

The Impact of Board Diversity on the Risk-taking of Listed Firms in Vietnam

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Abstract

This study examines how board diversity impacts the risk-taking behavior of listed firms in Vietnam. Through panel data regression analysis, the findings reveal that both demographic and structural diversity within the Board of Directors play a significant role in shaping corporate risk-taking. Specifically, gender diversity and the age of board members are associated with higher risk, while diversity in board expertise, board size, and the presence of independent directors help lower risk tolerance and ensure financial stability. The results enrich the application of agency and resource dependence theories in the context of board diversity and risk-taking. They highlight the critical role of diverse governance structures in balancing risk and return, offering valuable insights for enhancing corporate governance in Vietnam. As companies and policymakers navigate these complexities, promoting diversity may be crucial for effectively managing corporate risk in emerging markets.

Keywords: board diversity, corporate risk-taking, corporate governance, Vietnam, KLD, emerging.

1. Introduction

The risk-return tradeoff asserts that achieving higher returns necessitates a greater risk-taking. For listed firms, profitability is a primary objective; however, they inevitably face numerous risks throughout their operations. Taking risk within a reasonable threshold can stimulate growth and development (Yao et al., 2023).

At the macroeconomic level, decisions to expand production, enter new industries, or engage in research and development serve as crucial drivers of economic growth. However, excessive risk-taking can lead to corporate bankruptcy or even economic crises. Consequently, the study of corporate risk-taking has garnered significant interest from academics, investors, businesses, and policymakers (Atayah et al., 2022).

The risk-taking of a company is influenced by various factors that are both internal and external to the entrepreneurs. This study explores how board diversity, across both demographic and structural dimensions, influences the risk-taking behavior of publicly listed companies in Vietnam. While Corporate Governance (CG), particularly the role of the Board of Directors (BOD), has been widely recognized as a key determinant of risk-taking (Roggi et al., 2012), existing research in Vietnam remains limited and often centers on easily observable characteristics, overlooking other important facets of diversity. Moreover, current risk-taking measurement scales lack comprehensive representation, often relying on narrow or inconsistent proxies. This study addresses these limitations by adopting a more robust methodological approach that integrates financial stability indicators to capture risk-taking more accurately. This study aims to (1) identify which aspects of board diversity impact risk-taking behavior and (2) quantify the strength of those relationships. This research provides significant contributions to both the literature and empirical implications. The study delves into the factors influencing risk-taking in the Vietnamese context, contributing to the existing theoretical frameworks on how local market conditions and institutional factors shape attitudes to risk.

The research also provides specific recommendations for business managers, helping them build the capability to identify and mitigate risks within their organizations. By exploring these factors in a developing economy, this study offers guidance to enhance CG practices in Vietnam and potentially other developing markets.

The paper begins with a review of relevant theories and literature on board diversity and risk-taking, followed by hypothesis development, data collection, and the methodological approach. It then presents the empirical findings, discusses their implications, and concludes with recommendations, limitations, and suggestions for future research.

2. Theoretical Framework and Hypothesis Development

2.1 Agency Theory

Agency theory, originating from economics, was introduced by Alchian and Demsetz (1972) and later expanded by Meckling and Jensen (1976), becoming the principal analytical framework in CG. This theory focuses on the relationship between owners and executives through a principal–agent contract, wherein the principal hires an agent to perform tasks on their behalf (Borlea & Achim, 2013). At its core, the theory assumes that individuals act to maximize personal benefits within a closed system (Davis et al., 1997). This leads to the agency problem, where executives prioritize personal interests over shareholder value, resulting in agency costs and information asymmetry (Milgrom & Roberts, 1992).

CG is regarded as a mechanism to address agency issues by enhancing transparency, accountability, and control mechanisms (OECD, 2015). Common solutions include governance structure: the BOD overseeing senior management, non-executive board members monitoring the BOD, and with independent auditors supervising the board (Smallman, 2004).

2.2 Stakeholder Theory

The stakeholder theory integrates studies on ethics, behavior, economics, and management, and has been developing since the 1930s (Smallman, 2004). The concept of “stakeholders” includes individuals and organizations that influence or are influenced by the activities of a business (Borlea & Achim, 2013). This theory posits that an effective business must balance the interests of shareholders, customers, employees, and the environment. However, the theory has been criticized for its difficulty in defining the scope of stakeholders and the potential risk of corruption (Kaler, 2003; Coelho et al., 2003). Despite the controversy, the theory is regarded as an effective tool for building competitive advantage and financial growth (Harrison & Wicks, 2013). Stakeholder theory expands the scope of agency theory by adding that the board’s responsibility goes beyond maximizing shareholder value to include accountability for all stakeholders.

2.3 Resource Dependence Theory

The resource dependence theory, according to Pfeffer and Salancik (1978), explains the decision-making process of organizations based on their reliance on the environment and social relationships. The three key elements of this theory include the concentration of resources, the uncertainty in the availability of resources, and the interconnection between resources (Kyereboah-Coleman & Biekpe, 2007). Businesses reduce their dependence on external resources by strengthening organizational power and the quality of the BOD, which helps businesses access the necessary resources (Hillman et al., 2000).

2.4 Board of Directors and Board Diversity

The BOD is the governing body of a joint-stock company, especially for publicly listed companies, elected by shareholders to make strategic decisions and guide the company’s development. In cases where shareholders hold a small number of shares, they find it difficult to influence the company’s operations. Therefore, the

BOD represents shareholders when making critical decisions. While the BOD does not directly manage day-to-day operations, it provides advice and monitors the company's activities to ensure sustainable development and protect shareholder interests (Aluchna, 2013).

Gender diversity in the BOD has garnered attention from both the media and legislators, particularly since 2008, when some countries introduced regulations requiring a minimum number of women on BODs (Smith, 2014). While gender diversity is an obvious factor, it is only part of the overall diversity within the BOD (Kang et al., 2007). Board diversity is defined as the heterogeneity among its members, including demographic factors and board structure (Aggarwal et al., 2019). Diversity brings numerous benefits, such as enhanced analytical abilities, increased creativity, and helping businesses expand into new markets (Robinson & Dechant, 1997; Cao et al., 2020). However, diversity can also lead to conflicts, reduce decision-making efficiency, and increase risks, particularly when the BOD consists of long-serving members (Arrow, 2012; Coles et al., 2014).

2.5 Risk and Risk-taking

Risk-taking, as discussed in the literature, involves assessing potential losses, their severity, and the uncertainty surrounding them (Yates, 1990). Risk acceptance is a core aspect of managerial decision-making, reflected in strategic actions such as investments, acquisitions, and capital allocation (Wright, 1999). Recent research highlights that this risk-taking tendency is influenced by CG mechanisms, particularly board gender diversity, which significantly reduces both systematic and unsystematic firm risk and moderates the relationship between governance variables, including board size, independence, CEO duality, and risk-taking (Muhammad et al., 2023).

2.6 Board Diversity and Risk-taking

Agency theory suggests that board diversity can reduce agency costs by improving oversight and aligning management decisions with shareholder interests. Stakeholder theory complements this by arguing that a diverse board better represents the interests of various stakeholders, which can influence risk-taking behavior. Previous studies on the impact of board diversity on risk tolerance focus on two main aspects: demographics and board structure. Many studies have shown that gender diversity, age, tenure, education, and the experience of the board have a significant impact on corporate risk decisions (Adams & Ferreira, 2009; Kim & Lim, 2010; Carter et al., 2010; Le-Bao, 2024). Additionally, structural factors such as board size, the proportion of independent members, and the dual role of CEO and Chairman also have significant effects. However, the research findings remain inconclusive (Fama & Jensen, 1983; Cheng, 2008; Jiraporn & Lee, 2018). Some studies suggest that larger boards help mitigate risk through cautious decision-making (Wallach & Kogan, 1965; Sah & Stiglitz, 1986), while others argue that larger boards are less effective due to difficulties in coordination and oversight (Jensen, 1993). Similarly, the role of independent members on the board has been divided into two perspectives. On one hand, they may encourage the company to pursue risk to optimize shareholder profits (Carter et al., 2003; Jiraporn & Lee, 2018), while on the other, they may help the company better control risks through effective oversight and reducing information asymmetry (Armstrong et al., 2014).

2.6.1 Demographic Diversity in the Board of Directors and Risk-taking

Board diversity was initially addressed through the presence of women to promote gender and social equality (Bernile et al., 2018). The literature on decision-making behavior emphasizes the importance of gender diversity in corporate decision-making (Adams & Ferreira, 2009). Studies indicate that the presence of women contributes to enhancing CG effectiveness by increasing legitimacy

(Hillman et al., 2007), improving CEO oversight (Konrad et al., 2008), fostering connections between cultures and races (Tavanti & Werhane, 2013), and improving decision quality (Cruz et al., 2010; Dezsö & Ross, 2012). Furthermore, women tend to seek more certainty (Khaw et al., 2016), which can potentially reduce risk tolerance by improving oversight effectiveness. Therefore, it is expected that boards with greater gender diversity are associated with lower levels of risk-taking.

The scope of board diversity later expanded to include factors such as age, tenure, experience, and educational background (Carter et al., 2003). Kim and Lim (2010) demonstrated that age diversity contributes to improved financial performance while maximizing the board's social capital (Carter et al., 2010). However, the benefits of age diversity only manifest when members come from different age groups, bringing in diverse perspectives that indirectly influence risk tolerance (Li & Wahid, 2018; Zhang & Luo, 2021). Therefore, a positive relationship between age diversity and risk-taking is expected.

In contrast, Vafeas (2003) argued that the length of service of the board members reflects commitment and business understanding but may also increase the consensus with management, reducing oversight capacity, and thus increasing risk (Vafeas, 2003; Bernile et al., 2018). Greater diversity in tenure may help balance these effects, but overall, it is expected to correlate with lower risk-taking due to the improved board oversight.

Educational diversity, representing the variation in the members' academic qualifications, may support better access to knowledge and problem-solving skills, potentially improving governance quality (Bhagat & Black, 1999; Hillman & Dalziel, 2003). However, an excessive variation in educational background could also lead to communication gaps or a lack of shared strategic vision. On balance, it is expected that educational diversity reduces risk-taking by enhancing decision-making efficiency and external resource access (Zhang & Luo, 2021).

Knowledge diversity, often reflected through specialization in different academic or professional disciplines, enriches the board's informational resources (Hillman et al., 2000; Haynes & Hillman, 2010). A board with diverse knowledge bases may be more capable of identifying and mitigating risks, suggesting a negative association with risk-taking.

Lastly, experience diversity, such as prior service in various industries or leadership roles, is considered to be a valuable component of board social capital (Gray & Nowland, 2017). Members with varied expertise are likely to improve the oversight quality and adaptability in uncertain contexts, which could encourage more calculated risk-taking (Jensen, 1993; O'Reilly et al., 1998). Hence, experience diversity is hypothesized to positively impact risk-taking behavior by enabling boards to navigate complex decisions with greater confidence.

Based on this reasoning, the hypotheses are as follows:

- H1: Gender diversity within the Board of Directors negatively impacts the risk-taking level of listed companies in Vietnam.*
- H2: Age diversity among Board members positively impacts the risk-taking level of listed companies in Vietnam.*
- H3: Tenure diversity among Board members negatively impacts the risk-taking level of listed companies in Vietnam.*
- H4: Education diversity among Board members has a negative impact on the risk-taking level of listed companies in Vietnam.*
- H5: Knowledge diversity among Board members has a negative impact on the risk-taking level of listed companies.*
- H6: Expertise diversity among Board members has a positive impact on the risk-taking level of listed companies.*

2.6.2 Structural Diversity in the Board of Directors and Risk-taking

Decision-making behavior theories suggest that the size and composition of decision-making groups directly influence strategic outcomes. In social psychology, larger groups tend to adopt less extreme decisions, as reaching a consensus among many members is more difficult (Wallach & Kogan, 1965; Sah & Stiglitz, 1986). Although large boards may face coordination and communication challenges, these internal negotiations can moderate extreme risk preferences, resulting in more cautious and balanced decisions (Jensen, 1993; Cheng, 2008). Therefore, a larger board is expected to correlate with lower levels of risk-taking due to collective deliberation and internal checks.

The dual role of CEO and Chairman is linked to company risk, as it represents an important CG mechanism (Rechner & Dalton, 1991). Agency theory views this dual role as undermining the separation of management and control (Fama & Jensen, 1983), leading to suboptimal decision-making. Adams et al. (2005) argue that it gives the CEO unchecked power, resulting in more personal, riskier decisions. Conversely, managerial theory suggests that combining these roles maximizes shareholder value by streamlining decision-making (Donaldson & Davis, 1991). In Vietnam, where CG practices are still developing, the concentration of power in one individual, e.g., when the CEO also holds the position of Chairman of the Board, can expose organizations to excessive risks. The lack of proper control and oversight may encourage riskier decision-making as the CEO could prioritize their personal interests or short-term objectives over long-term shareholder value. Therefore, it can be argued that the relationship between CEO duality and risk-taking is positively correlated in the Vietnamese context.

From the perspective of agency theory, two opposing hypotheses regarding the role of independent board members have been discussed in the literature. The “risk-seeking” hypothesis posits that an increase in the number of independent directors may encourage managers to adopt higher-risk strategies in pursuit of

shareholder objectives (Carter et al., 2003; Jiraporn & Lee, 2018). In contrast, the “risk-averse” hypothesis argues that the compensation structures and rigorous oversight provided by independent directors can limit managerial autonomy, resulting in more cautious, balanced decisions with lower associated risk (Armstrong et al., 2014; Adams et al., 2005). Therefore, the relationship between board independence and risk tolerance is influenced by the governance dynamics and perspectives of independent directors, suggesting a need for further research on how board structure impacts corporate risk decisions. In Vietnam, CG standards, such as those set by the State Securities Commission, emphasize board independence to promote transparency and accountability. The Vietnam Corporate Governance Code recommends that at least one-third of the board be independent directors to reduce agency problems and ensure balanced decision-making. This oversight limits excessive risk-taking by executives, aligning decisions with long-term shareholder value and promoting sustainable growth.

As a result, the hypotheses between structural diversity in the BOD and risk-taking are proposed:

H7: The size of the Board of Directors negatively impacts the risk-taking level of listed companies in Vietnam.

H8: The independence of the Board of Directors negatively impacts the risk-taking level of listed companies in Vietnam.

H9: Role duality within the Board of Directors positively impacts the risk-taking level of listed companies in Vietnam.

2.6.3 Company Characteristics and Risk-taking

Regarding size, small businesses often accept higher risks in exchange for the potential for superior profitability to achieve growth objectives for their owners (Faccio et al., 2011), while larger businesses, through investment diversification, may face lower risks (Konishi & Yasuda, 2004). Financial leverage, measured by

the debt-to-equity ratio, can amplify shareholder income but simultaneously increase financial risk and income volatility (Boubakri et al., 2013). High tangible fixed assets increase risk as the company must achieve breakeven through higher sales volumes. The market-to-book value ratio reflects growth opportunities, driving higher-risk investment strategies, leading to a higher risk-taking level (Helwege et al., 2014). Capital expenditures to total assets, representing a tendency for long-term investment in fixed assets, contribute to greater income volatility (Boubakri et al., 2013).

3. Data and Methodology

3.1 Data

The research data and sample used in this report include 207 publicly listed companies on the Ho Chi Minh City Stock Exchange and the Hanoi Stock Exchange. The data collected for the study covers a period of five years from 2018 to 2022. The data on board characteristics as well as the financial indicators related to the companies were obtained from the annual reports, financial statements, and prospectuses of the companies, which were publicly published on the Vietstock.vn website.

The data processing for this study was carried out using the Excel software with the aim of ensuring data validity and consistency. The process involved verifying the reasonableness of the sample data, as well as identifying and removing observations with excessive missing values in both financial data and diversity measures. Necessary indices, such as Tobin's Q, ROA, Z-Score, and leverage ratio, were then calculated. The measurement data were standardized using the Blau Index, and any data that could potentially distort the model were filtered out, with corresponding observations being removed to maintain the integrity of the analysis.

3.2 Model and Variables

The research model was developed by integrating key demographic and structural diversity factors of the BOD, including gender, age, tenure, education, experience, board size, independence, and duality, to assess their impact on the firms' risk-taking behavior. Statistical techniques such as regression analysis were applied to validate the proposed hypotheses and measure the significance of each factor in the context of publicly listed companies in Vietnam as follows:

$$\begin{aligned}
 RISK_{i,t} = & \alpha + \beta_1 Diversity_Gender_{i,t} + \beta_2 Diversity_Age_{i,t} + \beta_3 Diversity_Tenure_{i,t} + \\
 & \beta_4 Diversity_Education_{i,t} + \beta_5 Diversity_Knowledge_{i,t} + \\
 & \beta_6 Diversity_Expertise_{i,t} + \beta_7 BoardSize_{i,t} + \beta_8 CEO_{Duality}_{i,t} + \\
 & \beta_9 BIndependent_{i,t} + \beta_{10} Controls_{i,t} + \varepsilon_{i,t}
 \end{aligned} \tag{1}$$

Where i represents the firm, and t represents the observation year. $RISK_{i,t}$ denotes the corporate risk-taking level, measured using the *Z-Score* model. *Diversity* includes variables measuring different aspects of board diversity, namely: gender diversity ($BGen$), age diversity ($BAge$), tenure diversity ($BTen$), educational diversity ($BEduD$), knowledge diversity ($BEduB$), and expertise diversity ($BExp$), while *Structural* comprises variables measuring board size ($BSize$), board independence ($BInd$), and CEO duality ($BDual$). Controls refer to firm-specific control variables, including firm size ($FSize$), financial leverage (LEV), Tobin's Q (TQ) (the ratio of market value to book value of total assets), and capital expenditures ($CAPEX$), which were chosen based on previous research that associates these factors with corporate behavior and risk-taking. $\varepsilon_{i,t}$ represents the error term in the econometric model.

The Blau Index is employed to measure the diversity within BOD by evaluating the distribution of members across different categories of gender, age, education, knowledge, experience, and tenure. This index helps quantify the degree

of diversity, with a higher value indicating greater diversity and a lower value indicating more homogeneity within the board.

Table 1. Variables and definitions

Variable	Name	Measurement	Source
Dependent Variable			
Risk-Taking Level	<i>Z-Score</i>	$Z_{i,t} = \frac{(ROA_{i,t} + CAR_{i,t})}{\sigma(ROA_{i,t})}$ (<i>i</i> represents a specific firm, <i>t</i> represents a specific year, <i>ROA</i> measures a firm's profitability relative to its total assets, <i>CAR</i> is capital asset ratio as total assets minus total liabilities, divided by total assets) The standard deviation of <i>ROA</i> is calculated over the period from <i>t</i> to <i>t-2</i>. After that, the logarithm of the <i>Z</i>-score is taken once the result is obtained.	Laeven & Levine (2009), Houston et al. (2010), Bhagat et al. (2015), Khan et al. (2017), Zhang & Luo (2021)
Independent Variable			
Gender Diversity	<i>BGen</i>	$1 - \sum_{i=1}^k p_i^2$ (<i>k</i> = 2, with <i>k</i> representing the number of representative groups of male and female)	Wang (2012), Bhat et al. (2020), Ozdemir et al. (2022), Yousaf et al. (2021), Zhang & Luo (2021)
Age Diversity	<i>BAge</i>	$1 - \sum_{i=1}^k p_i^2$ (<i>k</i> = 4, with <i>k</i> representing the number of representative age groups: (i) under 40, (ii) 41–49, (iii) 51–59, and (iv) over 60)	Bhat et al. (2019), Ozdemir et al. (2022), Yousaf et al. (2021), Zhang & Luo (2021)
Tenure Diversity	<i>BTen</i>	$1 - \sum_{i=1}^k p_i^2$ (<i>k</i> = 4, with <i>k</i> representing the number of representative groups: (i) ≤ 3 years, (ii) 4 years, (iii) 5 years, and (iv) ≥ 6 years)	Wang (2012), Bhat et al. (2020)
Educational Diversity	<i>BEduD</i>	$1 - \sum_{i=1}^k p_i^2$ (<i>k</i> = 4, with <i>k</i> representing the number of representative groups: (i) Doctorate, (ii) Master's degree, (iii) Bachelor's degree, and (iv) other qualifications)	Bhat et al. (2020), Yousaf et al. (2021), Zhang & Luo (2021)
Knowledge Diversity	<i>BEduB</i>	$1 - \sum_{i=1}^k p_i^2$ (<i>k</i> = 4, with <i>k</i> representing the number of representative groups: (i) economics and business-related fields, (ii) social sciences,	Bhat et al. (2019), Yousaf et al. (2021), Zhang & Luo (2021)

		(iii) natural sciences, and (iv) engineering and applied sciences)	
Expertise Diversity	$BExp$	$1 - \sum_{i=1}^k p_i^2$ ($k = 5$, with k representing the number of representative groups: (i) finance, (ii) consulting, (iii) legal, (iv) management, and (v) other)	Harjoto et al. (2018)
Board Size	$BSize$	The total number of members in the Board of Directors	Bhat et al. (2019)
Board Independence	$BInd$	The proportion of independent members on the Board of Directors	Yousaf et al. (2021), Ji et al. (2021)
CEO Duality	$BDual$	$BDual = 1$ if there is duality, $BDual = 0$ if there is no duality.	Bhat et al. (2019), Ji et al. (2021)
Control Variables			
Firm Size	$FSize$	The natural logarithm of the book value of total assets	Faccio et al. (2011), Ozdemir et al. (2022), Zhang & Luo (2021)
Financial Leverage	LEV	$\frac{Total\ liabilities}{Total\ assets}$	Boubakri et al. (2013) Bhat et al. (2020), Zhang & Luo (2021)
Capital Expenditure	$CAPEX$	$\frac{Capital\ Expenditure}{Total\ assets}$	Boubakri et al. (2013), Ozdemir et al. (2022), Ji et al. (2021)
Tobin's Q	TQ	$\frac{(Market\ value\ of\ the\ company + Book\ value\ of\ debt)}{(Book\ value\ of\ total\ assets)}$	Helwege et al. (2014), Zhang & Luo (2021), Ozdemir et al. (2022)

Note: Authors' compilation.

3.3 Methodology

The research method employs regression models to assess the impact of board diversity on the level of risk-taking of firms. Before analysis, the data is cleaned to remove missing values and normalize the variables, with the Blau index used to measure diversity. The primary regression models include Ordinary Least Squares (OLS), Fixed Effects (FEM), and Random Effects (REM) to control for unobserved factors, with the Hausman test aiding in the selection of the appropriate model. OLS assumes homoscedasticity and no autocorrelation, but these assumptions may not hold, making FEM or REM more appropriate for accounting for unobserved

heterogeneity. FEM assumes that there is a correlation between individual effects and explanatory variables, while REM assumes no such correlation. Generalized Least Squares (GLS) handles heteroscedasticity and autocorrelation. These models' suitability is verified through tests for multicollinearity, heteroscedasticity, and autocorrelation. The GLS method is applied to enhance the reliability of the estimates in cases of heteroscedasticity and autocorrelation.

4. Results and Discussion

4.1 Data Description

The descriptive statistics results include the number of observations, mean, standard deviation, and the maximum and minimum values. The data from publicly listed companies over the past five years is relatively complete; however, some newly listed companies had missing data and were excluded from the sample. Outliers were also removed to ensure the robustness of the estimates.

Table 2. Descriptive statistics of observed variables

Stats	N	Mean	Standard Deviation	Min	Max
<i>Z-Score</i>	1,035	3.601	0.982	0.429	8.655
<i>BGen</i>	1,035	0.479	0.389	0.000	1.000
<i>BAge</i>	1,035	0.692	0.159	0.000	0.938
<i>BTen</i>	1,035	0.578	0.244	0.000	0.980
<i>BEduD</i>	1,035	0.606	0.221	0.000	1.000
<i>BEduB</i>	1,035	0.592	0.228	0.000	0.963
<i>BExp</i>	1,029	0.755	0.130	0.000	0.975
<i>BSize</i>	1,035	6.243	1.477	3.000	11.000
<i>BInd</i>	1,035	0.235	0.144	0.000	0.667
<i>BDual</i>	1,035	0.075	0.264	0.000	1.000
<i>FSize</i>	1,035	6.785	0.783	4.297	9.326
<i>LEV</i>	1,035	0.520	0.222	0.013	0.958
<i>CAPEX</i>	1,035	0.032	0.060	-0.502	0.466
<i>TQ</i>	1,035	1.258	0.719	0.192	7.961

The average risk-taking level is 3.601. The average board size is 6.24 members, with an independent director ratio of approximately 25%, which is below the minimum threshold of 1/3. The incidence of combined roles of Chairman and CEO has significantly decreased, primarily observed in small companies during the 2018–2019 period.

Regarding demographics, the gender ratio is relatively balanced (Blau median of 0.4787), although many companies still have male-only boards, especially in state-owned enterprises, banks, and the construction sector. The age and education levels in the board show high diversity (medians of 0.692 and 0.606, respectively), but professional expertise remains relatively homogeneous. Professional experience is the most diverse factor (0.755), reflecting that board members typically have more than 15 years of experience.

The Pearson correlation matrix (Table 3) shows the correlation levels among the independent variables in the research model. Multicollinearity is not a concern, as the correlation coefficients between the variables are below 0.8 (Gujarati, 2003). The independent variables exhibit low correlation, except for Firm Size and Board Size, which is consistent with the fact that larger companies often have larger boards to form specialized committees (Hải & Toàn, 2020). Similarly, the pair of Financial Leverage and Firm Size reflects the reality that larger companies have easier access to bank financing, which aligns with financial theory.

Table 3: Independent and control variables correlation matrix

Var	BSize	BGen	BAge	BTen	BDual	BInd	BEduB	BEduD	BExp	TQ	FSize	LEV	CAPEX
BSize	1.0000												
BGen	0.0637	1.0000											
BAge	0.1649	0.0842	1.0000										
BTen	0.1289	0.0188*	0.0045*	1.0000									
BDual	0.0370*	0.0219*	0.0712	0.0251*	1.0000								
BInd	0.0283*	0.0614	0.0472*	0.0468*	-0.0853	1.0000							
BEduB	0.1307	-0.0749	0.0019*	0.0619	0.062	0.0711	1.0000						
BEduD	0.2683	0.0482*	0.068	0.0008*	0.0348*	0.0185*	0.1204	1.0000					
BExp	0.1397	0.1615	0.0743	0.1246	0.0037*	0.1295	0.1045	0.158	1.0000				
TQ	0.1344	0.0994	0.0208*	-0.0903	-0.0699	0.0642	0.1276	0.0283*	0.0501*	1.0000			
FSize	0.3858	0.0475*	0.0454*	0.0024*	-0.1238	0.0421*	0.079	0.2767	0.0912	0.0455*	1.0000		
LEV	0.2056	0.0629	0.0559*	0.0033*	0.0446*	0.0897*	0.0065*	0.1747	0.1589	-0.1631	0.5245	1.0000	
CAPEX	0.0435*	0.0538*	0.0322*	0.0217*	0.0082*	0.0485*	0.0376*	0.0345*	-0.1025	0.0319*	-0.0645	0.0228*	1.0000

Note: Asterisk (*) denotes statistical significance at the 5% level.

4.2 Regression Analysis and Hypothesis Testing

In the diagnostic phase, the multicollinearity test indicated that collinearity among the explanatory variables was not a critical issue. However, the heteroskedasticity test revealed the presence of non-constant error variance, suggesting that the OLS estimates might be inefficient with the results, as in Table 4. Consequently, both the FEM and REM models were estimated. The subsequent Hausman test yielded a p-value of 0.6979, favoring the REM specification over FEM. Additionally, the autocorrelation test detected first-order serial correlation in the residuals, as described in Table 5, necessitating the application of GLS to obtain efficient and consistent parameter estimates. The regression results are described in Table 6.

Table 4. Results of the heteroscedasticity test

	chi2	df	p
<i>Heteroskedasticity</i>	156.11	103	0.0006
<i>Skewness</i>	17.53	13	0.1761
<i>Kurtosis</i>	1.03	1	0.3099
Total	174.67	117	0.0004

Table 5. Results of the autocorrelation test

<i>F (1, 206)</i>	174.367
<i>P - Value</i>	0.0000

Table 6. The impact of board diversity on risk-taking

Variable	GLS (Z-Score)	REM (Z-Score)	OLS (Z-Score)
<i>BGen</i>	-0.201*** (0.0703)	-0.166 (0.144)	-0.133* (0.0793)
<i>BAge</i>	-0.477*** (0.166)	-0.268 (0.245)	-0.324* (0.196)

<i>BTen</i>	-0.0168 (0.0913)	-0.0107 (0.141)	-0.000523 (0.126)
<i>BEduD</i>	-0.0815 (0.126)	-0.0566 (0.220)	-0.0535 (0.145)
<i>BEduB</i>	-0.428*** (0.114)	-0.469** (0.218)	-0.423*** (0.137)
<i>BExp</i>	0.449** (0.227)	0.0792 (0.501)	0.683*** (0.246)
<i>BSize</i>	0.0986*** (0.0205)	0.0128 (0.0368)	0.0846*** (0.0234)
<i>BInd</i>	0.457*** (0.172)	0.542** (0.275)	0.145 (0.213)
<i>BDual</i>	-0.0350 (0.0784)	0.000725 (0.111)	-0.101 (0.116)
<i>FSize</i>	0.0909* (0.0472)	-0.0395 (0.147)	0.151*** (0.0497)
<i>LEV</i>	-0.602*** (0.146)	-0.727** (0.361)	-0.610*** (0.166)
<i>CAPEX</i>	-0.635 (0.403)	-0.600 (0.595)	0.253 (0.505)
<i>TQ</i>	-0.102*** (0.0293)	-0.112* (0.0651)	-0.134*** (0.0442)
Constant	3.051*** (0.331)	4.724*** (1.042)	2.559*** (0.360)
Observations	1,029	1,029	1,029

Note: Asterisks (***, **, and *) denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

The analysis reveals a statistically significant negative relationship between gender diversity and risk-taking at the 1% significance level. This indicates that more gender-balanced boards are associated with lower Z-scores, implying higher financial risk. This finding contributes to the ongoing debate regarding the impact of gender diversity on risk-taking and corporate performance. While Darrat et al. (2016) suggest that female board members help reduce financial distress, Kristanti

et al. (2016) found the opposite in the context of Indonesian firms. Two main explanations may account for the findings. First, women's greater risk aversion and preference for certainty may slow decision-making in more gender-balanced boards, potentially hindering timely strategic responses. Second, consistent with the risk-return trade-off theory (Nadeem et al., 2019), the data from 2018–2022 reveal that female-inclusive boards tend to reduce risk in uncertain periods (2020) while maintaining profitability, which increases risk-taking when conditions improve (2021), leading to higher ROE. These dynamics suggest that gender-diverse boards are more adaptable under volatile conditions, reinforcing the view that such diversity enhances resilience and performance. H1 is supported, but future research should investigate the mechanisms in different sectors and cultural settings.

The GLS model shows a significant positive relationship between age diversity on the board and Z-score at the 1% significance level, indicating that firms with a broader range of director ages tend to be more financially stable and take fewer risks. This finding suggests that having a mix of younger and older board members may enhance decision-making by combining fresh perspectives with seasoned experience. It supports the view that age diversity fosters more balanced and adaptable governance, rather than risk-taking behavior being driven solely by the average age of directors. H2 is rejected, and future research should consider more detailed measures, like generational differences.

Board tenure exhibits a weak and non-significant association with risk-taking, suggesting the limited influence of service duration on strategic risk appetite. This may reflect the diminishing marginal value of accumulated firm-specific knowledge or the balancing effect of long-standing internal networks. H3 is unsupported, potentially due to limited variance in tenure across firms in the sample.

For board educational degree, the results show no significant impact on risk-taking. This may be due to the sampling method, which only considers the highest degree held by each board member. For example, a board composed entirely of

master's degree holders would have lower diversity than one with a mix of high school, bachelor's, and master's degrees, despite the potentially stronger qualifications. According to resource dependence theory, boards with uniformly high education levels may still offer greater access to resources and expertise, even if they appear less diverse in formal metrics. Since H4 is not supported, future studies could look deeper into the specific skills or types of training that board members have.

The GLS model shows a significant effect for knowledge background diversity, similar to how REM and OLS models indicate a significant negative relationship, suggesting that greater diversity in academic fields is associated with increased risk-taking. This may reflect challenges in coordination and consensus-building among board members with differing knowledge bases. While such diversity can enhance oversight (Hillman et al., 2000), it may hinder swift decision-making during volatile periods, as seen during the COVID-19 pandemic. Coles et al. (2014) similarly found that diverse boards were less effective under crisis conditions. Thus, H5 is supported and should be interpreted with caution, considering the broader context.

Expertise diversity among board members is positively associated with the Z-score at the 5% significance level, indicating that firms with more professionally diverse boards face lower financial distress. This suggests that when board members bring varied industry experiences together in, e.g., finance, consulting, legal, and management, they can examine issues from multiple perspectives, enhancing the quality of oversight and strategic decision-making. The finding aligns with resource dependence theory (Hillman et al., 2000; Haynes & Hillman, 2010), which views such expertise as a form of social capital that enables boards to access critical resources when needed. It also supports the empirical evidence from Biswas and Mukherjee (2022) and Daniel-Vasconcelos et al. (2023), who found that experience diversity strengthens firm resilience and reduces the likelihood of sudden failure,

particularly in emerging markets. H6 is supported, with both statistical and practical implications for improving governance effectiveness and long-term stability.

Board size has a significant positive relationship with financial stability at the 1% significance level, consistent with decision-making behavior theory (Wallach & Kogan, 1965) and later models (Sah & Stiglitz, 1986). Larger boards may dilute extreme strategic positions, favoring more risk-averse, consensus-based decision-making. This moderation effect suggests a practical implication: Expanding board size could be a structural buffer against excessive risk-taking. H7 is supported.

The proportion of independent directors positively correlates with Z-score at the 1% significance level, supporting the view that independent oversight enhances transparency and reduces managerial risk inclination. This aligns with the risk aversion theory (Jiraporn & Lee, 2018) and findings by Armstrong et al. (2014), highlighting the role of independence in reducing information asymmetry. H8 is supported, and the result underscores the importance of board composition for stakeholder protection.

The effect of CEO duality is negative but statistically insignificant, suggesting the limited impact on corporate risk behavior in this context. The result may reflect sample-specific institutional dynamics or low variance in CEO duality across firms. H9 is unsupported, and its theoretical relevance may be context-dependent.

Among the control variables, firm size is positively associated with risk-taking, possibly due to enhanced resource buffers and risk absorption capacity. In contrast, CAPEX has no significant effect, which could be attributed to heterogeneity in capital intensity across industries (e.g., banking vs. real estate). Financial leverage has a significant negative relationship with Z-score at the 1% significance level, confirming that higher debt increases financial vulnerability. However, due to the inclusion of high-leverage industries, this interpretation should be cautious. Tobin's Q also negatively affects the Z-score at the 1% significance level,

indicating that firms with higher market valuations may engage in riskier behavior, supporting the findings of Ozdemir et al. (2022).

5. Conclusion

This study enhances the understanding of how board diversity influences corporate risk-taking in Vietnam's developing capital market. While the global evidence on gender diversity and financial stability remains mixed (Darrat et al., 2016; Kristanti et al., 2016), our findings indicate that gender diversity in Vietnam correlates with increased risk-taking. This suggests a move toward more dynamic but potentially riskier strategies, highlighting a key trade-off between promoting innovation through inclusivity and ensuring financial stability, one that Vietnamese firms must navigate carefully in an increasingly integrated economy.

The study's contribution also lies in its contextual application of agency theory and resource dependence theory. Consistent with Fama and Jensen (1983), the presence of independent directors in Vietnam significantly enhances financial stability, highlighting their oversight function in reducing excessive managerial risk-taking. At the same time, supporting Hillman et al. (2000), the positive influence of experience diversity reaffirms the value of heterogeneity in strategic deliberation, which is particularly important in Vietnam, where listed firms often operate in highly competitive and uncertain environments.

These findings suggest several practical recommendations for Vietnamese policymakers and corporate leaders. First, regulators should enhance the enforcement of board independence by improving compliance monitoring and requiring public disclosure, particularly in firms with concentrated ownership. Emphasis should be placed not just on numbers but also on the relevance and risk oversight capabilities of independent directors.

Second, the government could introduce gender diversity targets, as practiced in other countries. While gender-diverse boards may take more risks, they enhance decision quality and adaptability in uncertain environments. These benefits can be amplified through proper training and integration.

Third, board structures should align with firm strategy. Larger boards may offer greater stability for firms in high-risk or international markets, especially when equipped with diverse expertise. Conversely, smaller boards may be better suited to agility but require stronger governance to manage risk. Age diversity, linked to risk-taking, should be tailored to the firm's risk profile and market conditions.

Vietnam's openness to foreign investment could be further leveraged to raise CG standards. Encouraging strategic foreign shareholding, alongside improved disclosure requirements, can foster external pressures that promote better risk governance and sustainable growth across the market.

This study has several limitations that may affect the scope and generalizability of its findings. First, it focuses solely on the relationship between board diversity and corporate risk-taking without accounting for other relevant factors such as state ownership, foreign investment, executive compensation, or innovation intensity, all of which may interact with governance structures to influence firm behavior. Incorporating these variables could provide a more comprehensive view of risk dynamics. Second, potential endogeneity issues are not explicitly addressed. To address potential endogeneity issues, it is necessary to test the model through the Generalized Method of Moments (GMM), two-stage regression or dynamic panel. Third, the analysis is based on a five-year panel with a relatively limited sample size, which may not fully capture long-term trends or offer strong market-wide representation.

Lastly, while multiple board diversity indicators are examined, the marginal effects of individual components were not evaluated. Future research could explore

these effects, as well as the interactions between diversity dimensions and innovation levels, to better understand how governance influences risk across different types of firms and industries.

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Appendix

Table 7. Research model results run by OLS method

lnZscore	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
BGen	-.133	.079	-1.67	.095	-.288	.023	*
BAge	-.324	.195	-1.66	.098	-.707	.06	*
BEduD	-.053	.145	-0.37	.712	-.338	.231	
BEduB	-.423	.136	-3.10	.002	-.691	-.155	***
BExp	.682	.244	2.80	.005	.204	1.161	***
BSize	.085	.023	3.66	0	.039	.13	***
BInd	.145	.213	0.68	.496	-.273	.563	
BDual	-.101	.116	-0.87	.384	-.328	.126	
FSize	.151	.05	3.04	.002	.053	.248	***
LEV	-.61	.166	-3.67	0	-.936	-.284	***
CAPEX	.253	.504	0.50	.616	-.736	1.243	
TQ	-.134	.044	-3.06	.002	-.22	-.048	***
Constant	2.559	.355	7.20	0	1.862	3.256	***

Note: Asterisks (***, **, and *) denote statistical significance at the 1%, 5%, and 10% levels.

Table 8. Research model results run by FEM method

lnZscore	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
BGen	-.156	.103	-1.52	.129	-.357	.045	
BAge	-.287	.21	-1.37	.171	-.698	.124	
BEduD	-.03	.172	-0.17	.863	-.367	.308	
BEduB	-.443	.167	-2.66	.008	-.769	-.116	***
BExp	.455	.331	1.37	.17	-.195	1.104	
BSize	.054	.028	1.93	.054	-.001	.109	*
BInd	.324	.23	1.41	.159	-.127	.775	
BDual	-.018	.103	-0.17	.863	-.22	.184	
FSize	.148	.072	2.07	.039	.008	.289	**
LEV	-.624	.225	-2.77	.006	-1.064	-.183	***
CAPEX	-.352	.517	-0.68	.497	-1.365	.662	
TQ	-.121	.05	-2.40	.017	-.22	-.022	**
Constant	2.883	.506	5.69	0	1.89	3.876	***

Note: Asterisks (***, **, and *) denote statistical significance at the 1%, 5%, and 10% levels.

Table 9. Research model results run by REM method

lnZscore	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
BGen	-.165	.144	-1.15	.252	-.447	.117	
BAge	-.268	.245	-1.10	.274	-.749	.213	
BEduD	-.056	.22	-0.25	.799	-.487	.376	
BEduB	-.469	.218	-2.16	.031	-.896	-.042	**
BExp	.077	.5	0.15	.877	-.904	1.059	
BSize	.013	.037	0.35	.73	-.059	.085	
BInd	.541	.274	1.97	.049	.003	1.08	**
BDual	.002	.111	0.01	.989	-.216	.219	
FSize	-.04	.147	-0.27	.784	-.329	.248	
LEV	-.726	.36	-2.02	.044	-1.432	-.019	**
CAPEX	-.602	.594	-1.01	.312	-1.768	.565	
TQ	-.111	.064	-1.72	.085	-.237	.015	*
Constant	4.723	1.041	4.53	0	2.678	6.767	***

Note: Asterisks (***, **, and *) denote statistical significance at the 1%, 5%, and 10% levels.

Table 10. Research model results run by GLS method

lnZscore	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
BGen	-.133	.079	-1.68	.092	-.287	.022	*
BAge	-.324	.194	-1.67	.095	-.704	.057	*
BEduD	-.053	.144	-0.37	.711	-.336	.229	
BEduB	-.423	.135	-3.12	.002	-.689	-.157	***
BExp	.682	.242	2.82	.005	.207	1.157	***
BSize	.085	.023	3.68	0	.039	.13	***
BInd	.145	.211	0.69	.493	-.269	.559	
BDual	-.101	.115	-0.88	.381	-.326	.124	
FSize	.151	.049	3.05	.002	.054	.247	***
LEV	-.61	.165	-3.70	0	-.933	-.287	***
CAPEX	.253	.501	0.50	.614	-.729	1.235	
TQ	-.134	.044	-3.08	.002	-.22	-.049	***
Constant	2.559	.353	7.25	0	1.867	3.251	***

Note: Asterisks (***, **, and *) denote statistical significance at the 1%, 5%, and 10% levels.