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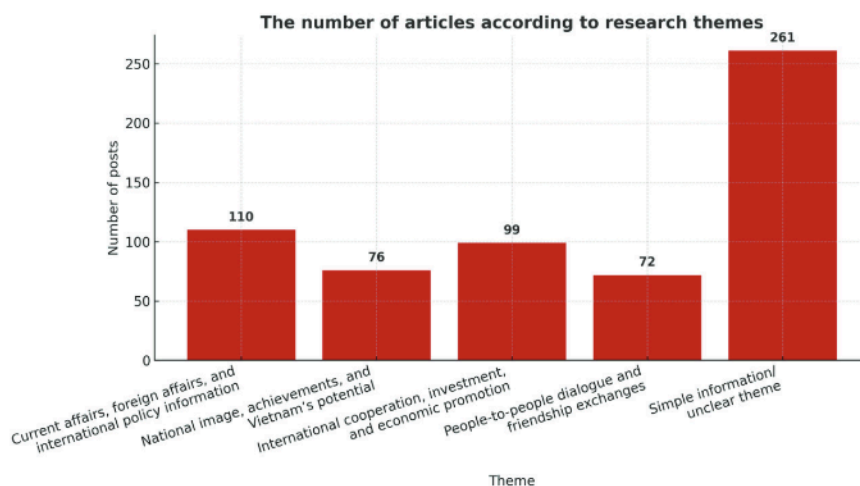
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Finding the “Sweet Spot”: Nonlinear effects of board size on firm performance in Vietnam

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Abstract:

This study investigates the relationship between board size and the financial performance of non-financial firms listed on the Hanoi Stock Exchange (HNX) over the period 2013-2022. To ensure robust estimation, the Feasible Generalised Least Squares (FGLS) method is employed to control for heteroscedasticity and autocorrelation commonly present in panel data. The empirical findings indicate a positive but nonlinear (U-shaped) association between board size and firm performance, as measured by return on assets (ROA) and return on equity (ROE). Specifically, firms with very small boards tend to exhibit weaker performance, whereas performance improves significantly when the board comprises at least four to five members. This result suggests that an adequately sized board can enhance managerial monitoring, enrich expertise diversity, and support more effective strategic decision-making. The study contributes to the corporate governance literature by providing evidence from an emerging market context and offers practical insights for managers and policymakers seeking to design board structures that are better suited to the operational characteristics and governance needs of Vietnamese enterprises.

Keywords: board size, financial performance, nonlinear relationship.

Classification numbers: 2.2, 2.3

1. Introduction

The Board of Directors (BOD) serves as the cornerstone of corporate governance, holding primary responsibility for oversight and strategic direction to maximise shareholder value [1-2]. Board size is widely recognised as a key structural attribute that reflects governance capacity, as it directly influences the quality and effectiveness of decision-making through two core functions: monitoring and strategic advisory roles [1, 3]. A well-structured board enhances accountability and transparency, strengthens stakeholder trust, and ultimately improves firm performance [4].

The relationship between board size and firm performance has long been a focal issue in corporate governance research, both globally and within the Vietnamese context. From a resource dependence perspective, larger boards may enhance firm efficiency by combining diverse expertise, experience, and networks, thereby strengthening their monitoring and strategic planning capabilities [5, 6]. Conversely, agency theory suggests that excessively large boards can hinder coordination, dilute individual accountability, and slow

down decision-making [3, 7]. Empirical evidence across countries reveals that the board size-performance nexus may follow either a linear [5, 8, 9] or a nonlinear pattern [10-12]. For instance, M.B. Lehari, et al. (2024) [13] identified a U-shaped relationship. In contrast, S. Potharla, et al. (2021) [10], and R. Sharma (2023) [11] documented an inverted U-shaped pattern, indicating declining performance once the board exceeds its optimal size [10-11]. Additionally, C. Liang (2022) [14] reported a cubic relationship with two turning points, underscoring the complex and dynamic nature of board effects on performance. These findings suggest that the impact of board size on firm performance is not purely linear, but somewhat contingent upon the alignment between board structure, corporate strategy, and the firm's operating environment. In essence, each firm may have an optimal board size threshold at which the advantages of diversity are balanced against the costs of coordination and decision-making. Hence, determining an appropriately sized board is critical, one that is sufficiently large to ensure adequate oversight without being so large as to undermine efficiency.

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In Vietnam, research on the relationship between board size and corporate performance remains limited, with a predominant linear perspective [15-18]. A few studies, such as L.T.X. Nguyen, et al. (2021) [19] have suggested potential nonlinear effects; however, the nonlinear relationship has yet to be empirically clarified within the Vietnamese context, where ownership structures (state-owned, private, and equitised enterprises) and governance institutions remain underdeveloped [20]. Moreover, international evidence indicates that the optimal board size varies considerably across countries: approximately 7-8 members in the United States [21, 22], 10-12 in Thailand [23], 10-13 in India [11], 13-17 in France [12], 8-10 in England [24], and 10-18 in China [14, 25]. In Vietnam, although the Law on Enterprises stipulates that boards must comprise between 3 and 11 members, it does not differentiate by firm type, ownership, or scale. Consequently, identifying the optimal threshold of board size for maximising firm efficiency is both theoretically important and practically relevant, particularly given the emerging evidence of a nonlinear relationship between board size and performance.

To address this gap, the study is guided by two main research questions. First, does board size significantly affect firm performance in Vietnam? Second, is this relationship linear or nonlinear, and if nonlinear, what is the optimal board size that maximises firm performance? Notably, this study explains the link between board size and firm performance by integrating competing theoretical perspectives. Agency theory suggests that larger boards weaken monitoring efficiency due to coordination problems and free-riding, thereby increasing agency costs and reducing performance. In contrast, resource dependence theory argues that larger boards enhance performance by providing diverse expertise and external networks that improve strategic decision-making and resource access. Meanwhile, stewardship theory highlights the role of trust and collaboration in strengthening governance effectiveness. Taken together, these perspectives imply that board size influences firm performance through monitoring, advisory, and resource channels. As board size increases, its benefits may initially outweigh coordination costs, but beyond a certain threshold, inefficiencies may dominate, leading to a nonlinear relationship between board size and firm performance.

Building upon this, the study examines both the linear and nonlinear relationships between board size and financial performance among non-financial firms listed on the HNX from 2013 to 2022. The findings

provide empirical evidence of a U-shaped relationship between board size and firm performance in an emerging market. Specifically, firm performance tends to decline when board size is small but improves once the board surpasses a minimum threshold of approximately four to five members. This result suggests that smaller boards may lack the diversity and expertise necessary for effective oversight, while moderately larger boards enhance monitoring, strategic decision-making, and overall governance quality. These findings offer valuable implications for corporate governance practice and policy-making in Vietnam. They emphasise the need for regulators and firms to establish an optimal and balanced board structure, one that aligns with firm characteristics and market conditions, to enhance governance efficiency and sustainable performance.

2. Literature review and hypothesis development

2.1. Theoretical framework

Agency Theory suggests that conflicts of interest can arise between shareholders and managers due to the separation of ownership and control within corporations [26]. In this context, the board of directors plays a crucial role in overseeing managerial actions and reducing agency costs that result from the misalignment of interests between managers and shareholders [27]. Accordingly, effective corporate governance mechanisms, particularly regarding the board's structure and size, are considered essential for protecting and enhancing shareholder value. However, this viewpoint has faced criticism, as various studies indicate that an increase in size may lead to inefficiencies. These can arise from coordination difficulties and the development of internal "cliques", which may compromise accountability and diminish the effectiveness of oversight [28].

In contrast to Agency Theory, which posits that directors' behaviour is primarily self-serving, Stewardship Theory challenges this notion. It argues that many board members act as responsible stewards, motivated by intrinsic values and a sense of organisational loyalty. As a result, they prioritise the long-term development of the firm [29]. This perspective emphasises that trust, cooperation, and a commitment to mutual benefit are essential to effective board dynamics. Consequently, the board functions not only as a monitoring mechanism but also as a foundation for sustainable strategic alignment [30].

Building on these perspectives, Resource Dependence Theory [31] emphasises the board's role in external networking and boundary-spanning activities.

Thus, the board not only addresses internal conflicts of interest and functions as a dedicated manager, but also acts as a vital link to acquire essential external resources such as capital, expertise, and legitimacy. From this standpoint, larger boards can offer broader networks and a deeper reservoir of knowledge, ultimately enhancing the firm's adaptive capacity and improving its competitive positioning [32].

When considered together, these three theoretical lenses provide a more comprehensive and nuanced understanding of the relationship between board size and firm performance. Agency Theory focuses on monitoring and control to reduce agency costs, while Stewardship Theory emphasises the importance of trust and long-term strategic collaboration. Meanwhile, Resource Dependence Theory underscores the significance of accessing and mobilising external resources. This synthesis suggests that the effects of board size are not uniform; instead, they can be both advantageous and disadvantageous, depending on the governance context and the firm's strategic objectives.

2.2. Hypothesis development

2.2.1. Linear relationship

Boards of directors are entrusted with overseeing critical organisational decisions, including investment strategies, executive remuneration, and governance structures [4]. The relationship between board size and firm performance has been extensively examined; however, empirical findings remain inconclusive.

A segment of the literature posits that larger boards can positively impact firm performance by bringing together diverse perspectives and a broader range of expertise. A. Kalsie, et al. (2016) [5], analysing 145 non-financial firms listed on India's NSE across 16 industries from 2008 to 2012, revealed that larger boards were positively linked to both accounting-based measures (such as ROA and ROCE) and market-based indicators (including Tobin's Q and the Market-to-Book Ratio). Similarly, H. Boussenna (2020) [12], investigating non-financial firms listed on the CAC 40 in France from 2005 to 2017, found a positive correlation between board size and performance (ROA, ROE, Tobin's Q, and Market-to-Book Ratio). Notably, the study identified an optimal size of 13-17 members as most beneficial for enhancing firm outcomes. Z. Yuanyuan, et al. (2024) [9], analysing 203 public and private Chinese non-profit organisations, showed a positive association between board size and organisational performance. S.M. Hasan, et al. (2024) [8], analysing annual data from 20 major financial

institutions in Bangladesh, including banks, non-bank financial institutions (NBFIs), and insurance companies, covering the period 2011-2022, found that board size has a significant positive impact on the performance of financial institutions (ROA, ROE, Net Asset Value). Larger boards facilitate strategic decision-making and safeguard stakeholder interests, ultimately enhancing overall organisational efficiency. Consequently, financial institutions may benefit from optimising board size to strengthen governance and boost performance.

Conversely, other studies underscore the potential disadvantages of larger boards. S.D. Nath, et al. (2015) [33] in their examination of 20 publicly listed pharmaceutical firms on the Dhaka Stock Exchange from 2003 to 2015, identified a negative correlation between board size and firm performance, as measured by ROA and Tobin's Q. They argued that smaller boards can enhance efficiency and generate greater shareholder value. In a similar vein, O.R. Uwuigbe, et al. (2012) [34] found that firms with smaller boards achieved higher ROEs, attributing this success to stronger cohesion and quicker decision-making. These findings resonate with the concerns raised by M. Lipton (1992) [22], who warned that larger boards might encounter coordination difficulties that ultimately hinder performance. Furthermore, P.M. Guest (2009) [3] posited that large boards could adversely affect profitability, particularly regarding earnings and Tobin's Q.

The complexity of the relationship between board size and firm performance has been further underscored by some scholars who report no significant correlation. B.I. Ehikioya (2009) [35] in Nigeria and J. Yammesri, et al. (2010) [36] in Thailand concluded that board size alone may not serve as a reliable predictor of firm performance. They suggest that its impact is contingent on contextual factors, including industry characteristics, governance frameworks, and national institutional environments.

This discourse has garnered increasing importance in emerging economies, such as Vietnam. Some studies indicate that larger boards may positively influence firm performance by enhancing decision-making and oversight. Q.M. Nguyen, et al. (2024) [16], using data from 30 large-cap firms listed on the Ho Chi Minh City and Hanoi Stock Exchanges, typically included in the VN30 or HNX30 indices, covering 2010-2021, showed that larger board size is significantly associated with higher financial performance (ROA). V.C. Nguyen, et al. (2023) [17], using data from 52 representative firms listed on the Vietnamese stock exchanges, covering the period from 2006 to 2020, indicated that board size, the

proportion of female directors, meeting frequency, and board members' education levels have positive effects on financial performance (ROA and ROE). T.K. Pham, et al. (2023) [37], using data collected from the annual reports of Vietnamese banks, covering the period 2011-2021, revealed that board size contributes positively to bank performance. However, excessively large boards might lead to inefficiencies, including weakened communication and accountability. H.T.M. Le, et al. (2023) [15], analysing the top 200 listed firms on the Vietnam Stock Exchange from 2014 to 2015, noted that larger boards tend to exacerbate leadership dominance and intra-board conflicts, ultimately detracting from performance. V.H. Duc, et al. (2013) [18], analysing 77 listed companies between 2006 and 2011, and D. Vo, et al. (2014) [38], utilising FGLS on a dataset of 177 listed firms from 2008 to 2012, found no consistent evidence to support the claim that larger boards enhance firm performance. The latter even proposed that board size may insufficiently reflect the board's proper role in management.

Building on theories that emphasise the board's role in securing essential external resources and supported by empirical evidence indicating that diverse and well-connected boards can enhance firm performance, this study argues that in Vietnam, where boards play a pivotal role in corporate direction and oversight, a larger board may foster greater expertise diversity, strengthen monitoring, broaden networks, and enhance corporate reputation. Accordingly, the following hypothesis is proposed:

H1: Board size has a positive impact on firm performance.

2.2.2. Nonlinear relationship

Prior empirical research consistently indicates that the relationship between board size and corporate performance is nonlinear. The debate surrounding the ideal board size remains unresolved, as the optimal point appears to be highly context-dependent, influenced by various factors, including company characteristics, institutional frameworks, laws, and economic conditions.

M.B. Lehri, et al. (2024) [13], analysing 500 publicly listed companies over the period 2010-2024 using PLS-SEM, reported a U-shaped association between board size and financial performance. Similarly, S. Potharla, et

al. (2021) [10], analysing Indian non-financial firms from 2011 to 2018, identified an inverted U-shaped relationship between board size and firm performance (measured by ROA and Tobin's Q), suggesting that medium-sized boards yield the most favourable outcomes [10]". R. Sharma (2023) [11], examining 213 Indian firms over the period 2001-2019, revealed an inverted U-shaped nonlinear relationship between board size and firm performance. Initially, performance improves as board size increases, but beyond a certain point, it begins to decline. Specifically, an increase in board size enhances firm performance up to an optimal threshold (13 members for Tobin's Q and 10 members for ROE), after which diminishing returns set in. C. Liang (2022) [14], examining 14 Chinese hotel firms listed on the Shanghai Stock Exchange and the Shenzhen Stock Exchange from 1999 to 2018, found a nonlinear relationship between board size and financial performance [14]. Specifically, board size exhibits a cubic effect on hotel growth opportunities, measured by Tobin's Q, with critical turning points at 12 and 18 members. K. Silpachai (2023) [23], employing a panel dataset of 1,768 firm-year observations of Thai companies (2014-2020), found a curvilinear relationship between board size and performance [23]. The study revealed that the optimal board size for maximising ROA and ROE was 10 directors, with peak values of 3.4% and 14.8%, respectively. For Tobin's Q, the optimal number was 12 members, corresponding to a peak value of 2.39. Beyond these thresholds, firm performance declined. P.N. Vaidya (2019) [24], using data from 100 companies listed on the London Stock Exchange (2018-2019), examined board size in relation to various financial metrics including ROA, EBIT, ROE, EPS, Dividend per Share, and Tobin's Q. The findings indicated that firms with 8-10 directors consistently outperformed those with either smaller or larger boards, further reinforcing the argument for an optimal range. J. Wang, et al. (2018) [25] also confirmed an inverted U-shaped relationship, pointing to 10 members as the optimal board size for enhancing ROA, ROE, and Tobin's Q. L.T.X. Nguyen, et al. (2021) [19], examining the manufacturing firms of the emerging East Asian markets between 2011 and 2016, explored an inverse U-shaped relationship between board size and environmental performance. In addition, other scholars have similarly proposed specific ranges: 13-17 members [12], 7-8 members [21-22].

Taken together, this body of evidence strongly supports the view that the board size-performance nexus is nonlinear. Accordingly, the following research hypothesis is proposed:

H2: There is a nonlinear relationship between board size and firm performance.

3. Data and methodology

3.1. Data

Data for this study were collected through a combination of manual methods and supporting software. Key corporate governance characteristics, such as board size, the number of female directors, CEO age, and CEO ownership, were primarily extracted from corporate governance reports, annual reports, and publicly disclosed consolidated financial statements. Additional information was sourced from reputable financial websites, including *cafef.vn* and *vietstock.vn*. Financial data were obtained from the FinPro database. According to the State Securities Commission of Vietnam, as of 2022, the HNX listed 341 firms. The following exclusion criteria were applied: (i) firms engaged in the financial, insurance, or banking sectors because of possessing distinct financial structures, leverage ratios, and accounting regulations compared to others; (ii) firms founded after 2013; and (iii) firms with incomplete or missing data. After applying these filters, the final sample consisted of 203 firms, resulting in a panel dataset of 2,030 firm-year observations spanning the period from 2013 to 2022.

3.2. Variable measurement

3.2.1. Dependent variable: Firm performance

Firm performance is assessed using accounting-based indicators, namely ROA and ROE. These measures are widely recognised in the corporate governance literature as reliable proxies for firm performance due to their availability, ease of calculation, and frequent application in prior studies [39].

3.2.2. Independent variable: Board size (BS)

Board size serves as the primary explanatory variable and is measured by the total number of directors serving on the board [40]. Prior research has considered board size a critical determinant of board effectiveness [4]. The board plays a central role in monitoring managerial activities; an increase in board size may strengthen the board's monitoring capacity and thereby improve governance effectiveness [5, 10]. Thus, board size can be viewed as a proxy for a firm's governance capability,

potentially influencing the board's ability to fulfil its monitoring and advisory responsibilities.

3.2.3. Control variables

To accurately assess the relationship between board characteristics and firm financial performance, it is necessary to include additional control variables to reduce omitted variable bias and enhance the reliability of the results. First, the presence of women on the board (FIB) increases diversity and improves monitoring effectiveness [41]. Meanwhile, CEO characteristics may shape managerial behaviour and the firm's strategic orientation [42]. CEO age (AGE) reflects prudence and risk-taking propensity [43], whereas CEO ownership (OWN) indicates a more substantial alignment of managerial interests with corporate objectives [39]. Finally, firm-specific characteristics must also be controlled, as they directly affect performance. Financial leverage (LEV) captures the impact of debt obligations and financial risk exposure [44], while firm size (FS) may provide advantages in terms of resources, market position, and profitability [45].

Measures of the variables are presented in Table 1.

Table 1. Variable measurements.

Variable	Measurement	Research
Return on Assets	Earnings after tax on total assets	[39]
Return on Equity	Earnings after tax on equity	[39]
Board size	The number of members on board	[40]
Leverage	Total debt on total assets	[44]
CEO age	CEO age	[43]
CEO ownership	The number of shares owned by the CEO over the total outstanding shares	[39]
Gender diversity on the board of directors	Dummy variable: 1 if there are women on the board of directors, 0 otherwise	[41]
Firm size	Ln(assets)	[45]

3.3. Research model

This study inherits the research model of R. Sharma (2023) [11] to test the linear relationship between board size and firm financial performance, the general model is specified as follows:

$$PER_{i,t} = \beta_0 + \beta_1 BS_{i,t} + \sum \theta_j (\text{Control})_{i,t} + \varepsilon_{i,t} \quad (1)$$

In the regression model, PER is designated as the dependent variable, reflecting operating efficiency, and represented by ROA and ROE. The primary independent variable, BS, indicates the size of the board of directors. Additionally, several control variables are included to

account for firm- and governance-specific characteristics, such as CEO age (AGE), the CEO's equity ownership ratio (OWN), gender diversity on the board of directors (FIB), firm size (FS), and financial leverage (LEV). Consequently, the model is specified as follows:

$$ROA_{i,t} = \beta_0 + \beta_1 BS_{i,t} + \beta_2 AGE_{i,t} + \beta_3 OWN_{i,t} + \beta_4 LEV_{i,t} + \beta_5 FS_{i,t} + \beta_6 FIB_{i,t} + \epsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 BS_{i,t} + \beta_2 AGE_{i,t} + \beta_3 OWN_{i,t} + \beta_4 LEV_{i,t} + \beta_5 FS_{i,t} + \beta_6 FIB_{i,t} + \epsilon_{i,t}$$

Then, to examine the potential nonlinear effect of board size on financial performance, following R. Sharma (2023) [11], the squared term of board size (BS^2) is incorporated into the model. The regression model is specified as follows:

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t} + \beta_2 X_{i,t}^2 + \epsilon_{i,t} \quad (2)$$

$$ROA_{i,t} = \beta_0 + \beta_1 BS_{i,t} + \beta_2 BS_{i,t}^2 + \beta_3 AGE_{i,t} + \beta_4 OWN_{i,t} + \beta_5 LEV_{i,t} + \beta_6 FS_{i,t} + \beta_7 FIB_{i,t} + \epsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 BS_{i,t} + \beta_2 BS_{i,t}^2 + \beta_3 AGE_{i,t} + \beta_4 OWN_{i,t} + \beta_5 LEV_{i,t} + \beta_6 FS_{i,t} + \beta_7 FIB_{i,t} + \epsilon_{i,t}$$

3.4. Research approach

The dataset was initially assessed to ensure its validity and to minimise the impact of outliers. Variables exhibiting high skewness and kurtosis, such as ROA and ROE, were winsorised at the 5th and 95th percentiles to mitigate extreme values, thus enhancing the reliability of the subsequent regression analysis. The initial estimations utilised Ordinary Least Squares (OLS) along with control variables, followed by Fixed Effects Model (FEM) and Random Effects Model (REM) to address potential endogeneity stemming from unobserved heterogeneity. The appropriate specification was determined using the Hausman and F-tests. To ensure robustness, diagnostic tests were performed to check for multicollinearity (Variance Inflation Factor), heteroscedasticity (Wald test), and autocorrelation (Wooldridge test). When necessary, the Feasible Generalised Least Squares (FGLS) method was employed to achieve efficient and unbiased estimates.

4. Results and discussion

4.1. Descriptive statistics

The sample firms exhibit moderate financial performance (Table 2), with a mean ROA and ROE of 5.6% and 10.6%, respectively. Board size varies between 3 and 9 members, with an average of around 5, suggesting stability in the governance structure. Although Vietnamese law permits boards of directors to have up

to 11 members, the maximum board size observed in the final sample is 9 due to the applied sample selection criteria and the characteristics of listed non-financial firms during the study period. The average age of a CEO is approximately 49, reflecting career maturity. CEO ownership averages 3.6% but is widely dispersed, while firm size and leverage show moderate variation across firms. Female representation on boards is nearly balanced, at 49.3%.

Table 2. Descriptive statistics.

Variable	N	Mean	Std.	Min	Max
ROA	2,030	0.056	0.053	-0.003	0.194
ROE	2,030	0.106	0.085	-0.010	0.305
BS	2,030	5.189	0.925	3	9
AGE	2,024	48.833	8.398	24	73
OWN	2,025	0.036	0.071	0.000	0.506
FS	2,030	26.457	1.379	23.330	30.915
LEV	2,030	0.490	0.236	0.007	1.376
FIB	2,030	0.493	0.500	0	1

ROA: Return on assets; ROE: Return on equity; BS: Board size; AGE: CEO age; OWN: CEO ownership; FS: Firm size; LEV: Leverage; FIB: Gender diversity on the board of directors.

The descriptive statistics in Table 3 indicate that board size ranges from 3 to 9 members, with a mean of 5.19 and a median of 5, suggesting that most firms maintain a moderately sized board. The positive skewness (0.99) reveals a slight rightward asymmetry, implying the presence of firms with relatively larger boards. Moreover, the high kurtosis (6.43) suggests that the distribution is sharply concentrated around the mean.

Table 3. Descriptive statistics of board size.

Percentile	Minimum		
1%	3	3	
5%	4	3	
10%	5	3	
25%	5	3	N 2,030
50%	5		Mean 5.189
		Largest	Std. Deviation 0.925
75%	5	9	
90%	7	9	Variance 0.855
95%	7	9	Skewness 0.993
99%	8	9	Kurtosis 6.430

Table 4 presents the correlation matrix of the independent and dependent variables. Overall, the correlations are low to moderate, suggesting limited risk of multicollinearity and supporting the reliability of subsequent regression analysis [46].

Table 4. Variable correlation matrix.

Variable	ROA	ROE	BS	AGE	OWN	FS	LEV	FIB
ROA	1							
ROE	0.869***	1						
BS	0.100***	0.110***	1					
AGE	0.295***	0.247***	0.055**	1				
OWN	-0.018	-0.019	-0.038*	0.162***	1			
FS	-0.204***	0.000	0.149***	-0.158***	-0.100***	1		
LEV	-0.457***	-0.093***	-0.005	-0.146***	0.023	0.517***	1	
FIB	0.174***	0.086***	0.139***	-0.008	0.059**	-0.116***	-0.213***	1

ROA: Return on assets; ROE: Return on equity; BS: Board size; AGE: CEO age; OWN: CEO ownership; FS: Firm size; LEV: Leverage; FIB: Gender diversity on the board of directors. T-statistics (*, **, ***) indicate statistical significance at the 1%, 5% and 10% levels, respectively.

To assess multicollinearity, the study employed the Variance Inflation Factor (VIF) test. All VIF values were below the conventional threshold of 5, indicating that multicollinearity is not a significant issue among the explanatory variables [47].

4.2. Regression results

4.2.1. Linear relationship

The study estimated OLS, FEM, and REM regression models, using firm performance as the dependent variable. Model selection was performed utilising the Hausman test to determine the appropriate choice between FEM and REM, and the F-test to compare OLS and FEM. The findings indicated that the FEM was the most suitable specification for both ROA and ROE. Additionally, the Wald test produced a p-value of 0.000, confirming the existence of groupwise heteroscedasticity. In contrast, the Wooldridge test for autocorrelation in panel data yielded a p-value of less than 0.05, indicating the presence of first-order autocorrelation. The regression results are presented in Table 5.

To manage these challenges and ensure robust estimates, the FGLS method was utilised. The FGLS results, presented in Table 6, show that board size has a positive and statistically significant impact on firm performance at the 1% level, thereby supporting hypothesis H1. This finding suggests that an increased board size enhances diversity, monitoring capabilities, and managerial oversight, ultimately leading to improved firm performance. This conclusion is consistent with previous research indicating that larger boards can positively affect firm outcomes by providing a broader range of expertise and diverse perspectives [5, 10].

In the context of an emerging market like Vietnam, where the board of directors plays a pivotal role in strategic decision-making and management oversight,

Table 5. Regression results of Ordinary Least Squares, Fixed Effects and Random Effects models.

	ROA			ROE		
	OLS	FEM	REM	OLS	FEM	REM
BS	0.004*** (0.001)	0.002 (0.147)	0.002* (0.071)	0.007*** (0.001)	0.003 (0.230)	 (0.065)
AGE	0.002*** (0.000)	0.000 (0.407)	0.000*** (0.002)	0.003*** (0.000)	0.000 (0.546)	0.001*** (0.004)
OWN	-0.034** (0.019)	0.012 (0.506)	0.002 (0.924)	-0.065** (0.014)	0.018 (0.582)	-0.003 (0.913)
FS	0.002** (0.036)	0.003* (0.060)	0.002* (0.064)	0.004*** (0.008)	0.000 (0.907)	0.002 (0.466)
LEV	-0.096*** (0.000)	-0.100*** (0.000)	-0.101*** (0.000)	-0.027*** (0.003)	-0.025* (0.067)	-0.030** (0.012)
FIB	0.009*** (0.000)	0.003 (0.161)	0.005** (0.038)	0.012*** (0.001)	0.004 (0.388)	0.006 (0.165)
_cons	-0.044* (0.060)	0.003 (0.952)	0.007 (0.835)	-0.154*** (0.000)	0.103 (0.231)	0.016 (0.799)
N	2020	2020	2020	2020	2020	2020
R-sq	0.279	0.108		0.084	0.004	
F test	Prob>F=0.0000			Prob>F=0.0000		
Hausman test	Prob>chi2=0.0000			Prob>chi2=0.0000		
Wald test	Prob>chi2=0.0000			Prob>chi2=0.0000		
Wooldridge test	Prob>F=0.0000			Prob>F=0.0000		

ROA: Return on assets; ROE: Return on equity; BS: Board size; AGE: CEO age; OWN: CEO ownership; FS: Firm size; LEV: Leverage; FIB: Gender diversity on the board of directors. T-statistics (*, **, ***) indicate statistical significance at the 1%, 5% and 10% levels, respectively.

increasing the number of members not only enhances the diversity of experience, expertise, and viewpoints but also strengthens the capacity to monitor and regulate management activities. These mechanisms help mitigate the risks associated with potential opportunistic behaviour

Table 6. Linear and Nonlinear Effects of Board Size on Performance.

	ROA		ROE	
	Linear	Non-linear	Linear	Nonlinear
BS	0.002*** (0.000)	-0.008** (0.015)	0.007*** (0.000)	-0.019** (0.022)
BS2		0.001*** (0.002)		0.002*** (0.002)
AGE	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.003*** (0.000)
OWN	-0.020*** (0.010)	-0.022*** (0.005)	-0.063*** (0.000)	-0.063*** (0.000)
FS	0.001** (-0.016)	0.001** (-0.026)	0.003** (-0.014)	0.003** (-0.014)
LEV	-0.098*** (0.000)	-0.097*** (0.000)	-0.021*** (0.002)	-0.021*** (0.001)
FIB	0.005*** (0.000)	0.005*** (0.000)	0.008*** (0.002)	0.008*** (0.003)
_cons	-0.005 (0.737)	0.027 (0.111)	-0.122*** (0.000)	-0.05 (0.182)
N	2020	2020	2020	2020

ROA: Return on assets; ROE: Return on equity; BS: Board size; BS²: Squared term of board size; AGE: CEO age; OWN: CEO ownership; FS: Firm size; LEV: Leverage; FIB: Gender diversity on the board of directors. T-statistics (*, **, ***) indicate statistical significance at the 1%, 5% and 10% levels, respectively.

by board members, while simultaneously promoting decisions that are advantageous for shareholders. Consequently, the findings align with practices in Vietnam, indicating that the effectiveness of the Board is bolstered by both its size and composition, ultimately leading to improved performance.

4.2.2. Nonlinear relationship

The study further investigated the nonlinear impact of board size on firm performance by introducing BS² into the regression model. As reported in Table 6, BS² exhibits a positive and statistically significant effect in both the ROA and ROE models. Specifically, the results reveal a U-shaped relationship between board size and performance, evidenced by the significant negative coefficient of BS and the significant positive coefficient of BS². This indicates that firm performance initially declines as board size increases but subsequently improves once the size surpasses a certain optimal threshold. These findings underscore the importance of firms carefully designing their board structure, striking a balance between effective monitoring and decision-making efficiency to enhance overall performance.

This conclusion is consistent with prior studies that documented a U-shaped nonlinear relationship between board size and performance [13].

The relationship between board size and both ROA and ROE exhibits a U-shaped nonlinearity, with the inflection point calculated following the method proposed by F. Plassmann, et al. (2007) [48]:

The findings indicate that the minimum point occurs at approximately 4 members in the ROA model and 4.75 members in the ROE model. This pattern suggests that financial performance tends to decline as board size increases up to these thresholds, but subsequently improves once additional members are added. In this context, the study identifies the range of four to five members as the turning point, highlighting the critical role of designing board structures that achieve an appropriate balance between enhanced monitoring capacity and the rising coordination costs associated with larger boards.

These findings are consistent with prior literature documenting nonlinear governance effects and highlight the importance of identifying an optimal board size that balances monitoring effectiveness and coordination costs. From a theoretical perspective, the U-shaped pattern provides empirical support for the integration of agency theory and resource dependence theory. At smaller board sizes, firms may suffer from weak monitoring, limited expertise, and concentrated decision-making power, leading to lower performance. However, as board size exceeds a critical threshold, the benefits of diversity, expertise, and external linkages become dominant, thereby improving firm outcomes. In addition, the results are partially aligned with stewardship theory, suggesting that moderately sized boards may foster better collaboration and trust among members.

The nonlinear relationship observed in this study can be further understood within the specific institutional and corporate context of Vietnam. Vietnamese firms are predominantly small and medium-sized, with relatively simple organisational structures and a high concentration of decision-making authority within the board. In such settings, very small boards may lack sufficient diversity in expertise and experience, limiting their ability to monitor management and provide strategic guidance effectively. At the same time, increasing board size in the early stages may introduce coordination challenges, including communication inefficiencies, unclear role allocation, and potential free-rider problems. These factors can temporarily reduce firm performance, explaining the negative slope observed at lower board sizes. However,

once the board reaches a moderate size (around 4 to 5 members), the benefits of additional expertise, improved monitoring, and broader perspectives begin to outweigh coordination costs, leading to enhanced performance.

Additionally, the findings reveal significant cross-country differences in optimal board size. Prior studies suggest optimal board sizes of 7-8 members in the United States [23, 24], 13-17 members in France [12], 10-13 members in India [11], and approximately 10-18 members in China [25]. These differences reflect variations in institutional quality, firm complexity, and governance systems. In developed economies, firms are typically larger and operate in more complex regulatory environments, requiring broader expertise and stronger monitoring mechanisms. Similarly, in countries such as China and India, firms often face complex institutional settings and stakeholder networks, where larger boards can help manage political connections and strategic uncertainty. In contrast, the smaller optimal board size identified in Vietnam reflects its unique context. The predominance of small and medium-sized firms reduces the need for large advisory boards, while the relatively underdeveloped governance environment limits the effectiveness of overly large boards. Moreover, the Law on Enterprises (2020) of Vietnam, which stipulates a board size of 3 to 11 members, also constrains the board structure. As a result, moderately sized boards are more effective in maintaining coordination efficiency and decision-making speed while still providing sufficient oversight and expertise.

Taken together, the results indicate that the effect of board size is nonlinear and varies across governance stages. In the Vietnamese context, smaller boards may initially face limited expertise and weak monitoring capacity, whereas larger boards enhance performance through improved oversight and greater resource diversity. This U-shaped pattern underscores that board effectiveness depends critically on achieving an appropriate balance between coordination efficiency and governance capacity. More broadly, the findings highlight that optimal board structures are context-specific and should be aligned with firm characteristics and the institutional environment rather than universally prescribed.

In conclusion, this finding extends the existing literature by demonstrating that the effect of board size is not only nonlinear but also highly context-dependent in emerging markets. While prior studies have primarily identified optimal board sizes in developed economies, the significantly lower threshold observed in Vietnam

reflects differences in institutional quality, firm scale, and governance maturity. This implies that the effectiveness of governance mechanisms cannot be universally generalised across countries. Instead, it depends critically on how internal governance structures interact with external institutional conditions. Consequently, the study contributes to the literature by providing empirical evidence that optimal board design should be tailored to the specific economic and governance context of each market.

5. Conclusions

This study examines the impact of board size on firm performance in non-financial firms listed on the HNX over the period 2013-2022. Using FGLS estimation, the results provide robust evidence of a nonlinear (U-shaped) relationship between board size and firm performance, with an optimal threshold of approximately 4 to 5 members. Importantly, this study contributes to the corporate governance literature by demonstrating that the effectiveness of board size is nonlinear and highly context-dependent in emerging markets. The relatively smaller optimal board size identified in Vietnam reflects differences in institutional quality, firm size, and governance maturity compared to those in developed economies.

These findings have several important implications. For managers, maintaining a board size of 4 to 5 members or more can effectively balance monitoring capacity and coordination costs. Further performance improvements may be achieved by ensuring that additional members bring complementary expertise, diverse experience, and strong governance skills. For policymakers, these results suggest that guidelines on board composition should focus on balancing board size, professional diversity, and oversight capacity, particularly in small- and medium-sized enterprises, to foster effective and sustainable corporate governance.

This study has some limitations. Although the FGLS regression method effectively addresses issues of first-order autocorrelation and heteroscedasticity, the challenge of endogeneity remains inherent in panel data and could significantly impact the findings. Therefore, future studies should employ endogenous treatment methods, such as two-stage least squares (2SLS) and generalised method of moments (GMM), to achieve the best results. Additionally, evaluating board effectiveness solely based on size offers a limited perspective and may overlook the complexities of governance mechanisms. Subsequent studies should incorporate additional factors,

such as board independence, ownership structure, and remuneration policies, to provide a more comprehensive understanding.

Overall, the study underscores that optimal board design is not a “one-size-fits-all” phenomenon; rather, it must be contingent upon firm-specific characteristics and the broader institutional landscape of emerging markets.

COMPETING INTERESTS

The author declares that there is no conflict of interest regarding the publication of this article.

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