two measurements of risk). The five observable variables in the measurement model that load the latent variables are the Z-score, ROAV, Leverage, Idiosyncratic Risk, and Stock Return Volatility. The measurement models are specified as follows:

$$ROAV_{i,t} = \alpha_2 + \beta_2 LV StandAlone Risk_{i,t} + \varepsilon_{1,i,t} \quad (1)$$

$$Z - score_{i,t} = \alpha_1 + \beta_1 LV StandAlone Risk_{i,t} + \varepsilon_{2,i,t} \quad (2)$$

$$Leverage_{i,t} = \alpha_3 + \beta_3 LV StandAlone Risk_{i,t} + \varepsilon_{3,i,t} \quad (3)$$

$$Stock Return Volatility_{i,t} = \alpha_4 + \beta_4 LV Market Risk_{i,t} + \varepsilon_{4,i,t} \quad (4)$$

$$Idiosyncratic Risk_{i,t} = \alpha_5 + \beta_5 LV Market Risk_{i,t} + \varepsilon_{5,i,t} \quad (5)$$

Where  $LV StandAlone Risk_{i,t}$  and  $LV Market Risk_{i,t}$  are the latent variables that represent the stand-alone risk and market risk for the institution  $i$  in the year  $t$ . Z-score, ROAV,

Leverage, Idiosyncratic Risk, and Stock Return Volatility are the observed variables.  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$  and  $\beta_5$  are the factor loadings that show how the observed indicators determine scores of latent variables.  $\varepsilon$  represents the residual. This measurement model is the same for both SEMs (board diversity and social ties)

The structural model for the first SEM includes the board diversity variables as the exogenous variables and the predictors of the latent variables defined in the measurement model. The structural model is specified as the following system of equations:

$$\begin{aligned} LV \text{ StandAlone Risk}_{i,t} = & \alpha_6 + \lambda_1 \text{Age Diversity}_{i,t-1} + \lambda_2 \text{Gender Diversity}_{i,t-1} + \\ & \lambda_3 \text{Nationality Diversity}_{i,t-1} + \lambda_4 \text{Financial Education Diversity}_{i,t-1} + \\ & \lambda_5 \text{Qualification Diversity}_{i,t-1} + \lambda_6 \text{Financial Experience}_{i,t-1} + \\ & \lambda_7 \text{Professional Experience}_{i,t-1} + \varepsilon 6_{i,t} \end{aligned} \quad (6)$$

$$\begin{aligned} LV \text{ Market Risk}_{i,t} = & \alpha_7 + \lambda_8 \text{Age Diversity}_{i,t-1} + \lambda_9 \text{Gender Diversity}_{i,t-1} + \\ & \lambda_{10} \text{Nationality Diversity}_{i,t-1} + \lambda_{11} \text{Financial Education Diversity}_{i,t-1} + \\ & \lambda_{12} \text{Qualification Diversity}_{i,t-1} + \lambda_{13} \text{Financial Experience}_{i,t-1} + \\ & \lambda_{14} \text{Professional Experience}_{i,t-1} + \varepsilon 7_{i,t} \end{aligned} \quad (7)$$

Where  $\text{Age Diversity}_{i,t-1}$ ,  $\text{Gender Diversity}_{i,t-1}$ ,  $\text{Nationality Diversity}_{i,t-1}$ ,  $\text{Financial Education Diversity}_{i,t-1}$ ,  $\text{Qualification Diversity}_{i,t-1}$ ,  $\text{Financial Experience}_{i,t-1}$  and  $\text{Professional Experience}_{i,t-1}$  are the board diversity and social network variables for the firm  $i$  in the year  $t - 1$ . LV StandAlone Risk and LV Market Risk are the latent variables defined in the measurement model.  $\lambda_1$  to  $\lambda_{14}$  are the regression coefficients.

The structural model for the second SEM includes the social ties variables as the exogenous variables and the predictors of the latent variables defined in the measurement model. The structural model is specified as the following system of equations:

$$LV\ StandAlone\ Risk_{i,t} = \alpha_6 + \lambda_1 OutsideNetwork_{i,t-1} + \lambda_2 InsideNetwork_{i,t-1} + \varepsilon_{6i,t} \quad (8)$$

$$LV\ Market\ Risk_{i,t} = \alpha_7 + \lambda_3 OutsideNetwork_{i,t-1} + \lambda_4 InsideNetwork_{i,t-1} + \varepsilon_{7i,t} \quad (9)$$

Where  $OutsideNetwork_{i,t-1}$  and  $InsideNetwork_{i,t-1}$  are the board diversity and social network variables for the firm  $i$  in the year  $t - 1$ . LV StandAlone Risk and LV Market Risk are the latent variables defined in the measurement model.  $\lambda_1$  to  $\lambda_4$  are the regression coefficients.

The variables and their definitions are listed in the variables' list. The exogenous variables were lagged by one year ( $t-1$ ). We ran the model with current variables and lagged it by one to three years. The results show that there is not much difference between laggings in terms of significance and model fit. Therefore, we lag the exogenous variables by one year to account for the lagged effect of board diversity and social networking on risk-taking.

#### 4.2 Linear Regression

To test the robustness of the effect of board diversity and social ties on risk-taking with the control variables, we estimate the following model:

$$Risk_{i,t} = \beta_0 + \beta_1 Age\ Diversity_{i,t-1} + \beta_2 Gender\ Diversity_{i,t-1} + \beta_3 Nationality\ Diversity_{i,t-1} + \beta_4 Financial\ Education\ Diversity_{i,t-1} + \beta_5 Qualification\ Diversity_{i,t-1} + \beta_6 Financial\ Experience_{i,t-1} + \beta_7 Professional\ Experience_{i,t-1} + \beta_8 Control_{i,t-1} + \varepsilon_{i,t} \quad (10)$$

$$Risk_{i,t} = \beta_0 + \beta_1 InsideNetwork_{i,t-1} + \beta_2 OutsideNetwork_{i,t-1} + \beta_3 Control_{i,t-1} + \varepsilon_{i,t} \quad (11)$$

Where  $Risk_{i,t}$  is one risk measurement for the company  $i$  in the year  $t$  out of the five different measurements of risk. In all risk measurements, a higher value indicates a higher risk, except for the Z-score where higher values indicate lower risk.  $Age Diversity_{i,t-1}$ ,  $Gender Diversity_{i,t-1}$ ,  $Nationality Diversity_{i,t-1}$ ,  $Financial Education Diversity_{i,t-1}$ ,  $Qualification Diversity_{i,t-1}$ ,  $Financial Experience_{i,t-1}$ ,  $Professional Experience_{i,t-1}$ ,  $InsideNetwork_{i,t-1}$ ,  $OutsideNetwork_{i,t-1}$  are the board diversity and social network variables for the firm  $i$  in the year  $t - 1$ .  $Control_{i,t-1}$  is a set of five variables that control for firm level.  $\varepsilon_{i,t}$  is the residual. We run a Hausman test which reveals that the null hypothesis is rejected, thus, all models include industry and year fixed effects.

The independent and control variables were lagged by one year (t-1) to account for lagged effects. The descriptions and definitions of all variables are detailed in the variables' list.

## 5. EMPIRICAL RESULTS

Table 4 and Figure 3 show the results of the SEM for the board diversity variables. Panel A reports the measurement model that shows the factor loadings of the risk measurements in the factor analysis. The variables ROA volatility and Leverage are positively loaded on the latent variable Stand-Alone Risk, while Z-score is negatively loaded. This means that the higher value of this latent variable indicates higher risk-taking, because the higher value of the Z-score indicates lower risk-taking. In addition, Idiosyncratic Risk and Stock Return Volatility are positively loaded on the latent variable Market Risk, which means that the higher value of Market Risk indicates more risk-taking.

[Table 4 near here]

*[Figure 3 near here]*

Panel B of Table 4 shows the results of the structural model. Age Diversity has a significant and positive effect on both the stand-alone and market risk. However, the effect is minor with a coefficient of only 0.152 for stand-alone risk, and 0.227 for market risk. These results are in line with Harjoto et al. (2018) who found no association between age diversity and board performance. In addition, Gender Diversity has a significant effect on risk-taking, but the effect is negative on stand-alone risk and positive on market risk. Also, similar to the age diversity, gender diversity's effect is low. The negative effect of female presence on stand-alone risk can be justified with the conclusion made by Berger et al. (2014) that female directors have lower experience in comparison to their male counterparts. Since greater age and gender diversity does not seem correlated with lower risk taking in financial institutions, these results thus reject the main hypothesis (H1).

The results show that nationality diversity has a significant and positive effect on risk. The effect also appears to be the strongest compared to the other variables. This result is supported by the increasing importance of nationality diversity in Europe. Borges (2011) reports that the of average non-national directors on European boards is 24%. The degree of diversity of nationality of Board members, reflects the demand for and importance of international competencies. However, Borges (2011) also reports that nationality diversity brings issues such as language difficulties and logistic problems. When comparing this result to other studies, they contradict the findings by García-Meca et al. (2015) who conclude that the demographic differences resulting from diversity of nationality lower cohesion between groups which leads to slowing the decision-making process. Also, the positive effect shown in our results is not in line with Bernile et al. (2018) who found that the diversity index (including ethnicity) leads to lower risk-taking. However, our results are not comparable to theirs, because the effect of ethnic diversity might have been offset by the other five variables in the same

index. Finally, since greater nationality diversity does not seem correlated with lower risk taking in financial institutions, this result thus rejects the main hypothesis (H1).

We include two aspects of education diversity, a general qualification aspect and another that is focused on financial education. Including more than one measurement will help us get a detailed view of the effect of diversity of education on risk-taking and enable us to compare between the importance of the type of qualification. The results show both general qualification and financial education diversity have more significant effect on stand-alone risk than the market risk. However, general qualification diversity has a negative effect, while financial education diversity has a positive effect. This indicates that financially educated board members influence the boards to take more risk.

For diversity of experience, we also include two measurements which are financial and professional. The professional diversity is measured using the Herfindahl-Hirschman index (HHI) which means that the higher value of this variable represents lower diversity. The results show that financial experience does not have a significant effect on risk-taking, while the diversity of professional experience has a significant and positive effect on market risk. This result is supported by the finding of Anderson et al. (2011) who found that board diversity including experience has a positive effect on firms' performance. This can be explained by Harjoto et al. (2018) conclusion that boards with diverse experiences are more effective in overseeing corporate investment activities.

Including several measurements of the same variable enables us to compare and contrast it with other variables from different angles. We have previously compared financial and non-financial aspects of the same variable. When comparing only the financial aspect of education and experience diversity, the results show that financial education has a more significant effect on risk than financial experience. This finding is in line with the corporate governance

principles of the Basel Committee on Banking Supervision (2015) and the corporate governance guide of NYSE Governance Services (2016); they both include board qualification as a main principle for selecting a board member.

Table 5 and Figure 4 show the results of the SEM to study the effect on board ties of alternative measures of risk-taking. The loadings of the latent variables in the measurement model are similar to the previous SEM suggesting that higher values of the latent variables indicate more risk-taking. Panel B reports the structural model of regressing Outside Network and Inside Network on the latent variables. The results show that both inside and outside ties of board members have more significant effect on the market risk than on stand-alone risk. However, outside network has a positive effect (in line with H2) while inside network has a negative effect (rejecting H2). This significant effect shows the important role of social ties in the decision process related to risk-taking. This important role is perhaps the result of the strategic resources provided by the board's social works which helps in creating competitive advantages (Yoshikawa et al., 2020). The positive effect of the outside network and the negative effect of the inside network is in line with Fan et al. (2019) who found that social ties tend to destroy a firm's value whereas professional ties do not. Also, it is worth mentioning that Kim (2005) found that while a moderate level of board network enhances firm performance, too cohesive a board network destroys it. Overall, the results on the effects of social networks are significant but the direction of the effect is inconclusive.

*[Table 5 near here]*

*[Figure 4 near here]*

Table 6 provides the results for estimating equation (10) to study the effect of board diversity on five risk measurements. Most of the linear regression results are consistent with the SEM's results except for a few differences. The SEM results show that nationality diversity



is very significant while it was not significant in the linear regression. Table 7 provides the results for estimating equation (11) to study the effect of board ties on five risk measurements. The results show consistency of the inside network effect on risk with the SEM's results reported in Table 5. However, the results of the outside network of boards are different, significant by linear regression and not significant by SEM.

*[Table 6 near here]*

*[Table 7 near here]*

For further analysis, we have divided the sample to two sub-samples; banks and non-banks. The results of the sub-samples were relatively similar to the full sample of financial institutions.

## **6. CONCLUSION**

The literature review provided by Teodósio (2021), recognizes the presence of women on the board of directors and top management teams has had an impact on the risk taking behavior of financial institutions. Research in this paper has expanded on those and similar findings to provide an improved understanding of the the impact of various diversity aspects, such as age, gender, nationality, education, and experience, on risk-taking in US financial institutions. We also included several dimensions of the same variable, level of qualification and financial aspect for diversity of education, and professional and financial aspects for diversity of experience.

The findings suggest that board diversity significantly affects risk-taking (H1), with the (financial) qualification of individual board members being the most influential factor. Age and gender also have a significant but minor effect on risk, while experience diversity is the least important, especially when compared to education. Regarding nationality diversity, our results are varied, it is very significant by the structural equations model (SEM) but not

significant by linear regression. Additionally, the study highlights the importance of social networks of directors in relation to risk-taking, particularly in terms of market risk, and emphasizes the need for further investigation and regulatory considerations in this area. Thus findings warn corporate governance codes of conduct not include blanket recommendations to increase or decrease aspects of diversity in the boards of financial institutions. As not all aspects of diversity reduce corporate risk taking.

The findings indicate that the social networks of directors (H2) have a significant impact on risk-taking, particularly in relation to market risk. However, due to the inconclusive nature of the results, further investigation is needed to understand how social ties can be regulated as a characteristic of directors. In this regard, the UK's corporate governance code recommends considering various aspects of diversity, including social backgrounds, in appointment and succession plans (Financial Reporting Council, 2018). This finding emphasizes the importance of incorporating the size and characteristics of social networks in defining the independence of directors. Specifically, include requirements related to the size of the network through measures that consider the intensity of relatedness inside and outside the Board for a director to be classified as independent.

Another important implication of our results is the importance of diversity in boards, emphasizing the need for a sensible level of diversity in nationality, social backgrounds, and education. Results suggested that overly diverse boards may face challenges in terms of cohesion and communication, potentially impacting the decision-making process. Conversely, boards with very low diversity may miss out on the benefits of diverse backgrounds and expertise. Financial institutions should consider these implications when appointing new directors.

## REFERENCES

- Abdelbadie, R. A., & Salama, A. (2019). Corporate governance and financial stability in US banks: Do indirect interlocks matter? *Journal of Business Research*, *104*(July), 85–105. <https://doi.org/10.1016/j.jbusres.2019.06.047>
- Akbar, S., Kharabsheh, B., Poletti-Hughes, J., & Shah, S. Z. A. (2017). Board structure and corporate risk taking in the UK financial sector. *International Review of Financial Analysis*, *50*, 101–110. <https://doi.org/10.1016/j.irfa.2017.02.001>
- Altunbaş, Y., Gambacorta, L., Reghezza, A., & Velliscig, G. (2022). Does gender diversity in the workplace mitigate climate change? *European Central Bank*. <https://doi.org/10.20955/r.85.67>
- Altunbaş, Y., Thornton, J., & Uymaz, Y. (2018). CEO tenure and corporate misconduct: Evidence from US banks. *Finance Research Letters*, *26*(July 2017), 1–8. <https://doi.org/10.1016/j.frl.2017.11.003>
- Anderson, R. C., Reeb, D. M., Upadhyay, A., & Zhao, W. (2011). The economics of director heterogeneity. *Financial Management*, *40*(1), 5–38. <https://doi.org/10.1111/j.1755-053X.2010.01133.x>
- Anginer, D., Demirguc-Kunt, A., Huizinga, H., & Ma, K. (2018). Corporate governance of banks and financial stability. *Journal of Financial Economics*, *130*(2), 327–346. <https://doi.org/10.1016/j.jfineco.2018.06.011>
- Basel Committee on Banking Supervision. (2006). *Enhancing corporate governance for banking organisations*. Bank for International Settlements. [https://doi.org/10.1016/s1093-3263\(98\)80024-7](https://doi.org/10.1016/s1093-3263(98)80024-7)
- Basel Committee on Banking Supervision. (2015). *Corporate governance principles for banks*. Bank for International Settlements. <https://doi.org/10.1002/9781118390443.ch16>
- Berger, A. N., Imbierowicz, B., & Rauch, C. (2016). The roles of corporate governance in bank failures during the recent financial crisis, *48*(4), 729–770. <https://www.jstor.org/stable/43863002>
- Berger, A. N., Kick, T., Koetter, M., & Schaeck, K. (2013). Does it pay to have friends? Social ties and executive appointments in banking. *Journal of Banking and Finance*, *37*(6), 2087–2105. <https://doi.org/10.1016/j.jbankfin.2013.01.040>
- Berger, A. N., Kick, T., & Schaeck, K. (2014). Executive board composition and bank risk taking. *Journal of Corporate Finance*, *28*, 48–65. <https://doi.org/10.1016/j.jcorpfin.2013.11.006>
- Bernile, G., Bhagwat, V., & Yonker, S. (2018). Board diversity, firm risk, and corporate policies. *Journal of Financial Economics*, *127*(3), 588–612. <https://doi.org/10.1016/j.jfineco.2017.12.009>
- Bhaduri, S. N., & Selarka, E. (2016). *Corporate governance and corporate social responsibility of Indian companies*. Springer. <https://doi.org/10.1007/978-981-10-0925-9>
- Black, B., de Carvalho, A. G., Khanna, V., Kim, W., & Yurtoglu, B. (2017). Corporate governance indices and construct validity. *Corporate Governance: An International Review*, *25*(6), 397–410. <https://doi.org/10.1111/corg.12215>

- Borges, A. (2011). *European corporate governance report*. Retrieved from [http://www.heidrick.com/PublicationsReports/PublicationsReports/HS\\_EuropeanCorpGovRpt2011.pdf](http://www.heidrick.com/PublicationsReports/PublicationsReports/HS_EuropeanCorpGovRpt2011.pdf)
- Byrne, D., Clore, G. L., & Worchel, P. (1966). Effect of economic similarity-dissimilarity on interpersonal attraction. *Journal of Personality and Social Psychology*, *4*(2), 220–224. <https://doi.org/10.1037/h0023559>
- Cain, M. D., & McKeon, S. B. (2016). CEO personal risk-taking and corporate policies. *Journal of Financial and Quantitative Analysis*, *51*(1), 139–164. <https://doi.org/10.1017/S0022109016000041>
- Cao, F., Sun, J., & Yuan, R. (2019). Board directors with foreign experience and stock price crash risk: Evidence from China. *Journal of Business Finance and Accounting*, *46*(9–10), 1144–1170. <https://doi.org/10.1111/jbfa.12400>
- Carter, D. A., Simkins, B. J., & Simpson, W. G. (2003). Corporate governance, board diversity, and firm value. *Financial Review*, *38*(1), 33–53. <https://doi.org/10.1111/1540-6288.00034>
- Cassell, C. A., Huang, S. X., Sanchez, J. M., & Stuart, M. D. (2012). Seeking safety: The relation between CEO inside debt holdings and the riskiness of firm investment and financial policies. *Journal of Financial Economics*, *103*(3), 588–610. <https://doi.org/10.1016/j.jfineco.2011.10.008>
- Christy, J. A., Matolcsy, Z. P., Wright, A., & Wyatt, A. (2013). Do board characteristics influence the shareholders' assessment of risk for small and large firms? *Journal of Accounting, Financia and Business Studies*, *49*(2), 161–196. <https://doi.org/10.1111/abac.12005>
- Cliff, N. (1983). Some cautions concerning the application of causal modeling methods. *Multivariate Behavioral Research*, *18*(1), 115–126. [https://doi.org/10.1207/s15327906mbr1801\\_7](https://doi.org/10.1207/s15327906mbr1801_7)
- Cohen, L., Frazzini, A., & Malloy, C. (2010). Sell-side school ties. *The Journal of Finance*, *40*(4), 35–37. <https://doi.org/10.2469/dig.v40.n4.25>
- Daily, C. M., Dalton, D. R., & Cannella, A. A. (2003). Corporate governance : Decades of dialogue and data. *The Academy of Management Review*, *28*(3), 371–382. <http://www.jstor.com/stable/30040727>
- de Andres, P., Romero-Merino, M. E., Santamaria, M., & Vallelado, E. (2012). Board determinants in the banking industry. An international perspective. *Managerial and Decision Economics*, *33*(January), 147–158. <https://doi.org/10.1002/mde>
- Deyoung, R., Peng, E. Y., & Yan, M. (2013). Executive compensation and business policy choices at U.S. commercial banks. *Journal of Financial and Quantitative Analysis*, *48*(1), 165–196. <https://doi.org/10.1017/S0022109012000646>
- Dionne, G., Chun, O. M., & Triki, T. (2019). The governance of risk management: The importance of directors' independence and financial knowledge. *Risk Management and Insurance Review*, *22*(3), 247–277. <https://doi.org/10.1111/rmir.12129>
- Dolan, C., Bechger, T., & Molenaar, P. (1999). Using structural equation modeling to fit models incorporating principal components. *Structural Equation Modeling*, *6*(3), 233–261. <https://doi.org/10.1080/10705519909540132>

- El-Khatib, R., Fogel, K., & Jandik, T. (2015). CEO network centrality and merger performance. *Journal of Financial Economics*, *116*(2), 349–382. <https://doi.org/10.1016/j.jfineco.2015.01.001>
- Engelberg, J. E., Reed, A. V., & Ringgenberg, M. C. (2012). How are shorts informed?. Short sellers, news, and information processing. *Journal of Financial Economics*, *105*(2), 260–278. <https://doi.org/10.1016/j.jfineco.2012.03.001>
- Erhardt, N. L., Werbel, J. D., & Shrader, C. B. (2003). Board of director diversity and firm financial performance. *Corporate Governance: An International Review*, *11*(2), 102–111. <https://doi.org/10.5465/ambpp.2017.14207abstract>
- Erkens, D. H., Hung, M., & Matos, P. (2012). Corporate governance in the 2007-2008 financial crisis: Evidence from financial institutions worldwide. *Journal of Corporate Finance*, *18*(2), 389–411. <https://doi.org/10.1016/j.jcorpfin.2012.01.005>
- Fan, Y., Boateng, A., King, T., & MacRae, C. (2019). Board-CEO friendship ties and firm value: Evidence from US firms. *International Review of Financial Analysis*, *65*(February), 101373. <https://doi.org/10.1016/j.irfa.2019.101373>
- Farag, H., & Mallin, C. (2017). Board diversity and financial fragility: Evidence from European banks. *International Review of Financial Analysis*, *49*, 98–112. <https://doi.org/10.1016/j.irfa.2016.12.002>
- Ferreira, M. A., & Laux, P. A. (2007). Corporate governance, idiosyncratic risk, and information flow. *The Journal of Finance*, *62*(2), 951–989.
- Ferris, S. P., Javakhadze, D., & Rajkovic, T. (2017). CEO social capital, risk-taking and corporate policies. *Journal of Corporate Finance*, *47*, 46–71. <https://doi.org/10.1016/j.jcorpfin.2017.09.003>
- Fields, M. A., & Keys, P. Y. (2003). The emergence of corporate governance from Wall St. to Main St.: Outside directors, board diversity, earnings management, and managerial incentives to bear risk. *Financial Review*, *38*(1), 1–24. <https://doi.org/10.1111/1540-6288.00032>
- Financial Reporting Council. (2018). *The UK Corporate Governance Code*. [https://doi.org/Retrieved from Financial Reporting Council](https://doi.org/Retrieved%20from%20Financial%20Reporting%20Council)
- Freedman, D. A. (1987). As others see us: A case study in path analysis. *Journal of Educational Statistics*, *12*(2), 101–128. <https://doi.org/10.3102/10769986012002101>
- García-Meca, E., García-Sánchez, I. M., & Martínez-Ferrero, J. (2015). Board diversity and its effects on bank performance: An international analysis. *Journal of Banking and Finance*, *53*, 202–214. <https://doi.org/10.1016/j.jbankfin.2014.12.002>
- Granovetter, M. (2005). The impact of social structure on economic outcomes. *Journal of Economic Perspectives*, *19*(1), 33–50. <https://doi.org/10.4324/9780429494338>
- Guay, W. R. (1999). The sensitivity of CEO wealth to equity risk: An analysis of the magnitude and determinants. *Journal of Financial Economics*, *53*, 43–71. <https://doi.org/10.4324/9780203940136>
- Harjoto, M. A., Laksmana, I., & Yang, Y. (2018). Board diversity and corporate investment oversight. *Journal of Business Research*, *90* (April), 40–47. <https://doi.org/10.1016/j.jbusres.2018.04.033>

- Hillman, A. J., & Thomas, D. (2003). Boards of directors and firm performance: integrating agency and resource dependence perspectives. *The Academy of Management Review*, 28(3), 383–396.
- Ho, C. L., Lai, G. C., & Lee, J. P. (2013). Organizational structure, board composition, and risk taking in the U.S. property casualty insurance industry. *Journal of Risk and Insurance*, 80(1), 169–203. <https://doi.org/10.1111/j.1539-6975.2012.01464.x>
- Hutchinson, M., Seamer, M., & Chapple, L. E. (2015). Institutional investors, risk/performance and corporate governance. *International Journal of Accounting*, 50(1), 31–52. <https://doi.org/10.1016/j.intacc.2014.12.004>
- Hwang, B. H., & Kim, S. (2009). It pays to have friends. *Journal of Financial Economics*, 93(1), 138–158. <https://doi.org/10.1016/j.jfineco.2008.07.005>
- Jizi, M. I., & Nehme, R. (2017). Board gender diversity and firms' equity risk. *Equality, Diversity and Inclusion*, 36(7), 590–606. <https://doi.org/10.1108/EDI-02-2017-0044>
- John, K., Litov, L. P., & Yeung, B. Y. (2008). Corporate governance and risk taking. *Journal of Finance*, 63(4). <https://doi.org/10.2139/ssrn.979413>
- Kent Baker, H., Pandey, N., Kumar, S., & Haldar, A. (2020). A bibliometric analysis of board diversity: Current status, development, and future research directions. *Journal of Business Research*, 108(August), 232–246. <https://doi.org/10.1016/j.jbusres.2019.11.025>
- Khatami, S. H., Marchica, M. T., & Mura, R. (2016). Rating friends: The effect of personal connections on credit ratings. *Journal of Corporate Finance*, 39, 222–241. <https://doi.org/10.1016/j.jcorpfin.2016.04.006>
- Kim, Y. (2005). Board network characteristics and firm performance in Korea. *Corporate Governance: An International Review*, 13(6), 800–808. <https://doi.org/10.1111/j.1467-8683.2005.00471.x>
- Kirkpatrick, G. (2009). The corporate governance lessons from the financial crisis. *OECD Journal: Financial Market Trends*, 1(February), 61–87.
- Laeven, L., & Levine, R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics*, 93(2), 259–275. <https://doi.org/10.1016/j.jfineco.2008.09.003>
- Larcker, D. F., So, E. C., & Wang, C. C. Y. (2013). Boardroom centrality and firm performance. *Journal of Accounting and Economics*, 55(2–3), 225–250. <https://doi.org/10.1016/j.jacceco.2013.01.006>
- Miller, M., Lynn, S.-L., & James, M. C. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27, 415–444.
- Minton, B. A., Taillard, J. P., & Williamson, R. (2014). Financial expertise of the board, risk taking, and performance: Evidence from bank holding companies. *Journal of Financial and Quantitative Analysis*, 49(2), 351–380. <https://doi.org/10.1017/S0022109014000283>
- Mishra, D. R. (2011). Multiple large shareholders and corporate risk taking: Evidence from East Asia. *Corporate Governance: An International Review*, 19(6), 507–528. <https://doi.org/10.1111/j.1467-8683.2011.00862.x>
- Nakano, M., & Nguyen, P. (2012). Board size and corporate risk taking: Further evidence



- from Japan. *Corporate Governance: An International Review*, 20(4), 369–387.  
<https://doi.org/10.1111/j.1467-8683.2012.00924.x>
- NYSE Governance Services. (2016). *NYSE: Corporate Governance Guide*. Retrieved from  
[https://www.nyse.com/publicdocs/nyse/listing/NYSE\\_Corporate\\_Governance\\_Guide.pdf](https://www.nyse.com/publicdocs/nyse/listing/NYSE_Corporate_Governance_Guide.pdf)
- OECD. (2015). G20/OECD Principles of Corporate Governance. *OECD Publishing*.  
<https://doi.org/10.1787/9789264236882-en>
- Pathan, S. (2009). Strong boards, CEO power and bank risk-taking. *Journal of Banking and Finance*, 33(7), 1340–1350. <https://doi.org/10.1016/j.jbankfin.2009.02.001>
- Perchard, A., & MacKenzie, N. G. (2020). Aligning to disadvantage: How corporate political activity and strategic homophily create path dependence in the firm. *Human Relations* (Vol. 74). <https://doi.org/10.1177/0018726720908923>
- Poletti-Hughes, J., & Briano-Turrent, G. C. (2019). Gender diversity on the board of directors and corporate risk: A behavioural agency theory perspective. *International Review of Financial Analysis*, 62(August 2018), 80–90. <https://doi.org/10.1016/j.irfa.2019.02.004>
- Qiu, X., Su, Z. qin, & Xiao, Z. (2019). Do social ties matter for corporate bond yield spreads? Evidence from China. *Corporate Governance: An International Review*, 27(6), 427–457. <https://doi.org/10.1111/corg.12294>
- Riordan, C. M., & Shore, L. M. F. (1997). Demographic diversity and employee attitudes: An empirical examination of relational demography within work units. *Journal of Applied Psychology*, 82(3), 342–358. <https://doi.org/10.1037/0021-9010.82.3.342>
- Saunders, A., Strock, E., & Travlos, N. G. (1990). Ownership structure, deregulation, and bank risk taking. *The Journal of Finance*, 45(2), 643–654.
- Sheikh, S. (2019). CEO power and corporate risk: The impact of market competition and corporate governance. *Corporate Governance: An International Review*, 27(5), 358–377. <https://doi.org/10.1111/corg.12285>
- Tajfel, H. (1974). Social identity and intergroup behaviour. *Social Science Information*, 13(2), 65–93. <https://doi.org/10.1177/053901847401300204>
- Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. *The SAGE Encyclopedia of Theory in Psychology*, 277–293.  
<https://doi.org/10.4135/9781483346274.n163>
- Teodósio, J. (2021). Corporate governance in Portugal: A literature review. in E. S. Vieira, M. Madaleno & G. Azevedo (eds) *Comparative research on earnings management, corporate governance, and economic value*. IGI Global. DOI: 10.4018/978-1-7998-7596-3.ch008
- Turner, J. C. (1987). *Rediscovering the Social Group: A Self-Categorization Theory*. Blackwell. <https://doi.org/10.1111/j.0001-7272.2004.00173.x>
- Walt, N., & Ingley, C. (2003). Board dynamics and the influence of professional background, gender and ethnic diversity of directors. *Corporate Governance*, 11(3), 218–234.  
<https://doi.org/10.1111/1467-8683.00320>
- Wang, T., & Hsu, C. (2013). Board composition and operational risk events of financial

institutions. *Journal of Banking and Finance*, 37(6), 2042–2051.  
<https://doi.org/10.1016/j.jbankfin.2013.01.027>

Webber, S. S., & Donahue, L. M. (2001). Impact of highly and less job-related diversity on work group cohesion and performance: a meta-analysis. *Journal of Management*, 27(2), 141–162. <https://doi.org/10.1177/014920630102700202>

Westphal, J. D., Boivie, S., & Chng, D. H. M. (2006). The strategic impetus for social network ties. Reconstituting broken CEO friendship ties. *Strategic Management Journal*, 27(5), 425–445. <https://doi.org/10.1002/smj.525>

Wu, S. (2016). Corporate governance and bankruptcy risk. *Journal of Accounting Auditing and Finance*, 31(2), 163–202.

Yoshikawa, T., Shim, J. W., Kim, C. H., & Tuschke, A. (2020). How do board ties affect the adoption of new practices? The effects of managerial interest and hierarchical power. *Corporate Governance: An International Review*, 28(1), 2–22.  
<https://doi.org/10.1111/corg.12300>

Zona, F., Gomez-Mejia, L. R., & Withers, M. C. (2015). Board interlocks and firm performance: Toward a combined agency–resource dependence perspective. *Journal of Management*, 44(2), 589–618. <https://doi.org/10.1177/0149206315579512>

**TABLE 1** Selected Research into Board Diversity and Risk-Taking in Financial Institutions

Aspect of Board Diversity	Positive Impact (Decrease risk or superior performance)	Negative Impact on (Increased risk or poor performance)	No Impact on Risk (Undetermined)
Age	Berger <i>et al.</i> (2014)	Wang & Hsu (2013)	Wang & Hsu (2013)
Gender	García-Meca <i>et al.</i> (2015); Jizi & Nehme (2017)	Berger <i>et al.</i> (2014)	
Education	Berger <i>et al.</i> (2014); Anderson <i>et al.</i> (2011); Dionne <i>et al.</i> (2019)	Kirkpatrick (2009)	N/A
Nationality and Ethnicity	Bernile <i>et al.</i> (2018); Anderson <i>et al.</i> (2011)	García-Meca <i>et al.</i> (2015)	Harjoto <i>et al.</i> (2018)



Social Ties	Yoshikawa <i>et al.</i> , (2020); Larcker <i>et al.</i> (2013); Khatami <i>et al.</i> (2016)	Kim (2005); Fan <i>et al.</i> (2019); Qiu <i>et al.</i> (2019)	N/A
-------------	--	--	-----

Notes: Source: authors own estimates.

**TABLE 2** List of Variables

Variable	Definition	Database
Risk Measurement		
Z-score	Return on assets plus equity to asset ratio divided by the standard deviation of the return on assets over the period 2010-2022 (High value=low risk)	Bloomberg
ROAV	The standard deviation of the returns on Asset constructed over the period 2010-2022	Bloomberg
Leverage	The ratio of total debt to total assets	Bloomberg
Stock Return Volatility	Annualized standard Deviation of Daily stock returns	Bloomberg
Idiosyncratic Risk	The Standard deviation of the residuals derived from regressing daily stock return on market return in each year	Bloomberg
LV Stand-Alone Risk	A latent variable that represents the stand-alone risk generated from the measurement model based on three risk measurements; <i>ROAV</i> , <i>Leverage</i> and <i>Z-score</i> .	Structed Model Equational

LV Market Risk	A latent variable that represents market risk generated from the measurement model based on two risk measurements; <i>Stock Return Volatility</i> and <i>Idiosyncratic Risk</i> .	Structural Model	Equational
----------------	---	------------------	------------

#### Board Diversity and Network

Age Diversity	The standard deviation of the ages of all directors in the board	BoardEx
---------------	--	---------

Gender Diversity	Percentage of female directors to the total number of directors	BoardEx
------------------	---	---------

Nationality Diversity	Proportion of Directors from different countries	BoardEx
-----------------------	--	---------

Financial Education Diversity	The percentage of directors on board that hold a financial or accounting degree or certificate	BoardEx
-------------------------------	--	---------

Qualification Diversity	The measure of dispersion of the number of qualifications held by Directors from the mean. This is a count of all qualifications of degree level including all professional qualifications.	BoardEx
-------------------------	---	---------

Financial Experience Diversity	The percentage of directors with financial experience that are Former bank executives, Executives of nonbank financials, Finance executives of nonfinancial firms, academic position in a related field, or Professional investors	BoardEx
--------------------------------	--	---------

Professional Experience Diversity	The Herfindahl index based on the number of directors' expertise within five categories: consulting, legal, management (executives), and other expertise (i.e. research, technology, medical, etc.). For example, 2 directors with legal experience and 3 directors with consulting experience would be defined as $(2/5)^2 + (3/5)^2$ .	BoardEx
-----------------------------------	--	---------

Inside Network	The log of the total network size of directors that share professional and/or educational background with another director within the board	BoardEx
----------------	---	---------

Outside Network	The log of the total outside network which is the numbers of overlaps through employment and education as provided by BoardEx.	BoardEx
-----------------	--	---------

#### Firm Control Variables

Firm size	the log of total assets in billion US dollars	Bloomberg
-----------	---	-----------

Market to Book	Market capitalisation to the book value of equity	Bloomberg
----------------	---	-----------

Board Size	Number of Directors on the company's board	Bloomberg
------------	--	-----------

Board Independence	Independent directors as a percentage of total board membership.	Bloomberg
--------------------	--	-----------

CEO Duality Indicates whether the company's Chief Executive Officer is currently also chairperson of the Board. Takes the value of 0 when the CEO and chairperson positions are separated and 1 otherwise Bloomberg

**TABLE 3** Descriptive Statistics

	<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>Std. Deviation</b>
IdiosyncraticRisk	4521	0.09	48.54	2.76	5.51
Zscore	4521	-2.18	1020.335	34.48	107.59
ROAVolatility	4521	0.00	30.35	1.43	3.63
Leverage	4521	0.00	94.31	12.10	15.91
StockReturnVolatility	4521	0.04	204.06	12.46	23.74
AgeDiversity	4521	3.00	14.80	7.72	2.38
GenderDiversity	4521	0.00	40.00	11.84	9.80
NationalityDiversity	4521	0.00	0.60	0.04	0.11
QualificationDiversity	4521	0.40	2.20	1.08	0.35
FinancialEducationDiversity	4521	0.00	0.50	0.11	0.10
FinancialExperienceDiversity	4521	0.00	0.28	0.03	0.06
ProfessionalExperienceDiversity	4521	0.21	1.00	0.44	0.14
OutsideNetwork	4521	52	70592	11030.47	12020.09
InsideNetwork	425	10	74	31.01	20.89
BoardIndependence	4521	37.50	94.11	79.32	11.85
BoardSize	4521	5	20	10.55	2.89

CEODuality	4521	0	1	0.40	0.48
FirmSize	4521	7.86	12.32	9.59	0.81
MarkettoBook	4521	0.10	15.01	1.55	1.51

TABLE 4 SEM: Board Diversity

<b>Panel A: Measurement Model</b>		
	<b>LV StandAlone Risk</b>	<b>LV Market Risk</b>
ROAV ←	1 (Constrained)	
Z-score ←	-1.847*** (0.372)	
Leverage ←	3.639*** (0.716)	
Idiosyncratic Risk ←		1 (Constrained)
Stock Return Volatility ←		0.384*** (0.206)
<b>Panel B: Structural Model</b>		
	<b>LV StandAlone Risk ←</b>	<b>LV Market Risk ←</b>
Age Diversity	0.152*** (0.029)	0.227*** (0.049)
Gender Diversity	-0.094*** (0.009)	0.184*** (0.009)

Nationality Diversity	1.623** (0.717)	3.043*** (0.827)
Qualification Diversity	-0.955** (0.204)	-0.542 (0.175)
Financial Education Diversity	1.311** (0.696)	-3.737* (0.770)
Financial Experience Diversity	-7.736 (1.298)	-2.085 (1.570)
Professional Experience Diversity	0.445 (0.477)	4.594*** (0.850)
R Squared	0.216	0.118
Observations	5542	5542
Panel C: Model Fit		
Chi-squared	NFI	CFI
1236.621	1.000	1.000

Notes: This table represents the results of the SEM to study the impact of board diversity on stand-alone and market risk. Definitions and sources of all variables are detailed in table 1. Standard errors are provided in parentheses. Variables with arrows pointing towards them are the endogenous variables \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1% respectively.

**TABLE 5** SEM: Board Social Ties

<b>Panel A: Measurement Model</b>		
	<b>LV StandAlone Risk</b>	<b>LV Market Risk</b>
ROAV ←	1 (Constrained)	
Z-score ←	-2.366** (2.189)	
Leverage ←	4.892** (1.101)	
Idiosyncratic Risk ←		1 (Constrained)
Stock Return Volatility ←		2.101*** (0.205)
<b>Panel B: Structural Model</b>		
	<b>LV StandAlone Risk ←</b>	<b>LV Market Risk ←</b>
Outside Network	-0.006 (0.002)	2.002** (1.003)
Inside Network	-0.105* (0.001)	-3.035*** (1.014)

R Squared	0.117	0.093
Observations	425	425
Panel C: Model Fit		
Chi-squared	NFI	CFI
146.177	1.000	1.000

Notes: This table represents the results of the SEM to study the impact of social network on stand-alone and market risk. Definitions and sources of all variables are detailed in table 1. Standard errors are provided in parentheses. Variables with arrows pointing towards them are the endogenous variables \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1% respectively.

**TABLE 6** Linear Regression: Board Diversity

	Dependent Variable: Five measures of risk				
	ROAV	Z-score	Leverage	Stock Return Volatility	Idiosyncratic Risk
Age	-0.009	-0.327	0.538***	0.227***	0.170***
Diversity	(0.023)	(0.294)	(0.110)	(0.215)	(0.054)
Gender	0.018**	0.179***	-0.015	-0.082*	0.001
Diversity	(0.008)	(0.012)	(0.027)	(0.024)	(0.008)
Nationality	1.948	-1.673	-9.877	0.442	-0.107
Diversity	(0.454)	(0.608)	(2.444)	(1.911)	(0.857)
Qualification	-0.925***	0.385*	-2.981*	0.599**	0.498*
Diversity	(0.108)	(0.250)	(0.627)	(0.255)	(0.191)
Financial	-0.061*	-1.998	-9.154***	-4.550***	-2.485***
Education	(0.488)	(0.691)	(2.323)	(1.241)	(0.772)
Diversity					
Financial	-4.577***	-1.740	7.247	-4.090	-0.762
Experience	(0.878)	(1.669)	(4.524)	(1.089)	(1.524)
Diversity					

Professional Experience Diversity	-1.325*** (0.307)	1.840 (0.692)	-7.752** (1.956)	4.450*** (2.750)	3.613*** (1.154)
Board Independence	-0.034*** (0.004)	0.295* (0.076)	0.090* (0.023)	-0.037*** (0.016)	-0.034*** (0.007)
Board Size	-0.1997*** (0.015)	0.172*** (0.313)	-1.185*** (0.106)	0.220 (0.077)	-0.129 (0.031)
CEO Duality	0.365** (0.115)	2.147 (0.195)	0.121 (0.550)	0.791*** (0.375)	0.420*** (0.162)
Firm Size	-0.856*** (0.104)	-1.492 (0.211)	3.081*** (0.391)	2.714*** (0.277)	1.806*** (0.182)
Market to Book	0.775*** (0.078)	0.524*** (0.044)	-0.675*** (0.235)	0.729*** (0.109)	0.434*** (0.053)
Observations	4173	4173	4173	4173	4173
R Squared	0.285	0.126	0.236	0.168	0.216

Notes: This table represents the results of regressing five risk measurements (*ROAV*, *Leverage*, *Z-score*, *Stock Return Volatility* and *Idiosyncratic Risk*) on board diversity variables. Definitions and sources of all variables are detailed in table 1. Model are estimated using industry and year fixed effects. t-statistics based on robust standard errors are provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1% respectively.

**TABLE 7** Linear Regression: Board Social Ties

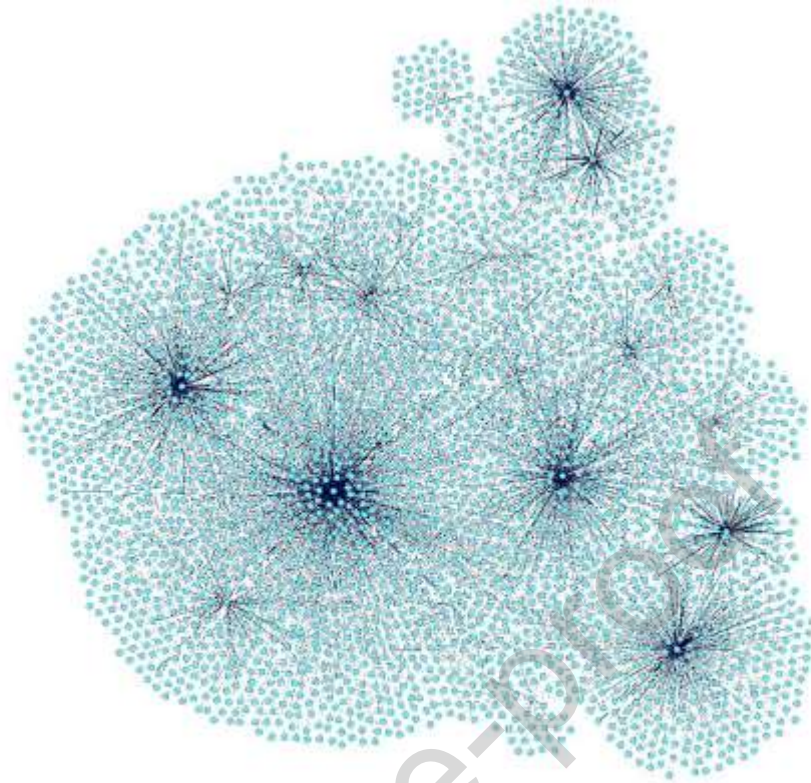
	Dependent Variable: Five measures of risk				
	ROAV	Z-score	Leverage	Stock Return Volatility	Idiosyncratic Risk
Outside Network	0.012 (0.001)	-0.921** (0.205)	2.940* (2.118)	-1.202** (1.116)	-1.411*** (1.001)
Inside Network	0.001 (0.002)	0.984* (0.798)	-1.685 (1.874)	-1.257*** (1.074)	-2.496** (1.714)
Board Independence	-0.036*** (0.005)	0.0742 (0.478)	-0.459*** (0.078)	-0.117*** (0.024)	-0.297*** (0.059)
Board Size	-0.076** (0.013)	0.317** (0.063)	-0.878 (0.237)	0.443** (0.339)	0.113 (0.094)
CEO Duality	-0.241 (0.082)	1.177*** (0.967)	-0.241 (1.504)	-1.057 (1.758)	-0.786 (0.649)
Firm Size	-0.350*** (0.074)	-1.256 (0.142)	2.107* (1.084)	2.530*** (1.482)	3.392*** (1.25)
Market to Book	0.325*** (0.067)	0.304*** (0.213)	-2.420*** (0.808)	-0.736 (0.693)	-0.128 (0.159)

Observations	399	399	399	399	399
R Squared	0.466	0.142	0.358	0.484	0.382

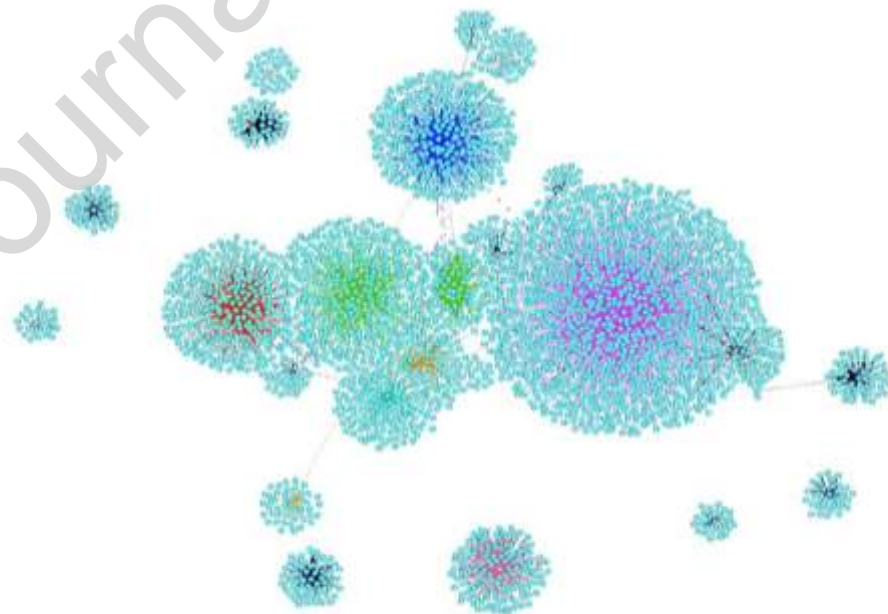
Notes: This table represents the results of regressing five risk measurements (*ROAV*, *Leverage*, *Z-score*, *Stock Return Volatility* and *Idiosyncratic Risk*) on social network variables. Definitions and sources of all variables are detailed in table 1. Models are estimated using industry and year fixed effects. t-statistics based on robust standard errors are provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1% respectively.

**FIGURE 1** Director network





**FIGURE 2** Financial institutions network



**FIGURE 3** SEM: Board Diversity

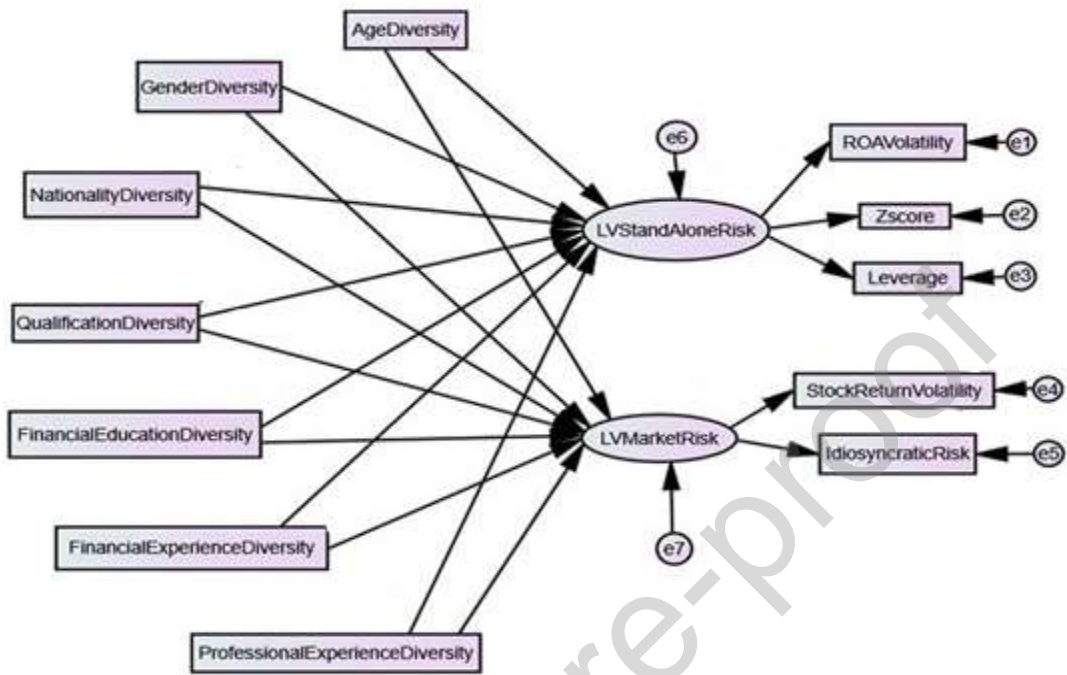
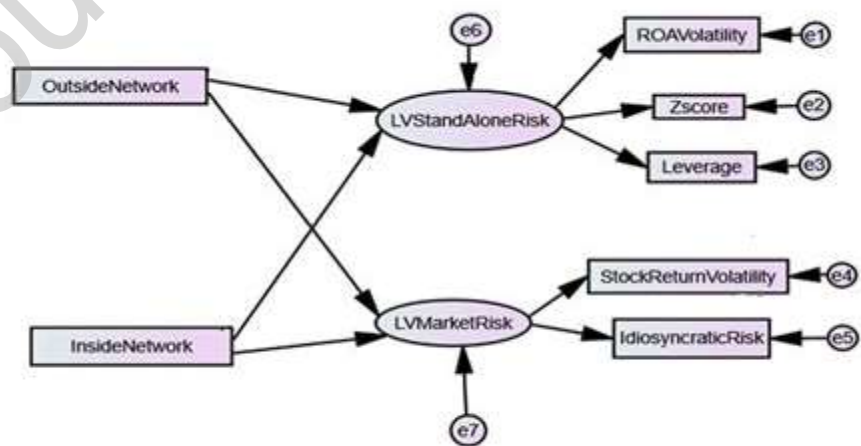


FIGURE 4 SEM Board Social Ties



## APPENDIX A Pearson Correlation

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Idiosyncratic Risk	1	.00	.03	.02	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17	.18	.19
Zscore	.00	1	-.02	-.01	-.01	-.01	-.01	-.01	.01	-.01	-.01	-.01	-.01	-.01	.01	.02	-.01	.00	.00	.00
ROA Volatility	.06	-.02	.01	.03	.03	.08	.00	.01	.01	.02	.00	.05	.00	.00	.02	.02	.08	.02	.08	.03
Leverage	.02	-.01	.01	.01	.00	.00	.01	-.01	-.01	.00	-.01	-.01	.01	-.01	-.01	-.01	.01	.00	.00	.00
Stock Return Volatility	.04	-.00	.00	.00	.01	.00	.00	.01	-.01	-.01	.00	.01	.00	.00	.00	.04	.02	.05	.01	.01
Age Diversity	.06	-.00	.00	.00	.00	.01	-.01	-.01	.00	-.01	-.01	.01	-.01	-.01	-.01	.00	.00	.02	.01	.01
Gender Diversity	.07	.00	-.00	.00	.00	-.01	.01	-.01	.00	.00	-.01	-.01	.03	.01	.02	.01	.00	.03	.00	.00
Nationality Diversity	.09	-.00	.00	.01	.01	-.01	.00	-.01	-.01	.00	-.01	-.01	.03	.04	.00	.00	.00	.02	.00	.00
Qualification Diversity	-.03	.01	-.01	-.01	-.01	.00	-.01	-.01	.01	.00	-.01	.00	-.01	-.01	.01	.01	-.01	-.01	-.01	-.01

Financial Education Diversity	- .0 4 8*	- .0 6 1*	.0 2 7 2*	- .0 4 7*	- .0 5 3*	- .0 3 7	.0 0 7 2	- .0 2 7	.0 0 7 9	1 0 0 0*	.1 3 0 7*	- .0 1 2	.1 3 2 2*	- .0 4 7*	- .1 1 4*	.0 4 4 7*	- .0 1 4*	.0 4 0 7*	- .0 1 4*
Financial Experience Diversity	- .0 4 4*	- .0 0 8	- .0 4 9*	.0 1 2 0*	- .0 5 0*	- .0 7 5*	.0 8 6*	.0 2 4 9	- .0 0 0*	.1 3 0 0*	1 0 0 2*	- .4 1 2*	.0 4 6 0	.0 3 0 0	- .0 1 2	.0 5 5 2*	.0 6 4 9*	.0 3 6 2*	.0 6 6 9*
Professional Experience Diversity	.0 8 2*	- .0 0 8	.0 5 0*	- .0 4 0*	.0 7 4*	.1 2 8*	- .1 6 3*	- .1 1 2*	.0 3 6 3*	- .0 4 7*	- .4 1 2*	1 - 0*	- .2 2 0*	- .2 4 1*	- .2 0 8*	.1 5 1*	.0 0 3 9*	.2 0 0 7	.0 0 0 7
Outside Network	.1 6 4*	- .0 8 1*	- .0 1 6	.1 5 5*	.1 8 6*	- .1 3 9*	.3 0 7*	.3 5 4*	- .1 6 6*	.0 1 4 1*	.0 4 2 2*	- .2 0 0*	.1 9 3*	.2 7 3*	.1 4 0*	.3 4 0*	.1 4 0*	.6 9 1*	.0 6 0*
Inside Network	- .0 7 3	.0 9 7	- .0 3 2	- .0 1 5	- .0 7 5	.1 3 8*	.4 9 4*	- .0 1 9	.1 3 2*	.0 0 6	.0 3 2*	- .2 4 1*	.2 9 3*	1 7 4*	.2 0 9*	.3 7 6*	- .1 6 7*	.2 8 4*	- .0 2 7
Board Independence	- .0 8 3*	.1 2 1*	- .2 1 1*	- .0 9 4*	- .0 8 2*	- .2 7 0*	.0 7 2*	.1 7 5*	- .0 2 7*	.0 4 0	.0 3 7*	- .2 0 8*	.1 7 3*	.2 4 4*	1 1 1*	.2 4 1*	- .1 8 8*	.2 6 5*	- .0 7 7*
Board Size	.0 2 5	.2 1 7*	- .2 9 5*	- .1 6 9*	.0 4 4*	- .0 8 8*	.1 8 5*	.0 9 2*	.1 2 1*	- .0 1 7*	- .0 1 2*	- .3 5 1*	.3 4 0*	.3 0 9*	.2 4 1*	1 1 3*	- .1 2 3*	.4 7 7*	- .0 9 1*
CEO Duality	.1 3 0*	- .0 4 8*	.0 8 2*	.1 1 1*	.1 2 4*	.0 0 0	.0 2 8	.0 4 1*	- .0 5 0*	.0 4 5*	.0 5 5*	- .0 0 3	.1 4 0*	- .1 6 7*	- .1 4 8*	- .1 2 3*	1 1 5*	.1 4 5*	.0 3 0
Firm Size	.2 2 8*	.0 1 9	- .2 8 8*	.0 8 4*	.2 5 1*	- .2 0 4*	.3 4 1*	.2 7 7*	- .0 7 4*	- .0 0 2*	.0 6 4*	- .2 0 9*	.6 9 1*	.2 8 4*	.2 6 5*	.4 2 7*	.1 4 5*	1 4 5*	- .1 2 8*
Market To Book	.1 1	.0 0 3	.3 8 8	.0 2 8	.1 1 1	.0 1 1	.0 7 7	.0 4 4	- .0 1 1	.0 4 6*	.0 3 6*	- .0 0 6	- .0 0 6	- .0 0 9	- .0 0 9	.0 3 0	- .1 1 2	.1 1 2	1

	6*	9*	4*	8*	9*	8*	9*	0	0*	2	7*	1*	8*
	*	*	*	*	*	*	*	7	*	7	*	*	*

Note: \*\* Correlation is significant at the 0.01 level, \* Correlation is significant at the 0.05 level.

#### APPENDIX B Board diversity and social network review

Journal Pre-proof

Paper	Board variables	Variables Definition	Risk measurements	Effect of board on risk	sector	country	sample size	Period
(Berger <i>et al.</i> , 2014)	age, gender, education of Board executives	Average Board Age increase of 5 years. Increase in female presence. Presence of executives with PhD	Risk-weighted assets to total assets (RWA/TA), and a Herfindahl Hirschman index for loan portfolio concentration (HHI, log))	Board age negatively related to risk. Increase in female presence leads to increase in portfolio risk. The presence of executives with PhD leads to decrease in portfolio risk	Banks	Germany	3525 banks, 19,750 observations	1994-2010
(Wu, 2016)	Gender Diversity	-	firm as being bankrupt if it makes a Chapter 11 filing. variable is set to 1 if the firm files for bankruptcy within one year, and 0 otherwise	Board size and gender diversity are negatively related to bankruptcy risk.	Non-financial	US	217 bankrupts, 9,100 non-bankrupts	1996-2006

(Ho <i>et al.</i> , 2013)	Board size, CEO duality, Board independence	-	Total risk is measured by the standard deviation of return on assets, Underwriting risk is measured by the standard deviation of the company's loss ratio, Investment risk is measured by the standard deviation of return on investment, Leverage risk is defined as 1 minus the surplus-to assets ratio	More board independence and CEO duality lead to higher risk, impact of board size on different risk-taking measures varies.	Property Causality Insurance Industry	US	252 firms	1996-2007
(Akbar <i>et al.</i> , 2017)	Board size, independence and CEO duality	Size is the log of number of directors, percentage of nonexecutive	idiosyncratic risk is the standard deviation of the residuals from the two-index market	Board independence and CEO duality have a negative impact on risk, board	Financial Sector	UK	276 firms, 2760 firm year observation	2003-2012

		directors , CEO duality is a dummy variable	model, Z-score is the average ROA and Average CAR to the standard deviation of ROS	size has no impact on size				
(Wang & Hsu, 2013)	Board size, independ- ence, age, tenure	Size is number of directors , independ- ence is percenta- ge of independ- ent directors , the standard deviatio- n of age divided by average age, the standard deviatio- n of tenure divided by average tenure	events by the variable OP, which equals one if a firm has an operation- al risk event in a certain year in our sample period, 0 otherwise	Board size is negative- ly associat- ed with operatio- nal risk, board independ- ence is associat- ed with less fraud, board age and tenure a proxy for diversity show importa- nt role in managin- g operatio- nal risk	Financi- al instituti- ons	US	103 firms	199 6- 201 0
(Harjot o <i>et al.</i> , 2018)	Board gender, race (Asian, Black, Caucasia- n, Hispanic , and Native	relation oriented index (Board gender, race, age) task- oriented index	firm- specific deviation from the expected level of investme- nt. They measure corporate	task- oriented board diversity attribute s, such as tenure and expertis	non- financia- l firms	US	15,125 firm year observa- tions form 1898 firms	199 8- 201 4



America (tenure, investment e, are ns), age, experien nt using negative tenure, ce) capital ly experien expedit associat ce ures ed with (financia (CAPEX subopti l, ), R& mal consulti D investm ng, expenses ent. No legal, (RDEX), associati management and acquisitio on between (executi n board ves), spending relation-oriented and (ACQEX diversity expertise ) measure d by gender, race, and age, and board perform ance

(García -Meca <i>et al.</i> , 2015)	Women, Foreigners	the percentage of female and foreign directors on boards	Tobin's Q: the book value of total assets minus the book value of common equity plus the market value of common equity divided by the book value of total assets. ROA is calculated as the	gender diversity increases bank performance, while national diversity inhibits it	Banks	9 countries (Canada, France, Germany, Italy, the Netherlands, Spain, Sweden, the United Kingdom, and the United States)	159 banks, 877 observations	2004-2010
-------------------------------------	-------------------	--	--	---	-------	---	-----------------------------	-----------

			income before extraordinary items, interest expense, and taxes divided by the average of the two most recent years of total assets					
(Bernile <i>et al.</i> , 2018)	Diversity index (gender, age, ethnicity, education, experience)	fraction of women on board, standard deviation of board age, Herfindahl concentration indexes for director ethnicity, institutions where directors received bachelor degree, director financial experience	Volatility of stock return, net book leverage, net market leverage, dividend-to-equity ratio, CAPEX-to-asset ratio, and R&D-to-asset ratio, log number of patents, firm profitability	greater board diversity leads to lower volatility and better performance.	nonfinancial, non-utility firms	US	21,572 firm year observations	1996-2014

(Minton <i>et al.</i> , 2014)	Financial expertise in the board	Directors is the percentage of independent directors who are financial experts (Former bank executive, Executive of nonbank financials, Finance executive of nonfinancial, academic position in a related field, Professional investor)	The standard deviation of daily stock return, section: real-estate-related activity and bank leverage, nominal cumulative stock return	fraction of independent financial experts is positively related to several measures of	commercial banks, S&Ls and investment banks	US	1,106 firm year observations	2003-2008
(Cao <i>et al.</i> , 2019)	Board directors with foreign experience	equals 1 if a firm has at least one director with foreign experience and 0 otherwise	negative conditional skewness, down-to-up volatility	Board Directors with Foreign Experience help reduce crash risk	non-financial firms	Chinese	23,758 observations, 2,610 firms	1999-2017
(Erhardt <i>et al.</i> , 2003)	Ethnic and gender diversity	percentage of women and minorities	Return on assets and investments	board diversity is positively associated	Public firms	US	127 firms	1993-1998

		(African, Hispanic, Asian and Native Americans) to white Anglo-Saxons for executive directors		ed with return on assets and investments				
(Anderson <i>et al.</i> , 2011)	age, gender, ethnic, education, experience, tenure	Age: the coefficient of variation of director age, Gender: percentage of women on board, Ethnicity: percentage of Asian, African American, Hispanic, and Native American director. Education: Herfindahl index based on percentage of education level	Industry adjusted Topin's Q.	both types of director heterogeneity gave a positive relationship to firm performance	Russell 1000 nonfinancial, industrial firms	US	615 firms	200 3-200 5

and major. Experience: CEO in other firms, Professional experience (law, accounting, consulting), standard deviation of firm's directors worked in, number of senior managerial positions during the career. Board tenure

(Jizi & Nehme, 2017)	Gender Diversity	Percentage of women on board, dummy variables to indicate the existence of women on the board	Stock return volatility	Women on board reduce firm's risk	FTSE 350 non-financial firms	UK	1,138 observations	2008-2013
----------------------	------------------	---	-------------------------	-----------------------------------	------------------------------	----	--------------------	-----------

(Dionne <i>et al.</i> , 2019)	Board independence and knowledge	A director has a financial knowledge if he or she is (a) financially active or has financial experience, (b) is financially educated, or (c) possesses an accounting background	Delta percentage, ROE, ROA, Tobin's Q	directors' financial knowledge increases firm value through the risk management	Gold mining industry	Canada and US	36 firms	1992-1999
(Poletti - Hughes & Briano-Turrent, 2019)	Gender Diversity	Percentage of female directors on the board	Volatility of ROA, Volatility of Tobin's Q, sales growth	women on board increase venture risk and performance hazard risk in family-owned firms	non-financial firms	Argentina, Brazil, Chile and Mexico	125 firms and 1,263 observations	2004-2014
(Altunbaş <i>et al.</i> , 2018)	CEO tenure, CEO age, CEO gender, CEO experience, CEO education, Board size, Board	CEO number of years	dummy variable indicating the presence of corporate misconduct	banks are more likely to commit misconduct when the CEO tenure is long. Large and independence	banks	US	960 banks	1998-2015

independence  
boards  
mitigate  
but do  
not  
prevent  
misconduct

(Qiu <i>et al.</i> , 2019)	Top management team network	interlocking members are defined as the ones who work in two or more firms in a fiscal year. three centrality measures: Degree, Betweenness, and Eigenvector.	The cost of debt. by subtracting the matched Chinese treasury bond yield from the corporate bond yield	results provide strong evidence that bondholders require lower bond yield spreads for firms with higher TMT network centrality	non-financial firms	China	688 firms, 857 bond year observations	2007-2016
(Yoshikawa <i>et al.</i> , 2020)	Sent ties and Received ties	Sent ties are the number of the focal firm's executive directors who serve on the	dummy variable that takes the value of 1 if firm <i>i</i> adopts the practice in year <i>t</i> , and 0	sent ties established by executives increase the probability of adopting stock option	non-financial firms	Japan	3,565 firms	1997-2002

board of otherwise pay  
 another . whereas  
 firm that received  
 has ties are  
 already strongly  
 adopted related  
 stock to the  
 option adoption  
 pay of both  
 and/or stock  
 EOS. option  
 received pay and  
 ties are board  
 the reform  
 count of  
 the focal  
 firm's  
 directors  
 who also  
 serve as  
 directors  
 on the  
 board of  
 firms  
 that are  
 prior  
 adopters.

(Fan <i>et al.</i> , 2019)	CEO-Board ties	classify a director as friendship-tied to the CEO if she has shared educational background or memberships of social organizations. Friendship Tie Breadth is	Tobin's Q and Total Q	board-CEO friendships have a negative and economically meaningful impact on firm value	non-financial firms	US	1696 firms, 2786 unique CEOs and 20,487 directors	2000-2014
----------------------------	----------------	--	-----------------------	--	---------------------	----	---	-----------



defined as the number of directors with friendship-ties to the CEO divided by the total number of board directors.

Friendship Tie Depth is computed as the total number of friendship ties the CEO has with board directors divided by the total number of board directors.

(Berger <i>et al.</i> , 2013)	Board Age, Board education, Gender diversity, social ties	Age: absolute difference between the age of the individual in question and the average age of the	Outside appointments or inside appointments	Homophily based on age and gender increase the chances of the outsider appointments. Similar education	Banks	Germany	between 1821 to 3364 per year	1993-2008
-------------------------------	---	---	---	--	-------	---------	-------------------------------	-----------

member  
 s of the  
 executiv  
 e board.  
 Educatio  
 n:  
 dummy  
 variable  
 that  
 takes on  
 the value  
 one if  
 both the  
 appointe  
 e and  
 any  
 member  
 of the  
 executiv  
 e board  
 of the  
 appointi  
 ng bank  
 have an  
 academi  
 c degree.  
 Gender  
 diversity  
 : dummy  
 equal to  
 one if  
 both the  
 appointe  
 e as well  
 as at  
 least one  
 executiv  
 e board  
 member  
 is  
 female.  
 Social  
 ties: the  
 intensity  
 of an  
 individu  
 al's  
 connecte  
 dness is  
 measure

nal  
 backgro  
 unds, in  
 contrast,  
 reduce  
 the  
 chance  
 that the  
 appointe  
 e is an  
 outsider.  
 Greater  
 social  
 ties also  
 increase  
 the  
 probabil  
 ity of an  
 outside  
 appoint  
 ment

d by the number of common contacts the agent has with any other individual in the staff database prior to appointment.

(Kim, 2005)	Board network density, board external social capital	Board network density is defined as the extensiveness or the cohesiveness of contact among the members of board of directors, and board external social capital refers to the degree to which board members have outside contacts in the external	ROA	moderate level of board network density enhances firm value, while too cohesive a board network destroys	Large Public firms	Korea	199 firms	1990-1999
-------------	--	---	-----	--	--------------------	-------	-----------	-----------

		environ ment.						
(Larcker <i>et al.</i> , 2013)	Director's formal or professional ties	Well connectedness by degree, closeness, betweenness, centrality, eigenvector	firm-specific one-year-ahead characteristic-adjusted returns	Firms with the best-connected boards earn higher future excess returns	Public firms	US	115,411 directors	2000-2007
(Khataimi <i>et al.</i> , 2016)	connections between board members and senior executives of Moody's and those of public debt issuers.	Connection Dummy: takes the value of 1 if there are past connections, current connections, Professional connections, educational connection, Army connections	non-convertible debt issues	the existence of personal connections between directors of the rating agency and those of the issuing company has a significant positive impact on the credit ratings assigned to the company's issues	industrial companies	US	1719 non-convertible public debt issues by 327 companies	1994-2011

Graphical abstract



### **CONFLICT OF INTEREST**

The authors report there are no conflict of interests to declare.

### **FUNDING**

The authors report no external funding to declare.

### **DECLARATION OF AI-ASSISTED TECHNOLOGIES AND EDITING SERVICES IN THE WRITING PROCESS**

During the preparation of this work the authors used explainedpaper.com and professional copy-edit services by JA Editorial in order to improve readability and flow of ideas. After using this tool and service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.