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Gender diversity on corporate boards, firm performance, and risk-taking: New evidence from Spain

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ABSTRACT

Spain was the first European country to pass a "Gender Equality Act" to improve gender balance on corporate boards. Motivated by this vital development in Spanish law, we examine whether and how women directors play a role in influencing firm risk-taking and performance. We use 805 firm-year observations from 165 unique firms for 2013–2018. We find that firms with higher board gender diversity experience better accounting-based firm performance but lower market-based firm performance. Notably, our results show that firms with more female directors take higher risks, which puts a new insight into the long-standing tale that female directors are risk averse. Our results are robust with alternative measures of board gender diversity, performance and risk measures, alternative model specifications, and the two-step system GMM approach to address possible endogeneity. Our study context is, however, limited to Spain and does not account for female directors' demographic and professional attributes due to the unavailability of relevant data. Despite these limitations, our research has important practical implications for policy and practice to enact a more gender-diverse board for better firm performance and risk management.

1. Introduction

Spain is the first among the European countries to introduce a 'Gender equality law'. Since then, several initiatives have been taken to strengthen the participant ratio of women, especially on corporate boards in Spain. Nevertheless, the country has been lagging in implementing the law (Amorelli and García-Sánchez, 2021). As per the law, all the listed companies in Spain should have at least 40% women's representation in their boardrooms by 2015 (Li and Chen, 2018). According to the Global Gender Gap report (2021), the listed companies have achieved only a 26.40% female presence on their corporate boards.

The deep-rooted characteristics of the gender equality law, the lack of punishment for the firms' non-compliance attitude to the law, the skepticism about women's ability to make corporate boardroom decisions, and the misunderstanding of women's risk-taking behavior are some of the identified reasons for such under-representation (Gabaldon and Giménez, 2017; Yang et al., 2019). The misunderstanding that women are risk-averse and cannot participate in board decisions is notable among them. It is, thus, necessary to bridge the understanding gap among corporate firms by exploring whether women's boardroom engagement results in higher firm performance and corporate risk-taking. However, till now, minimal research effort has been undertaken regarding the issue. Therefore, conducting research on the issue is considered beneficial for Spanish firms and policymakers (Papangkorn et al., 2021; Yang et al., 2019).

In Spain, the majority of empirical evidence focuses on the relationship between board gender diversity and firm performance (Campbell and Mínguez-Vera, 2008; Gallego-Álvarez et al., 2010; Reguera-Alvarado et al., 2017). However, these studies are now outdated as only up to 2009 is covered as the sample period. These studies also do not sufficiently reflect the role of female directors since the passage of the Gender Equality Act in 2007. Furthermore, the aforementioned studies pay attention to understanding the female directors and performance nexus using either accounting-based or market-based metrics. To the best of our knowledge, no prior work in Spain attempts to incorporate both accounting and market-based measures of firm

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performance. Thus, the results of prior studies are mixed (Lee-Kuen et al., 2017; Li and Chen, 2018; Reguera-Alvarado et al., 2017), which may be attributed to the narrow focus of firm performance measures. Additionally, examining the impact of female directors on firm risk-taking was beyond the scope of all prior studies.

Motivated by the above research gaps in the literature and the importance of understanding the influence of female directors on both firm performance and risk-taking, we conduct this empirical study. Our study examines the influence of board gender diversity on the corporate performance and risk-taking behavior of the listed Spanish firms for 2013–2018. The study further takes insights from three established theories of corporate governance, namely agency theory, resource dependence theory, and human capital theory, for developing its research ground. As per the agency theory, the inclusion of female directors in the corporate board reduces agency costs since they are more inclined to include a wide range of views and opinions to enhance board independence (Arora, 2021). The resource dependency theory states that the female board directors can bring additional personal ties, knowledge, and values that positively enhance the firm's performance (Garcia-Castro et al., 2010). The human capital theory argues that female directors bring a unique and extensive stock of education, skills and experiences to the board, thus increasing the firm's corporate values (Brahma et al., 2021).

This paper makes three contributions to the literature. First, while prior work focuses on board gender diversity and firm performance as measured by accounting or market-based data, we examine the role of board gender diversity in performance and risk-taking. In doing so, we use a comprehensive measure of firm performance, incorporating both accounting and market-based measures of performance. Also, we employ a comprehensive measure of risk-taking, including total risk and insolvency risk. Notably, the role of female directors in explaining the risk-taking behavior in Spanish-listed firms has not been investigated in the literature. Our study, extends and enriches the literature by developing an integrated picture of the gender diversity–risk–performance relationship in the context of Spanish-listed companies.

Second, while prior studies were limited to data up to 2009, we use an updated dataset for the empirical investigation to understand the present extent of the precedent relationship paradigm. Third, this study adds to the long-standing debate about whether female directors are risk-averse, which has significant implications for policymakers, firm managers, and regulators. By examining a new perspective on the role of women directors in the context of Spain, this study sheds light on the essence of gender quotas on boards. Finally, the study uses rigorous econometric methodology with panel data along with alternative specifications and alternative measures of board gender diversity. Our methodology is rigorous due to the use of firm-fixed effects and two-step system GMM, to address potential endogeneity concerns in the relationship between women directors and firm performance and risk-taking. In all, our study is novel and different from prior studies in this body of literature in terms of both theoretical and empirical contributions.

Our results show mixed findings regarding board gender diversity, performance, and risk relationships in the context of Spain. The diversity-firm performance relationship is positive when the listed firms use financial statement-based data and negative and insignificant for market-based data. Moving to the gender diversity–risk relationship, both operational and insolvency risk-taking behavior is positively associated with board gender diversity.

The remainder of the paper proceeds as follows. Section 2 summarizes the relevant theoretical background and formulates the study hypothesis. Section 3 outlines the methodological tools and techniques used in the study. Section 4 presents the analysis and findings of the empirical examination. Section 5 ends with the conclusions.

2. Extant literature and hypothesis development

2.1. Board gender diversity and firm performance

The listed companies in Spain have a governance code of conduct called CNMV (Comisión Nacional del Mercado de Valores). It is a voluntary, soft rule that follows the principle of "comply or explain" meaning that companies can decide by themselves whether or not to follow the code of conduct (Reguera-Alvarado et al., 2017). One of the principal recommendations of CNMV is that all the listed companies should have at least 40% female representation on their boards by 2015 (Gabaldon and Giménez, 2017). Nevertheless, most companies have not paid enough attention to this recommendation. The characteristics of the CNMV, lack of punishment for non-compliance behavior and failure to understand the benefits of women's board representation on firm performance are some of the identified reasons. Among them, the most important reason is the dearth of knowledge regarding the advantages of women's boardroom presence (Gabaldon and Giménez, 2017). Thus, exploring the impacts of women's board participation on the firm's performance is necessary to bridge the knowledge gap of the Spanish-listed companies.

Gender diversity on boards refers to the representation of women on the boards of directors in corporations (Amorelli and García-Sánchez, 2021). As a significant part of good corporate governance, board gender diversity could benefit board functioning and eventually firm performance (Reguera-Alvarado et al., 2017). Here, firm performance denotes the profitability issue of the firm as well as investors' perceptions and attitudes regarding the firm's future competitiveness (Khan et al., 2021). Extant literature has identified several theories supporting the board gender diversity-firm performance relationship. Some examples are an agency, resource dependence, human capital, social psychological, and critical mass theories (Brahma et al., 2021). This study picks the first three theories to develop its research grounds. According to the agency theory, a gender-diverse corporate board plays a crucial role in monitoring and resolving the conflict of interest that occurs between shareholders (principals) and managers (agents) (Adams and Ferreira, 2009). Thus, females' boardroom presence mitigates agency costs and ensures financial accountability on boards since females have better monitoring capability than their male counterparts (Brahma et al., 2021). Such accountability escalates the quality of the firm's profitability (Bennouri et al., 2018). In fact, females are more ethical, risk-aversion, and stricter monitors in making corporate financial decisions (Papangkorn et al., 2021). As previously mentioned, profitability is one way of examining whether the firm is performing better or not. The fact that the presence of females on the boards enhances firms' performance as measured by profitability metrics is confirmed by several prior studies (Bennouri et al., 2018; Papangkorn et al., 2021).

In the context of Spain, it is observed that females have remarkably higher moral values and ethical principles than males (Gabaldon and Giménez, 2017). Despite having such quality characteristics, females are hardly incorporated into the board's financial decision mechanism (Reguera-Alvarado et al., 2017). Most Spanish companies have misperceptions regarding female competency in handling corporate financial activities. Thus, examining whether female board presence results in positive firm performance as measured by profitability metrics is necessary. Therefore, this study proposes the following hypothesis:

H1: Female directors influence firm performance as measured by financial statement-based data.

The resource dependency theory contends that gender-diverse firms want to appoint board members with dynamic human and social capital. Such board members can bring a wide range of knowledge, legitimacy, and prestige to the organization (Arora, 2021). The human capital theory, similar to the previous one, states that the considering women in boardrooms enables firms to exploit women's education, skills, and experience for productive performance (Brahma et al., 2021). The present scenario of Spanish corporate boards, however, does not fully accommodate the insights of the aforementioned two theories (Reguera-Alvarado et al., 2017). The lack of relevant, experienced female candidates is one of the prominent logical reasons.

In Spain, female candidates require prior experience in top managerial positions to be selected by the board of directors (Gabaldon and Giménez, 2017). However, they are hardly able to accumulate job experience since many have lost their jobs in the middle of their career due to the work-life imbalance issue (Reguera-Alvarado et al., 2017). Thus, investors in Spain perceive that ensuring board diversity by following the 'Gender Equality law' decreases firm performance if females do not possess enough top managerial experience (Bennouri et al., 2018). It is worth pointing out that investors' perceptions and behaviors are closely related to stock-based measurement metrics of firm performance. Thus, if investors have negative perceptions regarding gender diversity, it will result in a decreased firm's performance as measured by stock-based metrics (Papangkorn et al., 2021). Based on this argument, this study hypothesizes that:

H2: Female board members influence firm performance as measured by market-based data.

2.2. Board gender diversity and firm risk

The gender of a particular individual plays a viable role in decision-making since females work differently than their male counterparts (Cho et al., 2021). As documented by growing literature, such gender differences lead to differences in corporate policies (Sah et al., 2022). As per the self-construal theory, males assume themselves as independent while females perceive them as interdependent (Gabriel and Gardner, 1999). Females try to be compassionate regarding their decisions' effects on others' well-being and are inclined to build close, intimate relationships and avoid conflict in resolving disputes. The implications of such enduring and sensitive characteristics of females are prominent in alleviating risk-taking tendencies in the corporate world (Hurley and Choudhary, 2020).

Risk appetite for males and females, as evidenced by gender studies literature, differ significantly (Cho et al., 2021). A common notion exists among firms that women tend to be more risk-averse than men (Sila et al., 2016). Such risk-aversion behavior is extreme when women are responsible for making strategic business decisions (Bruna et al., 2019). They are conservative in making decisions related to financial investments (Domínguez and Gámez, 2014). However, literature provides evidence that the degree of risk-aversion characteristics has vanished once females break the glass-ceiling practice and adapt them to the male-dominated culture (Adams and Funk, 2012). There exists greater empirical evidence for example in Sweden that female directors can seek more risks compared to their male counterparts in the corporate (Switzer and Huang, 2007).

The literature has identified corporate governance's role in coping with firms' risk-taking behavior (Bhagat et al., 2015). Specifically, a plethora of corporate governance studies has identified gender diversity as an effective mechanism for mitigating the risk-taking tendency of firms (Ali et al., 2022; Bufarwa et al., 2020; Hurley and Choudhary, 2020; Khatib et al., 2022; Koirala et al., 2020; Mumu et al., 2021). For instance, Hurley and Choudhary (2020) observed that an increasing number of female board of directors results in decreased corporate risks since females see the risky venture as a threat. Furthermore, a comprehensive content analysis by Mumu et al. (2021) evidences that gender diversity, a prime element of corporate social responsibility, diminishes the probability of a firm's financial risks since these two components are inversely related to each other. These recent empirical efforts attempt to offer a nuanced understanding that differences in gender results in differential financial decisions and risk-taking in firms.

Previously, in Spain, females experienced several difficulties in promoting decision-making to the corporate board. Among the identified reasons, the glass ceiling was found to be a significant barrier to promoting females to top-level management positions (Reguera-Alvarado et al., 2017). In an attempt to reduce such barriers, the government of Spain has introduced the 'Corporate Governance Code-2006' and the 'Gender Equality Law-2007'. It would be interesting to see if these acts can help to break down the glass ceiling and encourage Spanish females, like their male counterparts, to take financial risks. However, no empirical evidence has been found regarding this issue until now (Bruna et al., 2019). Given the previous background and research gap, thus, this study assumes that-

H3: Female directors on the board influence firm's risk-taking behavior.

3. Methodology and data

3.1. Sample

The purpose of the study is to explore how gender diversity in the boardroom can impact firm performance and risk-taking. The study sample comprises firms that are listed with the Spanish stock exchange commission (CNMV), a government agency responsible for handling financial regulations for Spanish securities markets. The dataset contains 165 firms and 805 firm-year observations for the period 2013–2018. Prior 'gender diversity' research from the Spanish firms' context covers the time periods up to 2009 (Campbell and Mínguez-Vera, 2008; Reguera-Alvarado et al., 2017). However, understanding the current conditions of Spanish firms in terms of gender equality law is necessary (Gallego-Álvarez et al., 2010).

This study accommodates the prior study gap by starting with the year 2013 and ending in 2018. Furthermore, the time period provides two-sided information: both before and after the year 2015 which is declared as the deadline to achieve the desired 40% diversity goal. The years 2011 and 2012 have been dropped from the dataset due to the missing of relevant firm-level data. Further, the study dataset does not consider the year 2019 to 2022 owing to the unavailability of up-to-date information. The dataset, thereby, ends with the year 2018. Firms from eight diverse industries and sectors namely basic materials, energy, consumer, financials, healthcare, industrials, utilities, and technology & telecommunication services comprise the dataset. However, industry-wise in-depth information has not been scrutinized in this study. The boardroom diversity perspective is thoroughly examined in the current study using the dataset of only Spanish firms. Nonetheless, European countries other than Spain have not been examined because of the shortage of cross-country, firm-level relevant data. Some prominent items interrelated to boardroom diversity such as female age, ethnicity, educational qualification and job tenure have not been investigated owing to data shortage. Overall, the dataset comprises financial, gender diversity, and risk-related information collected from Thomson Reuters Eikon.

3.2. Variable measurement

3.2.1. Dependent variables

The dependent variable of the study corresponds to firm performance and risk. The study uses both accounting-based and stock-based measures of firm performance. While the accounting-based measure represents the profitability of a firm in a particular year, the stock-based measure reflects shareholders' expectations regarding the firm's future performance. Thus, applying both measures offer a clear snapshot of the firm performance. Hence, the study adopts four key indicators of firm performance (i) Tobin's Q (TQ_{it}) (ii) Return on Asset (ROA_{it}) (iii) Return on Equity (ROE_{it}) (iv) the Basic Earning Power ratio (BEP_{it}) The first indicator represents market-based measures, while the last three are accounting-based measures of firm performance.

Tobin's Q (TQ_{it}) is considered the most reliable measure as it is forward-looking and measures the firm's competitive advantage. Firms with TQ_{it} greater than 1 indicates that they have high growth potential, investment opportunities, and a well-utilized resource management system (Khan et al., 2021). Return on asset (ROA_{it}) is the ratio of total income to total assets that denotes how profitable a firm is in relation to its total reported assets for a given financial year. Return on equity (ROE_{it}) measures how well a firm is utilizing shareholders' equity in order to generate earnings. The final proxy basic earning power ratio (BEP_{it}) provides a complete picture regarding how much money a firm is making that sounds similar to ROA_{it}. However, ROA_{it} considers only operating income while BEP_{it} adds non-operating income along with operating income.

Furthermore, we use two widely used measures of firm risk. Asset return volatility is the first proxy for risk, which is measured as the standard deviation of ROA ($SDROA_{it}$). The second proxy for risk is the insolvency risk as measured by Z_Score_{it}. The formula for the Z-score is defined as follows:

$$Z\_Score_{it} = \frac{(ROA_{it} + CAR_{it})}{SDROA_{it}}$$

where, ROA_{it} = Return on assets, CAR_{it} = Capital-to-asset ratio, $SDROA_{it}$ = Standard deviation of ROA, it = number of firms i for the year t. These two measures capture total risk and risk of financial distress (John et al., 2008; Safiullah and Shamsuddin, 2018).

3.2.2. Independent variables

Gender diversity, the independent variable of interest in the study, is measured in several ways. Four different proxies are considered to measure this variable. The percentage of women on the board ($PWOMEN_{it}$) denotes the ratio of female directors to total board members. $DWOMEN_{it}$ is the conventional measure of women's representation that uses a dummy variable when there is at least one woman on the board. The study adopts two more complementary measures of gender diversity including Blau (1977) ($BLAU_{it}$) and Shannon (19480) ($SHANNON_{it}$) index of diversification. These two diversification indices are significant for gender diversity research as they consider both the number of gender categories and the evenness of distribution of board participants among them. Specifically, the Shannon index takes into account even the small differences in the board's gender composition since the index takes the natural logarithm of the total asset (Campbell and Mínguez-Vera, 2008). The following equations are employed:

$$BLAU_{it} = 1 - \sum_{i=1}^{n} p_i{}^2$$

$$SHANNON_{it} = -\sum_{i=1}^{n} p_I \times \ln p_i$$

where, P_i = For every ith group, the proportion of board directors in each category (male & female categories), n = The total number of board directors, $\ln p_i$ = natural logarithm taken for p_i. The Blau index ($BLAU_{it}$) for gender diversity takes the value between 0–0.5 where 0 indicates the board consists of only males or females (no gender diversity) and 0.5 denotes the maximum, balanced number of females and males. Moving to the Shannon index ($SHANNON_{it}$), the value range is bound between 0–0.69, indicating no diversity (0) and equal distribution of each gender category (0.69).

3.2.3. Control variables

The preceding literature identified that firm performance can be influenced by multiple firm-specific characteristics (Marinova et al., 2016; Reguera-Alvarado et al., 2017). Thus, beyond the predictor variables, this study employs several control variables in the regression models in order to overcome model misspecification and outcome biases. For instance, the study incorporates the board size ($BSIZE_{it}$) that defines the total number of members in a particular corporate board. The Firm size ($FSIZE_{it}$) is employed by taking the natural logarithmic transformation of the total reported assets. The total debts over the total asset, termed as leverage (LEV_{it}) is further used. Lastly, the percentage of total asset that is invested for research & development ($R\&D_{it}$) purpose is entered into the model (see Table 1).

3.3. Research design

To examine the association between board gender diversity, firm performance and risk-taking, the study employs the following empirical models:

$$\begin{aligned} Performance_{it} = {} & \beta_0 + \beta_1 Performance_{i,t-1} + \beta_2 PWOMEN_{it} \\ & + \beta_3 DWOMEN_{it} + \beta_4 BLAU_{it} \\ & + \beta_5 SHANNON_{it} + \beta_6 BSIZE_{it} + \beta_7 FSIZE_{it} + \beta_8 LEV_{it} \\ & + \beta_9 R\&D_{it} + \mu_i + \eta_t + \varepsilon_{it} \end{aligned} \quad (1)$$

$$\begin{aligned} Risk_{it} = {} & \beta_0 + \beta_1 Risk_{i,t-1} + \beta_2 PWOMEN_{it} + \beta_3 DWOMEN_{it} \\ & + \beta_4 BLAU_{it} + \beta_5 SHANNON_{it} \\ & + \beta_6 BSIZE_{it} + \beta_7 FSIZE_{it} + \beta_8 LEV_{it} + \beta_9 R\&D_{it} \\ & + \mu_i + \eta_t + \varepsilon_{it} \end{aligned} \quad (2)$$

where performance represents four measures of firm performance such as TQ_{it}, ROA_{it}, ROE_{it} and BEP_{it}. Risk refers to the total risk and insolvency risk as measured by asset return volatility ($SDROA_{it}$) and Z-score (Z_Score_{it}). $PWOMEN_{it}$, $DWOMEN_{it}$, $BLAU_{it}$ $SHANNON_{it}$ are the various measures of gender diversity and $BSIZE_{it}$, $FSIZE_{it}$, LEV_{it}, $R\&D_{it}$ are the firm-level control variables. The one-year lag value of the dependent variables is added to the model to represent prior firm performance and risk-taking behavior. β_0 is the regression constant, i indicates firm, t indicates the year (time dimension), β_1 to β_9 indicate the regressor coefficients, μ_i, η_t, and ε_{it} represent the time effect, individual time-invariant effect and stochastic error term, respectively.

Some of the econometric limitations, such as unobserved heterogeneity and endogeneity issues, may be present when using panel data regression (Baltagi and Baltagi, 2008; Gormley and Matsa, 2014). While the first issue deals with time-invariant characteristics of the sample, the second one involves imprecise casualty direction between independent and dependent variables. For example, gender diversity in the boardroom impacts firm performance, but at the same time, it is possible that the presence of women on the board is also determined by firm performance. Thus, since the direction of the relationship between variables is unclear, the study adopts a carefully designed methodology to

Table 1
Variable definitions.

Identification of variables			References
Main variables	Acronyms	Definition & Measure	
Firm's performance (Dependent variable)			
Tobin's Q	TQ	The sum of the market value of stock and the book value of debt is divided by the book value of total assets.	Bennouri et al. (2018), Brahma et al. (2021) and Khan et al. (2021)
Return on assets	ROA	The ratio of a firm's annual operating income to total assets in a financial year.	Brahma et al. (2021) and Yang et al. (2019)
Return on equity	ROE	The ratio of a firm's annual net income to stockholders' equity in a financial year.	Bennouri et al. (2018) and Khan et al. (2021)
Basic earning power ratio	BEP	The ratio of Earnings before interest & tax (EBIT) to total assets reported in a financial year.	Papangkorn et al. (2021)
Firm's risk (Dependent variable)			
Asset return volatility	SDROA	The standard deviation of return on assets (ROA) over a five-year overlapping window.	Bruna et al. (2019)
Z-Score	Z-SCORE	The ratio of the summation of return on asset and capital-to-asset to asset return volatility.	Safiullah and Shamsuddin (2018)
Gender diversity (Independent variables)			
Percentage of women on the board	PWOMEN	% of women director on the board.	Chijoke-Mgbame et al. (2020) and Papangkorn et al. (2021)
Dummy variable for women	DWOMEN	Dummy variable = 1 if at least 1 woman is present on the board, 0 otherwise.	Li and Chen (2018) and Papangkorn et al. (2021)
Blau index	BLAU	An index of measuring gender diversity.	Gordini and Rancati (2017) and Lee-Kuen et al. (2017)
Shannon index	SHANNON	An index to measure gender diversity.	
Control variables			
Board size	BSIZE	The total number of board members.	Li and Chen (2018) and Marinova et al. (2016)
Leverage	LEV	The ratio of the total debt to total assets.	Duppati et al. (2020) and Li and Chen (2018)
Firm size	FSIZE	The natural logarithm of total assets.	Papangkorn et al. (2021) and Reguera-Alvarado et al. (2017)
Research & development	R&D	Total research & development expense divided by the total assets reported in the financial year.	Bennouri et al. (2018) and Papangkorn et al. (2021)

Notes: This table represents the list of dependent, independent and control variables, their definitions and measurement formulas. Variables from the Thomson Reuters Eikon are winsorized at the 1% significance level.

handle the endogeneity problem. More specifically, we employ firm-random effects, and a two-step system GMM to address the possible endogeneity concerns.

Before stepping into the panel regression, all the variables in the study are winsorized at the 1% level to make the data normally distributed and fit to run. Next, the multi-collinearity issue is examined by adopting pairwise correlation analysis among the dependent, independent, and control variables. This is further examined by using the Variance Inflation Factor (VIF) test. Since, the two correlation statistics discover autocorrelation issues among independent variables, the principal component method (PCA) of factor analysis is carried out. After that, the panel regression method is conducted, which corresponds to deciding between fixed effect (FE) and random effect (RE). Finally, the Two-step system Generalized methods of moments (GMM) is applied to control for the heterogeneity issue that is inherent in the gender diversity–performance–risk relationship (Blundell and Bond, 1998).

4. Empirical results

4.1. Summary statistics

The summary of the descriptive analysis of the dependent variables (TQ_{it}, ROA_{it}, ROE_{it}, BEP_{it}, $SDROA_{it}$ & Z_Score_{it}), independent variables ($PWOMEN_{it}$, $DWOMEN_{it}$, $BLAU_{it}$ $SHANNON_{it}$) and control variables ($BSIZE_{it}$, $FSIZE_{it}$, LEV_{it}, $R\&D_{it}$) is shown in Table 2. The results suggest that the TQ_{it} value ranges from 0.03 to 7.73, which suggests that firms' performance varies significantly across the eight different listed sectors in Spain. Similarly, the profitability of the industries (ROA_{it}, ROE_{it}, BEP_{it}) also differs considerably across the 805 observations. The asset return volatility ($SDROA_{it}$) and the Z-score (Z_Score_{it}) of firm risk measures have significant differences in their mean values, indicating that firms within the eight industries are highly exposed to insolvency risk compared to operational risk. Regarding the gender diversity variables, only 16% of the directors of the Spanish boards are women ($PWOMEN_{it}$) which indicates a clear under representation of women in the total board membership. $DWOMEN_{it}$ is a dummy variable, taking the value of 1 if there is at least one women director or 0 if otherwise. Approximately, 80% of the Spanish sample listed firms have at least one woman representation in the total board composition. The average values for the $BLAU_{it}$ and $SHANNON_{it}$ indices are 0.24 and 0.37 respectively which is much higher compared to the value reported in the study (Campbell and Mínguez-Vera, 2008). Previously in Spain, the participation of women in the workplace seemed slower since society had a tradition-bound, negative attitude towards the role of women (Campbell and Mínguez-Vera, 2008). Still, Spanish workplaces are away from achieving a perfect diversity score ($0.5 = BLAU_{it}$; $0.69 = SHANNON_{it}$) (Lee-Kuen et al., 2017). With respect to the control variables, the board has an average of 10 members ($BSIZE_{it}$). The average firm size ($FSIZE_{it}$) is 20% with a leverage ratio (LEV_{it}) of around 27%, implying that the majority of the firms do not have

Table 2
Descriptive statistics.

	Mean	Median	Std. Dev.	Min	Max
Firm performance					
TQ	1.08	0.85	1.01	0.03	7.73
ROA	0.03	0.02	0.07	−0.19	0.21
ROE	0.04	0.08	0.30	−2.63	0.79
BEP	0.03	0.04	0.14	−2.45	0.79
Firm risk					
SDROA	0.066	0.068	0.002	0.063	0.068
Z-Score	2.158	1.546	3.028	−5.400	13.469
Gender diversity					
PWOMEN	0.16	0.15	0.12	0.000	0.57
DWOMEN	0.80	1.00	0.40	0.000	1.00
BLAU	0.24	0.26	0.15	0.000	0.50
SHANNON	0.37	0.43	0.22	0.000	0.69
Control variables					
BSIZE	9.87	10.00	3.56	3.00	21.00
FSIZE	0.27	0.27	0.19	0.00	0.90
LEV	20.75	20.71	2.58	13.85	28.01
R&D	0.03	0.001	0.09	0.00	0.46

Notes: This table represents the summary statistics of the firm's performance, risk measures, gender diversity and firm-level control variables for the sample of the listed 165 firms of Spain. The final sample consists of the unbalanced panel of the 805 firm-year observations from the year 2013 to 2018.

any high debt to repay. Lastly, the Spanish firms have kept a small amount of R&D budget ($R\&D_{it}$), which is around 3% of their total reported assets.

4.2. Correlation matrix

This section covers the discussion regarding Pearson correlation analysis of the dependent, independent and control variables. The matrix reveals that the "Firm performance" measures (TQ_{it}, ROA_{it}, ROE_{it}, BEP_{it}) are negative but insignificantly correlated with the "Gender diversity" variables. Oppositely, the risk measures ($SDROA_{it}$ & Z_Score_{it}) have a positive and significant correlation with the "Gender diversity" variables at the 10% level. The four dependent variables have a negative correlation with all the control variables except "R&D" with a coefficient of 0.593. Moreover, the matrix explores a high correlation among the variables of the "Gender diversity" constructs with the highest being 0.992, indicating that multicollinearity will become an issue in this study. This is further confirmed by the findings of the Variance Inflation Factor (VIF) test (see Table 4). The collinearity statistics reveal that the average value of VIF is 584.671 which is far above the recommended threshold level (Gujarati et al., 2012).

To overcome the multicollinearity issue, Factor analysis (FA) is applied to transform the four correlated independent variables into one or more uncorrelated factors. Here, only a single factor is retained as it accounts for around 92% of the variances of the "Gender diversity" construct (see Tables 3–5).

4.3. Does board gender diversity influence firm performance?

Regarding the gender diversity-firm performance relationship, the study first runs regression with fixed and random effects separately for the unbalanced panel of 805 observations from 2013 to 2018. Next, the study determines the validity of fixed and random effect estimators using the Hausman specification test. The null hypothesis is that the difference in the coefficient is not systematic, meaning that if the p-value < 0.05, then the fixed effect model should be chosen. However, the study result reveals that the Hausman test cannot reject the null hypothesis ($\chi 2 = 6.561$; $P = 0.255$) and thus, random effect models are preferred for explaining the diversity–performance relationship.

The regression outputs of random effect models are reported in Table 6. The results indicate that the coefficient of gender diversity remains positive across all the firm performance measures, but statistically significant only with ROA_{it} and BEP_{it}. One possible explanation for why there is not a significant relationship between TQ_{it} and the presence of women on the board ($PWOMEN_{it}$) is that TQ_{it} is a stock-based measure that closely deals with the subjective perception and behaviors of investors (Papangkorn et al., 2021). The result that $PWOMEN_{it}$ has a significant positive influence on the accounting performance is in line with the study of Bennouri et al. (2018). The coefficient for $BSIZE_{it}$ is insignificantly negative for models 1 and 3, suggesting that the firm's performance decreases when the number of board members increases. Except in model 3, $FSIZE_{it}$ is negatively associated with the firm's performance across all models. It strengthens the findings of Campbell and Mínguez-Vera (2008) as when a firm reaches an optimal size, it will start to exhibit a decreasing growth rate, thus affecting the firm's value in turn. In terms of LEV_{it} and $R\&D_{it}$, the coefficients are negatively significant for models 2, 3, and 4 respectively.

4.4. Does board gender diversity influence firm risk-taking?

Like the diversity–performance relationship, fixed and random effects models are separately run for gender diversity-firm risk relationships at the beginning. Next, the Hausman specification test is run to determine which model best explains the relationship. The test reveals that the Chi-square value is 7.534 with a P-value of 0.184 meaning that the null hypothesis is rejected ($p\text{-value} > 0.05$) and thus the random effect estimator is preferred for the relationship.

The regression results of the random effect model are presented in Table 7. The gender diversity coefficients are positively associated with all the firm risk measures but statistically significant with only the asset volatility return ($p\text{-value } 0.004 < 0.01$). The coefficients of the relationship, though small across the risk measures ($SDROA_{it} = 0.001$; $Z\_Score_{it} = 0.001$), but statistically significant only to $SDROA_{it}$. Also, both risk measures are positively related to all of the control variables except LEV_{it}. Furthermore, the coefficient of $BSIZE_{it}$ is positive and significant to $SDROA_{it}$ (coefficient is close to 0) while it is negative to Z_Score_{it} (coefficient $= -0.046$), meaning that larger corporate boards are associated with lower insolvency risk and higher operational risk. The finding that a larger board size increases operational risk breaks the "too-big-to-fail" notion and is inconsistent with prior studies (Nakano and Nguyen, 2012; Safiullah and Shamsuddin, 2018). Similarly, $FSIZE_{it}$ and $R\&D_{it}$ increases a firm's operational risk while decreasing insolvency risk.

5. Additional tests: Two-step system GMM

The endogeneity issue of gender diversity-firm risk-firm performance relationship is a matter of concern since the direction of the relationship among variables is unclear. Some unobserved factors may impact boardroom gender diversity, and the participation of females in the boardroom decisions impact firm's performance. However, the extent to include more females in the board decisions may also be determined by whether the firm is performing financially better or not. To account for such an unclear direction of the relationship and to address the potential endogeneity problem, this study employs two-step system GMM estimators, proposed initially by Blundell and Bond (1998). A dynamic panel model (two-step system GMM) approach is applied to provide econometric evidence regarding the effect

Table 3
Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) TQ	1.000													
(2) ROA	0.419* (0.000)	1.000												
(3) ROE	0.129* (0.001)	0.700* (0.000)	1.000											
(4) BEP	0.536* (0.000)	0.649* (0.000)	0.555* (0.000)	1.000										
(5) SDROA	0.034 (0.365)	0.074 (0.045)	0.057 (0.129)	0.089 (0.015)	1.000									
(6) Z Score	0.692* (0.000)	0.497* (0.000)	0.205* (0.000)	0.447* (0.000)	0.066 (0.078)	1.000								
(7) PWOMEN	−0.053 (0.176)	0.113* (0.003)	0.097 (0.014)	0.115* (0.003)	0.195* (0.000)	0.080 (0.041)	1.000							
(8) DWOMEN	−0.022 (0.574)	0.202* (0.000)	0.176* (0.000)	0.168* (0.000)	0.157* (0.000)	0.178* (0.000)	0.673* (0.000)	1.000						
(9) BLAU	−0.032 (0.413)	0.143* (0.000)	0.116* (0.003)	0.135* (0.000)	0.204* (0.000)	0.117* (0.003)	0.968* (0.000)	0.792* (0.000)	1.000					
(10) SHANNON	−0.028 (0.477)	0.161* (0.000)	0.130* (0.001)	0.145* (0.000)	0.202* (0.000)	0.134* (0.001)	0.937* (0.000)	0.862* (0.000)	0.992* (0.000)	1.000				
(11) BSIZE	−0.163* (0.000)	0.000 (0.995)	0.177* (0.000)	0.162* (0.000)	−0.002 (0.958)	0.022 (0.573)	0.070 (0.056)	0.327* (0.000)	0.129* (0.000)	0.170* (0.000)	1.000			
(12) FSIZE	−0.210* (0.000)	0.009 (0.809)	0.187* (0.000)	0.137* (0.000)	0.026 (0.459)	−0.061 (0.102)	0.147* (0.000)	0.273* (0.000)	0.184* (0.000)	0.206* (0.000)	0.706* (0.000)	1.000		
(13) LEV	−0.069 (0.064)	−0.269* (0.000)	−0.161* (0.000)	−0.170* (0.000)	−0.032 (0.387)	−0.526* (0.000)	−0.036 (0.350)	−0.093 (0.015)	−0.049 (0.207)	−0.060 (0.118)	0.110* (0.004)	0.097* (0.008)	1.000	
(14) R&D	0.593* (0.000)	−0.381* (0.000)	−0.400* (0.000)	−0.290* (0.006)	0.046 (0.666)	−0.013 (0.907)	0.028 (0.800)	−0.007 (0.949)	0.054 (0.630)	0.052 (0.645)	−0.085 (0.446)	−0.310* (0.003)	0.212 (0.056)	1.000

Notes: ***, ** and * denotes to the statistical significance at 1%, 5% and 10% level respectively.

Table 4
Collinearity statistics.

Variables	VIF	Tolerance
PWOMEN	2439.835	0
DWOMEN	42.736	.023
BLAU	2100.706	0
SHANNON	84.228	.012
BSIZE	3.841	.26
FSIZE	3.515	.284
LEV	1.23	.813
R&D	1.276	.784
Mean VIF	584.671	

Notes: This table represents the collinearity statistics of the gender diversity and firm-level control variables. The VIF < 10 indicates that there is no issue of multicollinearity among the variables.

of board gender diversity on firm performance and risk-taking. This methodology is considered a better estimation approach since it accounts for unobserved heterogeneity, simultaneity, and dynamic endogeneity (Blundell and Bond, 1998). The estimation results are presented in Tables 8 and 9.

Table 8 shows the regression outputs for the diversity-performance relationship using TQ_{it}, ROA_{it}, ROE_{it}, and BEP_{it} as the dependent variables. The results report that both ROA_{it} and ROE_{it} have positive significant associations with their lagged values at 5% and 1% levels, respectively. On the contrary, TQ_{it}, and BEP_{it} have only a positive but insignificant relationship with their lag period coefficient. The implication is that both prior and current firm performances are positive across all the measures and significant when a company uses accounting-based performance metrics. Regarding the independent variable, the relationship between gender diversity and firm performance (accounting-based measure) is significant with the coefficients of 0.011 (ROA_{it}) and 0.012 (BEP_{it}) successively. However, the study finds a negative impact of the gender diversity construct on the stock-based firm performance metric (TQ_{it})

With regard to the control variable, it is found that board size develops a positive relationship with all the dependent variables except ROE_{it}. The negative association that board size has on ROE_{it} can be explained by the fact that the large board size ($BSIZE_{it}$) creates miscommunication, disagreement, and decision-making problems, thus degrading firm performance (Khan et al., 2021). As expected, $FSIZE_{it}$ is found to have a negative association with the majority of the performance measures, indicating that a firm should not try to expand beyond its optimal size (Campbell and Mínguez-Vera, 2008). Contrary to expectation, the coefficient of LEV_{it} is found to be negative across all the performance measures which are contradictory to agency theory (Lee-Kuen et al., 2017). The theories state that firms with high leverage indicate low agency problems, less risk-taking, and tax savings, thereby ensuring an optimistic future. Moving to the last variable, the nexus between $R\&D_{it}$ and firm performance is found to be significantly positive (p-value 0.00 $<$ .01) only for TQ_{it}.

Table 9 represents the two-step system GMM outputs for the board gender diversity–risk relationship using asset return volatility ($SDROA_{it}$) and Z-score (Z_Score_{it}) as the dependent variables. As expected, both firm risk measures ($SDROA_{it}$ & Z_Score_{it}) have a positive relationship with their respective lagged values at the 1% significance level. This implies that both previous and current operational and insolvency risk-taking behavior of firms is associated with each other. Furthermore, the asset return volatility ($SDROA_{it}$) is found positively correlated with all the firm-level control variables except leverage (coefficient $=$ −0.003). Overall, this study finds no evidence that female board presence reduces firm risk-taking behavior. This finding is consistent with the study of Bruna et al. (2019) where no association is observed between female directors and firm-risk-taking level in the context of France. Since Spain and France belong to the EU, it is quite possible that both countries have some form of similarity in their corporate governance mechanisms (Bruna et al., 2019).

Table 5
Principal component analysis output.

Before rotation					After rotation				
Factor	Eigenvalue	Difference	% of Variance	Cumulative%	Factor	Eigenvalue	Difference	% of Variance	Cumulative%
Factor1	3.660	3.330	0.915	0.915	Factor1	3.660	.	0.915	0.915
Factor2	0.330	0.321	0.083	0.998					
Factor3	0.010	0.009	0.002	1.000					
Factor4	0.000	.	0.000	1.000					

Notes: This table represents the factor analysis for the gender diversity variables using principal component analysis (PCA) method. Here the factors are rotated using orthogonal varimax procedure.

Table 6
Gender diversity and firm performance.

Firm performance				
Variables	(1) TQ	(2) ROA	(3) ROE	(4) BEP
Gender diversity	0.07	0.018**	0.031	0.015**
	(0.243)	(0.032)	(0.525)	(0.014)
BSIZE	−0.018	0.000	−0.006	0.003
	(0.644)	(0.994)	(0.797)	(0.376)
FSIZE	−0.194*	−0.002	0.045	−0.012
	(0.065)	(0.822)	(0.328)	(0.118)
LEV	−0.4	−0.107**	−0.456*	−0.052
	(0.441)	(0.013)	(0.052)	(0.19)
R&D	1.165	−0.252**	−1.122*	−0.379***
	(0.422)	(0.028)	(0.064)	(0.001)
Constant	5.778***	0.114	−0.647	0.316**
	(0.005)	(0.452)	(0.428)	(0.03)
R^2	0.353	0.328	0.347	0.302

Notes: This table presents the random effect estimation results for the gender diversity-firm performance relationship. Tobin's Q (TQ) represents the market-based performance metric; Return-on-asset (ROA), Return-on-equity (ROE) and Basic earning power ratio (BEP) are the accounting-based performance metrics. The sign ***, ** and * indicate the statistical significance level at 1%, 5% and 10% respectively. The p values are shown in the parenthesis.

Table 7
Gender diversity and firm risk.

Firm risk		
Variables	(1) SDROA	(2) Z_score
Gender diversity	0.001***	0.001
	(0.004)	(0.999)
BSIZE	0.000***	−0.046
	(0.001)	(0.77)
FSIZE	0.001***	−0.786***
	(0.006)	(0.037)
LEV	−0.002*	−8.717***
	(0.076)	(0.000)
R&D	0.007***	−4.111
	(0.051)	(0.435)
Constant	0.056***	23.053***
	(0.000)	(0.001)
R^2	0.164	0.482

Notes: This table denotes the random effect estimation of the gender diversity-firm risk relationship. The asset-return volatility (SDROA) and Z-score (Z_Score) represent the two risk measures of the sample firms. The sign ***, ** and * indicate the statistical significance level at 1%, 5% and 10% respectively. The p values are shown in the parenthesis.

Tables 8 and 9 show the estimation results of AR (2) second-order serial correlation tests and Hansen's overidentify restriction J test. Although the diagnostic test results are not robust across the model, our GMM results imply that our main finding, board-room gender diversity impacts firm performance and risk-taking, holds and is not driven by possible endogeneity concerns.

6. Conclusions

This study offers new insights into the corporate governance literature. This study comprehensively examines the gender diversity-firm performance-firm risk relationships using the listed companies' dataset in Spain. The empirical analysis reports some contradictory findings. The 'diversity–performance' association is significantly positive for the accounting-based performance measure, and a negative, insignificant one for the market-based measure. Thus, having a balanced board regarding gender diversity escalates financial profitability while negatively affecting investors' perceptions and behaviors. On the other hand, the diversity–risk relationship is positively associated with each other across all the risk measures but is only statistically significant to the asset return volatility.

The findings of this study have some significant implications for the managers, firms, and policymakers of Spain. The aforementioned positive relationship between diversity and performance implies that females are more ethical and stricter monitors of financial activities, which mitigates a firm's earning management practices. Thus, companies can take advantage of women's values to have a bottom-line contribution. Furthermore, companies should remove their biased perception of women in the top position to build a positive relationship between board diversity and market-based performance measures (Papangkorn et al., 2021). Regarding diversity and firm risk, it is evident that Spanish women have successfully broken the glass ceiling and are more interested in taking risks for firms. Lastly, the government and policymakers of Spain should convert their non-mandatory gender equality law into a mandatory one and introduce some forms of penalties for those companies with non-compliance behavior like Norway.

This study is subject to some limitations. For example, the database covers the period from 2013-to 2018. Application of recent data would give better results. The current study explores diversity–performance–risk relationships for overall eight different industries in Spain. The consideration of a single industry would provide an industry-wise clear picture of the aforementioned relationship. Some specific characteristics of women for instance education, job experience, age, ethnicity, and qualifications are not included in the model due to the shortage of data. Another limitation would be the number of countries used in this study. Only Spain is considered a sample unit for the study among the European countries. The rest of the countries may have different cultures, laws, regulations and historical backgrounds that can affect corporate board diversity.

Thus, future scholarly works may include other European countries for comparative analysis. Another possible research area would be studying how the characteristics above can explain the practical benefits of women's presence on the board. Furthermore, moderating or intervening variables such as firm size can be included in the diversity–performance relationship. The inclusion of two more alternative risk measures namely systematic and idiosyncratic risks may offer a more in-depth picture of the diversity–risk relationship of the Spanish firms.

Table 8
Gender diversity and firm performance: Two-step system GMM.

Variables	TQ	ROA	ROE	BEP
TQ(n − 1)	0.077			
ROA(n − 1)		0.41** (0.012)		
ROE(n − 1)			0.307*** (0.000)	
BEP(n − 1)				0.03* (0.853)
Gender diversity	−0.013	0.011*** (0.001)	0.036	0.012* (0.092)
BSIZE	0.045	0.002	−0.021*** (0.009)	0.005* (0.067)
FSIZE	−0.136	−0.009** (0.012)	0.083** (0.01)	−0.01 (0.189)
LEV	−0.331	−0.071** (0.013)	−0.49*** (0.002)	−0.041 (0.279)
R&D	4.711*** (0.00)	−0.249*** (0.00)	−1.47*** (0.000)	−0.361*** (0.00)
Constant	3.457* (0.074)	0.209*** (0.001)	−1.307*** (0.001)	0.245 (0.115)
Number of observations	72	72	72	72
Number of groups	17	17	17	17
Number of instruments	10	10	10	10
Arellano–Bond AR (1) (z, p-value)	−1.47 (P = 0.140)	−1.23 (P = 0.217)	−0.93 (P = 0.352)	−1.68 (P = 0.093)
Arellano–Bond AR (2) (z, p-value):	0.57 (P = 0.566)	0.73 (P = 0.463)	−1.29 (P = 0.196)	0.80 (P = 0.423)
Hansen test (Chi-square, p-value)	4.33 (P = 0.228)	4.69 (P = 0.196)	7.89 (P = 0.048)	3.76 (P = 0.288)

Note: This table presents the two-step system GMM for gender diversity-firm performance relationship. TQ Tobin's Q, TQ (n − 1) one year lag of market-based performance measure, ROA Return-on-asset, ROA (n − 1) one year lag of return on asset, ROE Return-on-equity, ROE (n − 1) one year lag of return on equity, BEP Basic Earning Power Ratio, BEP (n − 1) one year lag of basic earning power ratio, the estimated coefficient and p values are the two-way system GMM. Arellano–Bond tests check whether the data process is autoregressive. The Hansen test of exogeneity of the instruments subset tests the null hypothesis of exogenous instruments. The sign ***, ** and * indicate the statistical significance level at 1%, 5% and 10% respectively. The p values are shown in the parenthesis.

Table 9
Gender diversity and firm risk: Two-step system GMM.

Variables	SDROA	Z score
SDROA (n − 1)	0.847*** (0.000)	
Z_Score (n − 1)		0.493*** (0.000)
Gender Diversity	0.0002* (0.083)	0.234
BSIZE	0.0004** (0.025)	0.000
FSIZE	0.0003** (0.026)	−0.266
LEV	−0.003** (0.012)	−3.541*** (0.000)
R&D	0.003** (0.037)	−0.792
Constant	0.005	8.267
Number of observations	74	74
Number of groups	18	18
Number of instruments	10	10
Arellano–Bond AR (1) (z, p-value)	2.48 (p value = 0.013)	−1.46 (p value = 0.144)
Arellano–Bond AR (2) (z, p-value):	−2.60 (p value = 0.009)	−0.03 (p value = 0.975)
Hansen test (Chi–square, p-value)	10.50 (p value = 0.015)	4.01(P value = 0.260)

Note: This table presents the two-step system GMM for gender diversity-firm risk relationship. SDROA asset return volatility, SDROA (n − 1) one year lag value of asset return volatility, the estimated coefficient and p values are the two-way system GMM. Arellano–Bond tests check whether the data process is autoregressive. The Hansen test of exogeneity of the instruments subset tests the null hypothesis of exogenous instruments. The sign ***, ** and * indicate the statistical significance level at 1%, 5% and 10% respectively. The p values are shown in the parenthesis.

Future researchers should attempt to include the national cultural perspective of Spain into the current model since the propensity of a particular firm to invest in a risky financial project has been linked to the country's national culture (Gaganis et al., 2019).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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