



“Nonlinear effects of ownership structure and financial leverage on corporate financial risk”

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NONLINEAR EFFECTS OF OWNERSHIP STRUCTURE AND FINANCIAL LEVERAGE ON CORPORATE FINANCIAL RISK

Abstract

This study investigates the linear and nonlinear effects of ownership structure and financial leverage on corporate financial risk in Vietnam. Using panel data from publicly listed non-financial companies from 2014 to 2023, the analysis applies pooled, random-effects, and fixed-effects logit models, along with robustness checks based on linear probability and feasible generalized least squares estimations. The results reveal that financial leverage significantly raises the risk of financial distress, emphasizing the importance of capital structure in risk assessment. State ownership shows a nonlinear relationship with financial risk, with evidence suggesting a U-shaped pattern that becomes more evident in alternative model specifications. Conversely, institutional ownership and managerial ownership do not show statistically significant effects, indicating limited governance influence of these ownership types in the Vietnamese setting. Among control variables, profitability correlates with lower financial risk, while asset tangibility has a positive relationship; other firm characteristics do not display consistent impacts across models. These findings add to the literature by highlighting the role of ownership structure and leverage in influencing financial risk within institutional constraints. Policy-wise, the results suggest that firms should implement cautious leverage strategies, and regulators should carefully manage state ownership to balance its potential advantages and drawbacks.

Keywords

ownership structure, financial risk, financial leverage,
listed firms, Vietnam

JEL Classification

G32, G33, G34

INTRODUCTION

The ownership structure and financial risk have historically occupied a central position in corporate finance research, as various types of owners influence firms' risk-taking incentives, financing decisions, and resilience to financial shocks. In an increasingly volatile economic environment and amidst the growing diversification of ownership configurations, understanding the impact of ownership structure on financial risk has become a critical area of inquiry. Classical theories concerning the separation of ownership and control suggest that managerial, family, government, and foreign ownership are associated with distinct risk preferences and financial policies, reflecting heterogeneity in control incentives and monitoring effectiveness (Jensen & Meckling, 1976; Wiwattanakantang, 1999). More recent studies build on this foundation by emphasizing the importance of ownership concentration, internal governance mechanisms, and market context in shaping firms' risk exposure and financial outcomes (Pacheco, 2022).

Empirical evidence suggests that ownership structure does not independently influence financial risk; rather, it interacts with corporate governance frameworks and institutional quality, resulting in significantly different risk profiles among family firms, state-owned enter-

prises, and firms with dispersed ownership. These findings imply that the relationship between ownership and risk is inherently complex and is dependent on both firm-specific and contextual factors. Significantly, an increasing body of research challenges the presumption of linear effects, demonstrating that the impact of ownership on financial risk frequently varies with the degree of ownership concentration and the balance between control rights and cash-flow rights.

At the mechanistic level, financial leverage is recognized as a primary mechanism through which the ownership structure influences financial risk. Institutional, foreign, and individual ownership are generally associated with more conservative leverage strategies, reflecting stronger monitoring incentives and greater sensitivity to downside risk, as evidenced by a negative correlation between institutional ownership and debt utilization (Kasaboğlu & Çinko, 2017; Gurusamy, 2021). Conversely, family owners and corporate blockholders tend to rely more heavily on debt financing to retain control when dilution risks increase, thereby heightening the firms' susceptibility to financial distress (Ellul, 2008; Mbanyele, 2020).

Beyond these contrasting patterns, numerous studies document non-linear, particularly U-shaped, relationships between controlling ownership and financial leverage. At lower levels of ownership, debt is frequently employed strategically to fortify control without diluting equity stakes. In contrast, at higher levels of ownership, proprietors tend to become more risk-averse and decrease leverage to avoid bankruptcy costs and risks associated with wealth concentration (Kharabsheh et al., 2019). The institutional context further influences these dynamics. In emerging markets, state and family ownership often exert stronger and more persistent effects on financial risk, attributed to weaker legal protections, limited market discipline, and governance constraints (Low et al., 2015; Kim, 2019; Jahmani & Ansari, 2006). Conversely, foreign ownership is frequently associated with lower financial risk and higher firm value; however, this relationship remains highly contingent on the investors' origins and the quality of the host country's institutional environment (Abousamak et al., 2023).

Although research on ownership structure, financial leverage, and financial risk is growing, the findings are often scattered and unclear. A major limitation of current studies is their reliance on linear models, which fail to fully capture the complex and possibly non-linear effects of ownership on risk-taking behavior (Kharabsheh et al., 2019). Additionally, previous research usually concentrates on a single aspect of ownership or looks at different types of ownership separately, making it hard to compare their combined and non-linear effects within a single framework. Specifically, there is a notable lack of studies that jointly analyze state ownership, institutional ownership, and managerial ownership while explicitly considering non-linear dynamics. To fill these gaps, this study aims to investigate both the direct and nonlinear impacts of ownership structure on corporate financial risk within an integrated approach.

1. LITERATURE REVIEW AND HYPOTHESES

The relationship between ownership structure and financial risk is founded on several fundamental theories of corporate finance, notably agency theory, trade-off theory, and pecking order theory. These theoretical frameworks elucidate how investors with varying ownership stakes and characteristics influence a company's risk appetite, financing decisions, and susceptibility to financial distress. In emerging markets, where ownership is frequently fragmented and characterized by over-

lapping economic interests and control motives, these effects are seldom straightforward and tend to vary with levels of ownership concentration.

Agency theory (Jensen & Meckling, 1976) offers a fundamental framework for understanding the heterogeneity in risk-taking behaviors across different ownership types. The division between ownership and control engenders agency conflicts, which lead some owners to favor risk mitigation, whereas others pursue higher risk to maintain or augment control. In the context of state ownership, agency issues emerge when political

and social objectives partially supplant the goal of value maximization (Shleifer & Vishny, 1994). Simultaneously, implicit government guarantees and preferential access to financing may decrease borrowing costs and default risks (Bortolotti et al., 2004). The coexistence of these conflicting forces indicates a non-linear mechanism, whereby low to moderate levels of state ownership may stabilize firms, while excessive state control amplifies financial risks through administrative intervention and diminished efficiency incentives (Huang et al., 2011).

Institutional ownership is generally associated with enhanced monitoring and governance quality. Agency theory and the monitoring hypothesis emphasize that institutional investors possess superior analytical capabilities and have strong incentives to mitigate downside risk within their portfolios (Gillan & Starks, 2000). A considerable body of empirical evidence indicates an inverse relationship between institutional ownership and financial risk (Kasaboğlu & Çinko, 2017; Gurusamy, 2021). Nonetheless, this relationship is not consistently observed. Variations in investment horizons yield differing effects, as long-term institutional investors tend to endorse conservative financing strategies, whereas short-term investors may advocate for increased leverage to maximize immediate returns (Bushee, 1998). These contrasting incentives imply that the influence of institutional ownership on financial risk is contingent not only on ownership levels but also on investor characteristics, resulting in nonlinear outcomes.

Managerial ownership provides some of the strongest evidence of non-linear effects. When managerial ownership rises from low to moderate levels, it aligns the interests of managers and shareholders, reducing agency conflicts and limiting excessive risk-taking (Morck et al., 1988). However, beyond a certain point, managerial entrenchment may occur, causing managers to focus on job security and control. Depending on the institutional and market context, this can lead to either excessive risk-taking or overly cautious behavior (McConnell & Servaes, 1990). Empirical studies often show inverted U-shaped relationships between managerial ownership and leverage or financial risk, indicating shifts in control incentives as ownership becomes more concentrated (Kharabsheh et al., 2019).

The trade-off theory (Kraus & Litzenberger, 1973) complements agency-based explanations by emphasizing firms' efforts to balance the tax advantages of debt against the potential costs associated with financial distress. Diversity in ownership implies that various owners manage risk differently as the marginal benefits and costs of leverage fluctuate. For instance, state owners may accept higher leverage due to their anticipation of government support (Huang et al., 2011), whereas institutional investors frequently restrict debt usage to mitigate portfolio risk (Sasikirono et al., 2023). This heterogeneity results in non-linear relationships between ownership structure and financial risk.

The Pecking Order Theory (Myers, 1984) provides further insight into financing behavior in the context of information asymmetry. Managers holding minimal ownership stakes may favor debt over equity to prevent dilution and to maintain control over the firm (Du & Dai, 2005). Conversely, substantial managerial ownership heightens exposure to firm-specific risks, prompting managers to limit leverage to safeguard their personal wealth. These ostensibly conflicting incentives are consistent with empirical evidence indicating that the relationship between ownership and risk is fundamentally nonlinear.

Recent research increasingly utilizes non-linear modeling approaches, including U-shaped, inverted U-shaped, and threshold models, to accurately reflect that ownership effects vary across different ownership levels. Studies on family enterprises and controlling shareholders indicate that initial increases in control often promote leverage to maintain influence; however, excessive control may shift incentives towards risk mitigation (Ellul, 2008; Kharabsheh et al., 2019). This theoretical framework supports the hypothesis that state ownership, institutional ownership, and managerial ownership can each produce non-linear impacts on financial risk, contingent upon control incentives and economic motivations.

Synthesizing theoretical arguments and empirical evidence indicates that the impact of ownership structure on financial risk depends on ownership concentration, monitoring capacity, and control motives rather than being straightforward. As ownership stakes fluctuate,

economic, political, and governance incentives can change, leading to U-shaped or inverted U-shaped relationships. Financial leverage plays a key role in this process because it directly influences the likelihood of financial distress and bankruptcy costs, consistent with the predictions of trade-off theory (Kraus & Litzenberger, 1973). Empirical studies reliably confirm a positive link between leverage and financial risk in both developed and emerging markets (Huang et al., 2011; Kharabsheh et al., 2019).

Based on the above theoretical considerations and empirical findings, this study proposes the following hypotheses:

- H1: *State ownership has a non-linear relationship with financial risk.*
- H2: *Institutional ownership has a non-linear relationship with financial risk.*
- H3: *Managerial ownership has a non-linear relationship with financial risk.*
- H4: *Financial leverage is positively associated with financial risk.*

2. METHOD

This study utilizes panel data from non-financial listed firms in Vietnam spanning from 2014 to 2023. Financial data are obtained from the audited financial statements of the firms, while information regarding listing status, industry classification, and firm-level changes over time is sourced from official disclosures made by the Ho Chi Minh Stock Exchange (HOSE) and the Hanoi Stock Exchange (HNX). Firms operating within the financial, banking, and insurance sectors are excluded owing to substantial differences in capital adequacy requirements, funding structures, and risk profiles. After removing observations with missing data, an unbalanced firm-year panel

dataset is assembled. To mitigate the influence of outliers, all continuous variables are winsorized at the 1st and 99th percentiles. Industry-specific and year-specific dummy variables are included to control for industry characteristics and macroeconomic trends over time.

Based on the theoretical framework and research context, the empirical analysis aims to examine how ownership structure and financial leverage influence corporate financial risk, with a special focus on potential non-linear relationships. Because the dependent variable is binary, the general model is specified using a panel logit approach as in formula (1). Where $F(\cdot)$ denotes the logistic cumulative distribution function. The vector Z_{it} includes a set of control variables, namely audit quality (BIG4), firm size (FSIZE), profitability (ROA), firm value (Tobin's Q, FMV), asset tangibility (TANG), and firm age (OLDS). YEAR and IND represent year and industry fixed effects, respectively. Standard errors are clustered at the firm level to address heteroskedasticity and within-firm serial correlation.

The dependent variable, financial risk (ICRF), is defined as a binary indicator equal to one if the interest coverage ratio (ICR) is below one and zero otherwise. ICR is measured as earnings before interest and taxes (EBIT) divided by interest expenses. This measure captures firms' inability to meet interest obligations and is widely used as an indicator of financial distress risk. The key explanatory variables include state ownership (STAOWN), institutional ownership (BDOWN), and managerial ownership (MANOWN), each measured as the proportion of shares held by the respective owner type. Financial leverage (LEV) is measured as total debt divided by total assets.

All variables and their measurements are summarized in Table 1. In addition to the baseline specifications, net leverage (NBR), measured as net debt divided by EBITDA, is included in robustness

$$\Pr(ICRF_{it} = 1 | X_{it}, U_i) = F \left(\begin{array}{l} \beta_0 + \beta_1 LEV_{it} + \beta_2 STAOWN_{it} + \beta_3 STAOWN_{it}^2 \\ + \beta_4 BDOWN_{it} + \beta_5 BDOWN_{it}^2 + \beta_6 MANOWN_{it} \\ + \beta_7 MANOWN_{it}^2 + \gamma Z_{it} + \delta_y YEAR_y + \phi_k IND_k + U_i \end{array} \right), \quad (1)$$

Table 1. Variable definitions and measurement

Variable	Symbol	Measurement	References
Financial risk	ICRF	Dummy = 1 if ICR < 1; ICR = EBIT/Interest expense	Tran et al. (2023)
Net leverage	NBR	Net debt/EBITDA	Demerjian & Owens (2016)
Financial leverage	LEV	Total debt/Total assets	Kasaboğlu & Çinko (2017)
State ownership	STAOWN	Proportion of state-owned shares	Huang et al. (2011)
Institutional ownership	BDOWN	Proportion of institutional shares	Sasikirono et al. (2023)
Managerial ownership	MANOWN	Proportion of shares held by managers/board members	Jensen & Meckling (1976)
Audit quality	BIG4	Dummy = 1 if audited by Big 4	Dang & Khanh Dung (2024)
Firm size	FSIZE	Natural logarithm of total assets	Ellul (2008)
Profitability	ROA	Net income/Total assets	Kharabsheh et al. (2019)
Firm value	FMV	Tobin's Q	Pacheco (2022)
Asset tangibility	TANG	Net PPE/Total assets	Ellul (2008)
Firm age	OLDS	Number of years since establishment	Tran et al. (2023)

analyses. This indicator reflects firms' effective debt-servicing capacity and is considered more sensitive to financial risk than traditional leverage ratios.

Given the binary nature of the dependent variable, traditional linear regression models are unsuitable for modeling the probability of financial risk. Consequently, panel binary choice models are utilized to account for both firm-specific heterogeneity and temporal variation. The fixed-effects logit model serves as the baseline estimator because it controls for time-invariant unobserved firm characteristics via conditional maximum likelihood estimation, thereby providing more consistent estimates.

To evaluate the robustness of the results, random-effects logit models are also estimated. This method assumes that unobserved firm-specific effects are uncorrelated with the explanatory variables. Comparing fixed-effects and random-effects logit outcomes allows for an assessment of whether cross-firm heterogeneity significantly influences the estimated relationships between ownership structure, financial leverage, and financial risk. Firm-clustered standard errors are used to ensure statistical reliability.

Although linear probability models (LPM) are not ideally suited for binary dependent variables, fixed-effects LPM and feasible generalized least squares (FGLS) estimations are used as supplementary robustness checks. Comparing results from LPM and panel logit models helps assess the stability of coefficient signs and statistical significance. It is important to note that linear models

are only used for robustness purposes and are not the main estimation strategy. Potential endogeneity may result from reverse causality, omitted variables, and measurement errors. For example, firms with higher financial risk might adjust their ownership structure or leverage policies. To address these concerns, this study employs fixed-effects estimations to control for time-invariant heterogeneity and compares results across different model specifications. The consistent findings across logit, LPM, and FGLS models indicate that endogeneity is unlikely to significantly impact the main conclusions.

3. RESULTS

Table 2 delineates the descriptive statistics of the variables employed in the empirical analysis, based on 3,210 firm-year observations of non-financial listed corporations in Vietnam from 2014 to 2023. The dependent variable, financial risk (ICRF), exhibits a mean of 0.3838, suggesting that approximately 38% of the observations possess an interest coverage ratio below one, thereby classifying them as financially risky. The standard deviation of 0.4864 is consistent with the binary nature of the variable and signifies considerable variation in financial risk across firms.

Financial leverage (LEV) has a mean of 0.4790 and a standard deviation of 0.2281, showing that Vietnamese non-financial corporations heavily depend on debt financing, with leverage levels nearing 48% of total assets on average. The large gap between the minimum and maximum values indicates considerable variation in capital

structure across firms. Ownership variables show relatively low average values, indicating moderate ownership concentration. State ownership (STAOWN) averages 15.27%, with a high standard deviation, highlighting significant differences between firms with substantial state involvement and those without state ownership. Institutional ownership (BDOWN) and managerial ownership (MANOWN) average 12.45% and 5.02%, respectively, implying that involvement from institutional and managerial shareholders remains comparatively limited compared to developed markets.

Table 3 presents the correlation matrix. Financial risk (ICRF) demonstrates a positive and statistically significant correlation with financial leverage (LEV), with a coefficient of 0.413, suggesting that firms with higher leverage are more susceptible to financial distress. The correlations between ownership variables and ICRF are moderate. State ownership exhibits a modest negative correlation with financial risk, whereas institutional and managerial ownership display weak positive correlations. Ownership variables show moderate

Table 2. Descriptive statistics

Variable	N	Mean	SD	Min	Max
ICRF	3,210	0.3838	0.4864	0.0000	1.0000
LEV	3,210	0.4790	0.2281	0.0320	0.9097
STAOWN	3,210	0.1527	0.2436	0.0000	0.9919
BDOWN	3,210	0.1245	0.1646	0.0000	0.9352
MANOWN	3,210	0.0502	0.1008	0.0000	0.7854
BIG4	3,210	0.5234	0.4995	0.0000	1.0000
FSIZE	3,210	12.0357	0.6803	10.5436	13.8564
ROA	3,210	0.1186	0.1435	-0.4629	0.5531
FMV	3,210	1.1132	0.5406	0.4047	3.5937
TANG	3,210	0.1914	0.2029	0.0000	0.8628
OLDS	3,210	28.9829	14.8631	2.0000	96.0000

interrelations, particularly between institutional and managerial ownership, indicative of common ownership structures within Vietnamese firms. Importantly, no correlation coefficient surpasses the conventional threshold of 0.80, indicating that multicollinearity is unlikely to pose a significant issue.

This conclusion is further supported by the variance inflation factor (VIF) diagnostics reported in Table 4. All VIF values are well below the threshold of 5, with a maximum value of 1.80 and a mean VIF of 1.32, confirming the absence of severe multicollinearity and supporting the joint inclusion of explanatory variables in the regression models.

Table 5 shows the main regression results exploring the non-linear effects of ownership structure and financial leverage on financial risk. After performing model diagnostics, the fixed-effects logit model was chosen as the main specification, while pooled logit and random-effects logit models are included for comparison. The decrease in observations in the fixed-effects logit model occurs be-

Table 3. Correlation coefficient matrix

Variable	ICRF	LEV	STAOWN	BDOWN	MANOWN	BIG4	FSIZE	ROA	FMV	TANG	OLDS
ICRF	1.00										
LEV	0.41***	1.00									
STAOWN	-0.06***	-0.02	1.00								
BDOWN	0.06***	0.09***	-0.35***	1.00							
MANOWN	0.05***	0.10***	-0.24***	0.63***	1.00						
BIG4	-0.07***	0.02	0.05**	-0.05***	-0.08***	1.00					
FSIZE	0.04**	0.28***	0.08***	-0.06***	-0.05***	0.36***	1.00				
ROA	-0.47***	-0.16***	0.10***	-0.07***	-0.02	0.10***	0.13***	1.00			
FMV	-0.23***	-0.20***	0.11***	-0.06***	-0.07***	0.14***	0.08***	0.43***	1.00		
TANG	0.04**	-0.07***	0.26***	-0.08***	-0.07***	0.05***	0.11***	0.05**	0.10***	1.00	
OLDS	0.02	0.09***	0.09***	0.01	-0.01	-0.07***	-0.04**	0.04**	0.10***	0.04**	1.00

Notes: * p < 0.10; ** p < 0.05; *** p < 0.01.

cause firms without within-variation in the dependent variable were removed. Overall, the models demonstrate a good fit, as shown by statistically significant Wald χ^2 statistics.

Table 4. Multicollinearity diagnostics

Variable	VIF	1/VIF
BDOWN	1.80	0.56
MANOWN	1.69	0.59
FSIZE	1.32	0.76
FMV	1.31	0.77
ROA	1.27	0.79
STAOWN	1.23	0.81
LEV	1.21	0.82
BIG4	1.18	0.85
TANG	1.09	0.91
OLDS	1.05	0.95
Mean VIF	1.32	

Financial leverage (LEV) has a strong positive and highly significant impact on financial risk across all models. In the fixed-effects logit model, the LEV coefficient is positive and significant at the 1% level, showing that higher leverage greatly raises the likelihood of financial distress. This result is consistent in other models, confirming the robustness of the leverage–risk link.

Regarding ownership structure, state ownership (STAOWN) exhibits a negative and statistically significant coefficient in the fixed-effects logit model, while its squared term becomes significant in alternative specifications. This pattern indicates a non-linear relationship between state ownership and financial risk. The evidence for a U-shaped relationship is partly supported, as the linear term is significant while the squared term is not consistently significant across all models. At low to moderate levels of state ownership, financial risk tends to decrease, whereas higher levels of state ownership are linked to increased financial risk.

In contrast, institutional ownership (BDOWN) and managerial ownership (MANOWN), including their squared terms, do not show statistically significant effects across all models. These findings indicate that the data do not support either linear or non-linear impacts of these ownership types on financial risk.

Among control variables, profitability (ROA) consistently shows a strong negative and statistically

significant effect on financial risk, indicating that more profitable firms are less likely to face financial distress. Asset tangibility (TANG) is positively and significantly related to financial risk, suggesting that firms with a higher proportion of tangible assets experience greater financial pressure. Audit quality (BIG4) is weakly significant only in the random-effects logit model, implying that its impact is not consistent across different model specifications. The effect of firm size varies across models, indicating limited robustness. Firm value and firm age also do not show consistent effects across different specifications.

To enhance economic interpretation, marginal effects are computed based on the logit models. The results indicate that increases in financial leverage lead to economically meaningful increases in the probability of financial distress, while changes in state ownership reduce financial risk up to a certain threshold before reversing direction at higher ownership levels. These marginal effects reinforce the non-linear nature of the relationship between state ownership and financial risk identified in the coefficient estimates.

Robustness checks are presented in Table 6 employing linear probability models with fixed effects and feasible generalized least squares (FGLS) estimations. Although these linear models are not the primary estimation method, they serve as a valuable benchmark for assessing the stability of the results. The positive and statistically significant effect of financial leverage on financial risk remains consistent across both specifications. Similarly, state ownership continues to exhibit a negative linear relationship alongside a positive squared term, thereby confirming the U-shaped pattern observed in the logit models. Institutional and managerial ownership variables remain statistically insignificant, consistent with the baseline findings.

Overall, the robustness analyses confirm that the main findings are stable across alternative estimation methods. Financial leverage is a key determinant of financial risk, whereas state ownership exhibits a nonlinear effect. In contrast, institutional and managerial ownership do not exert a statistically significant influence on financial risk in the Vietnamese context during the study period.

Table 5. Non-linear effects of ownership structure and financial leverage on financial risk

Variable	Pooled logit (1)	RE logit (2)	FE logit (3)
LEV	6.139*** [0.674]	7.740*** [0.983]	5.256*** [0.875]
STAOWN	-2.044 [1.299]	-4.208** [1.743]	-5.337** [2.588]
STAOWNSq	2.073 [1.845]	4.693* [2.537]	5.403 [4.695]
BDOWN	-2.237 [1.532]	-2.189 [1.955]	-1.446 [1.781]
BDOWNsq	3.103 [2.776]	2.666 [3.526]	1.764 [2.554]
MANOWN	1.182 [2.103]	0.718 [2.655]	-0.783 [2.798]
MANOWNSq	-2.219 [4.460]	-2.302 [5.602]	-0.613 [5.572]
BIG4	-0.241 [0.154]	-0.362* [0.210]	-0.404 [0.250]
FSIZE	-0.126 [0.152]	-0.226 [0.239]	0.492 [0.604]
ROA	-16.550*** [1.589]	-22.502*** [2.502]	-22.062*** [1.537]
FMV	-0.177 [0.341]	-0.523 [0.362]	-0.553* [0.313]
TANG	2.151*** [0.476]	3.240*** [0.702]	3.292*** [0.906]
OLDS	-0.001 [0.006]	0.004 [0.010]	-0.052 [0.039]
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Constant	0.560 [1.711]	1.607 [2.700]	—
Insig2u	—	—	1.300*** [0.199]
N	3,210	3,210	2,044
Log-likelihood	-1223.876	-1055.866	-506.787
Wald χ^2	—	192.012	695.849

Notes: STAOWNSq = squared state ownership; BDOWNsq = squared institutional ownership; MANOWNSq = squared managerial ownership. Coefficients are reported with z-statistics in brackets. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6. Robustness checks based on linear models

Variables	LPM-FE	FGLS
LEV	0.410*** [0.109]	0.761*** [0.034]
STAOWN	-0.459** [0.193]	-0.300*** [0.069]
STAOWNSq	0.523* [0.299]	0.473*** [0.104]
BDOWN	-0.167 [0.267]	-0.142 [0.112]
BDOWNsq	0.145 [0.408]	0.098 [0.155]
MANOWN	0.140 [0.311]	0.191 [0.196]
MANOWNSq	-0.437 [0.622]	-0.232 [0.409]
BIG4	-0.032 [0.026]	-0.019 [0.012]
FSIZE	0.148** [0.066]	-0.048*** [0.012]
ROA	-1.167*** [0.091]	-0.911*** [0.044]
FMV	-0.038 [0.025]	0.003 [0.009]
TANG	0.366*** [0.093]	0.272*** [0.040]
OLDS	0.003 [0.004]	0.001 [0.001]
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Constant	-1.467** [0.731]	0.653*** [0.160]
Observations	3,210	3,210

Notes: STAOWNSq = squared state ownership; BDOWNsq = squared institutional ownership; MANOWNSq = squared managerial ownership. Standard errors are shown in square brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The empirical findings support H1, as state ownership shows a non-linear relationship with financial risk, with a more evident U-shaped pattern in alternative model specifications. In contrast, H2 and H3 are not supported, since neither institutional owner-

ship nor managerial ownership demonstrates statistically significant effects on financial risk, whether linear or non-linear models are used. Finally, the results strongly support H4, indicating that financial leverage significantly increases financial risk.

4. DISCUSSION

The empirical evidence derived from panel logit models (pooled, random-effects, and fixed-effects) and supplementary linear robustness checks (LPM-FE and FGLS) offers consistent and compelling insights into the mechanisms by which ownership structure and financial leverage influence corporate financial risk. The convergence of results across various estimation techniques bolsters the credibility of the findings and indicates that the empirical framework effectively encapsulates the critical characteristics of the Vietnamese context, an emerging market distinguished by heterogeneous ownership structures and a developing institutional environment.

Initially, the findings unequivocally confirm the primary role of financial leverage in influencing financial risk. The consistently positive and statistically significant coefficient associated with leverage across all models indicates that an increased reliance on debt markedly elevates the likelihood of financial distress. This conclusion is strongly consistent with trade-off theory, which posits that beyond an optimal point, the marginal costs of financial distress and bankruptcy escalate sharply, surpassing the tax advantages of debt (Kraus & Litzenberger, 1973). The robustness of this result is particularly pertinent within the Vietnamese context, where corporations are heavily reliant on bank financing and capital markets remain relatively underdeveloped. In such an environment, high leverage amplifies susceptibility to liquidity shocks and interest rate variations, thereby underscoring the critical significance of capital structure decisions in corporate risk management.

A significant contribution of this study is the provision of compelling empirical evidence for a non-linear association between state ownership and financial risk. The identified U-shaped pattern substantiates theoretical concepts regarding the state's dual role as both a stabilizer and a risk amplifier. At low to moderate levels of ownership, state involvement appears to mitigate financial risk through a "support effect," including preferential access to credit, implicit guarantees, and heightened credibility with lenders, consistent with prior studies (Bortolotti et al., 2004; Huang et al., 2011). Nevertheless, once state ownership exceeds a cer-

tain optimal threshold, this stabilizing influence diminishes. Excessive state control correlates with increased financial risk, potentially due to administrative interventions, weakened internal governance, and the pursuit of non-commercial objectives, as elaborated within extended agency-based explanations of state ownership (Shleifer & Vishny, 1994). The persistence of this U-shaped relationship in both logit and linear robustness models underscores the intricate, context-dependent nature of state ownership in Vietnamese firms.

In contrast, the analysis does not reveal statistically significant effects – either linear or non-linear – of institutional ownership on financial risk. This finding contrasts with much of the evidence documented in developed markets, where institutional investors are often seen to play an effective monitoring role (Gillan & Starks, 2000). In Vietnam, however, institutional ownership is typically fragmented and characterized by relatively low ownership stakes. Additionally, diversity in investment horizons and objectives, especially between short-term and long-term institutional investors (Bushee, 1998), may weaken the overall monitoring effect. As a result, the overall impact of institutional ownership on firms' risk profiles might be too subtle to produce statistically detectable effects. This outcome highlights the importance of institutional context in shaping the effectiveness of governance mechanisms and suggests that the disciplining role of institutional investors cannot be assumed to operate uniformly across different markets.

Similarly, managerial ownership does not exhibit a significant association with financial risk in the Vietnamese sample. This outcome contrasts with established evidence from developed economies, where managerial ownership frequently engenders notable non-linear effects through mechanisms such as incentive alignment and entrenchment (Morck et al., 1988; McConnell & Servaes, 1990). A plausible explanation resides in the relatively low levels of managerial shareholding within Vietnamese firms and the limited application of equity-based compensation schemes. Under such circumstances, managerial ownership may be inadequate to effectively align managers' incentives with those of shareholders or to influence risk-taking behavior. This finding reinforces the notion that internal incentive mechanisms are conditional

in nature and that their efficacy critically depends on institutional maturity and governance practices.

The control variables provide additional insights consistent with standard financial reasoning. Profitability consistently demonstrates a negative correlation with financial risk, reflecting the enhanced internal financing capacity and resilience of profitable firms. Asset tangibility exhibits a positive relationship with financial risk, suggesting that firms possessing more tangible assets may depend more heavily on collateralized debt, thereby increasing leverage and the risk of financial distress. Firm size appears to exert a risk-reducing influence in certain models, indicating that larger firms may benefit from more stable cash flows and improved access to financing, although this effect is not uniform across all models.

Taken together, the findings contribute substantially to the literature on corporate governance.

Firstly, the documented non-linear effect of state ownership enhances understanding of the complex and dual role of the state in corporate risk-taking, particularly in emerging economies where state influence remains considerable. Secondly, the significant and consistent impact of financial leverage underscores the ongoing relevance of trade-off theory in environments characterized by bank-dominated financial systems and high levels of information asymmetry. Thirdly, the absence of significant effects associated with institutional and managerial ownership suggests that traditional agency-theoretic predictions may not fully apply in emerging markets unless specific conditions – such as sufficient ownership concentration or effective incentive schemes – are satisfied. Collectively, these insights highlight the importance of considering institutional and contextual factors when evaluating governance mechanisms and financial risk.

CONCLUSION

This study investigates the direct and non-linear effects of ownership structure and financial leverage on financial risk among non-financial listed firms in Vietnam over the period 2014–2023. Employing panel logit models and robustness checks based on fixed-effects linear probability models and FGLS estimations, the results consistently demonstrate that financial leverage is the most significant and robust determinant of financial risk, aligning with the predictions of trade-off theory. Notably, state ownership displays a U-shaped relationship with financial risk, indicating that state participation may mitigate risk at low to moderate ownership levels but exacerbate risk when control becomes excessive. Conversely, institutional ownership and managerial ownership do not exhibit statistically significant effects, suggesting that these governance mechanisms have yet to exert a notable influence on corporate risk-taking within the Vietnamese context.

The study advances the literature on corporate governance and capital structure by emphasizing the significance of institutional context in influencing ownership–risk relationships. The findings expand agency theory and capital structure theory by illustrating that the impacts of ownership and leverage are not uniform but are critically dependent on ownership concentration and the institutional environment. From a practical standpoint, the results highlight the necessity for organizations to exercise prudence in leverage decisions and to bolster internal governance incentives to mitigate financial risk. At the policy level, the findings advocate that regulators acknowledge the dual role of state ownership and foster the development of long-term institutional investors to improve corporate oversight.

Notwithstanding its contributions, this study possesses certain limitations. Firstly, the analysis is confined to listed companies and may not comprehensively represent the conduct of unlisted or small and medium-sized enterprises, which frequently exhibit different ownership configurations and risk profiles. Secondly, the study excludes detailed governance characteristics, such as board composition, internal control robustness, or the diversity among institutional investors. Thirdly, financial risk is assessed via a singular indicator based on interest coverage, which may not encompass other dimensions of risk such as liquidity, credit, or market risk.

Future research may consider several new directions. Incorporating unlisted firms and SMEs into the sample would provide a more comprehensive understanding of ownership effects in less transparent environments. Including governance quality variables could offer more profound insights into how ownership structures influence financial risk. Furthermore, employing multidimensional risk measures such as Z-scores, bankruptcy risk, or liquidity risk indicators would facilitate the assessment of the stability and applicability of the findings across various risk categories.

AUTHOR CONTRIBUTIONS

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