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BOARD DIRECTORS' EDUCATIONAL BACKGROUNDS AND CORPORATE DEFAULT RISK: EVIDENCE FROM CHINA

Abstract

Amid China's accelerating financial development and heightened concerns over corporate debt, default risk has emerged as a central challenge for financial stability. This study investigates whether the educational attainment of board directors significantly reduces corporate default risk in the context of China's listed firms. Using a panel dataset of 4,751 firms spanning 2003–2023, default risk is measured through Merton Distance to Default and the Z-Score, a widely used metric of financial distress constructed as a weighted linear combination of five financial ratios. Fixed-effects regression results show that higher educational attainment among board members significantly lowers default risk. A one-standard-deviation increase in board education leads to a 0.344-point increase in Z-Score, approximately 7% of its standard deviation. Notably, the mitigating effect of board education is more evident in non-state-owned enterprises, where weaker governmental support makes governance quality especially vital. The effect is also stronger in small firms, where limited internal controls heighten reliance on board oversight. Furthermore, in firms with weak institutional monitoring, better-educated boards appear more capable of navigating market pressures and reducing financial vulnerability. To address potential endogeneity, lagged variable analyses are conducted, which suggest that earlier levels of board education predict lower future default risk. Two-stage least squares regressions, using the industry-median board education as an instrument, further support the causal interpretation of the relationship. These findings underscore the strategic importance of board education in mitigating financial distress, strengthening risk management, and fostering sustainable corporate development in China's evolving market environment.

Keywords default risk, board of directors, educational background, two-stage least squares, institutional monitoring, China

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INTRODUCTION

China's rapid economic transformation and the development of its financial markets have generated both exceptional opportunities and significant challenges for corporate governance and financial stability. In recent years, China's financial markets have expanded substantially, with the bond market now ranking as the world's second largest. Bond issuances in 2023 totaled 71 trillion yuan (approximately 10 trillion U.S. dollars), reflecting a 14.8% increase from the prior year, while outstanding bonds under custody reached 157.9 trillion yuan by year-end, representing 9.1% annual growth (Xinhua, 2024). As credit expansion gains momentum, balancing financial risk mitigation with economic growth presents a critical challenge to financial system stability. Corporate default risk has surfaced as a key concern for policymakers and market participants, exerting a pivotal influence on the financial stability of both emerging and advanced economies.

Against this backdrop, corporate governance has assumed a central role in protecting firms from financial distress. Boards of directors

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are critical in formulating corporate strategies and managing firms' risk exposures. Among the various attributes that characterize board effectiveness, directors' educational background has attracted growing attention in both policy discussions and corporate practice. In China, where governance reforms increasingly converge with global standards, firms are placing greater emphasis on higher education as a key consideration in board appointments. Despite this trend, empirical evidence remains limited on how directors' academic qualifications influence a firm's exposure to default risk. As the complexity of financial decision-making intensifies, it becomes ever more important to evaluate whether better-educated boards are more capable of anticipating, mitigating, or responding to default risks.

1. LITERATURE REVIEW

Understanding the determinants of corporate default risk is central to evaluating financial stability, firm performance, and governance effectiveness. While extensive research has explored financial and macroeconomic predictors of default risk, the role of board-level characteristics, particularly directors' educational backgrounds, remains relatively overlooked.

Default risk, or credit risk, denotes the probability that a firm will fail to meet its debt obligations, thereby exposing creditors and stakeholders to potential financial losses (Altman, 1968). As a key metric of financial condition, default risk reflects a firm's exposure to financial distress, directly affecting its ability to survive and grow (Merton, 1974). For firms, elevated default risk is often associated with operational disruptions (Altman & Hotchkiss, 2010), constrained access to external finance (Stiglitz & Weiss, 1981), and increased borrowing costs (Merton, 1974). From the standpoint of investors and creditors, default risk is a critical determinant in capital allocation and risk assessment. Investors and financial intermediaries rely on default risk as a central input in evaluating credit ratings (Cantor & Packer, 1997), making lending decisions (Jiménez & Saurina, 2004), and pricing debt instruments (Elton et al., 2001). Elevated default risk prompts creditors to require a higher risk premium, thereby increasing firms' financing costs (Elton et al., 2001). The impact of default risk extends beyond individual firms, generating broader implications for the economy and society. An industry-wide rise in default risk often serves as a leading indicator of macroeconomic distress (Acharya & Richardson, 2009), potentially triggering market downturns, eroding public confidence (Giesecke et al., 2011), and contributing to systemic financial risk (Brunnermeier, 2009).

Prior research on the determinants of default risk has primarily emphasized financial indicators and external macroeconomic factors, including leverage ratios (Merton, 1974), cash holdings (Acharya et al., 2012), firm size (Titman & Wessels, 1988), and business cycles (Bernanke et al., 1996). These studies identify key determinants of default risk and underscore the roles of financial health and the broader economic environment in its formation. Leverage levels directly affect a firm's solvency, with higher ratios elevating the probability of financial distress due to greater debt service obligations (Graham & Harvey, 2001). Larger firms tend to exhibit more financial resilience owing to diversified revenue sources and superior access to capital markets. In contrast, smaller firms face heightened exposure to external shocks and credit constraints, thereby increasing their default likelihood (Titman & Wessels, 1988). Green innovation may also influence corporate default risk (Meles et al., 2023). Macroeconomic dynamics, such as business cycles, significantly influence default risk. Economic contractions reduce demand, tighten credit availability, and amplify uncertainty, all of which intensify default risk (Campbell et al., 2008). The external environment exerts significant influence on default risk by shaping firms' operating conditions and financial stability (Bernanke et al., 1996). Regulatory changes also affect default risk by modifying compliance costs and operational flexibility (La Porta et al., 1998). Moreover, institutional and cultural settings play a substantial role in determining default outcomes (Stulz & Williamson, 2003). Despite the breadth of prior research, few studies consider board-level human capital as a predictive factor in default models. Incorporating directors' edu-

cation into the analysis offers a governance-oriented perspective that complements traditional financial indicators.

Board composition is widely regarded as a central mechanism of corporate governance, shaping a firm's behavior and performance through the collective attributes of directors. A substantial body of research has examined how individual-level characteristics, such as gender, independence, tenure, and professional experience, influence firm outcomes ranging from financial performance to innovation and risk oversight.

Among these, board diversity has attracted considerable attention, particularly with respect to gender and racial representation. For instance, board gender diversity enhances financial performance, with the effect notably intensifying when female representation reaches an optimal threshold (Nguyen et al., 2015). Racial diversity among directors (Goyal et al., 2019), the presence of independent directors (Terjesen et al., 2016), and directors' professional experience (Goyal et al., 2019) also materially influence firm performance. Gender, education, age, and independence represent key diversity dimensions, significantly impacting short-term financial outcomes (Dalton et al., 1998; Mahadeo et al., 2012). Board demographics can meaningfully improve decision-making quality and governance efficacy, thereby enhancing firm performance (Forbes & Milliken, 1999).

In particular, the educational background of the board of directors typically encompasses members' academic qualifications, fields of study, and the prestige of their institutions. The presence of directors with graduate degrees from reputable universities positively impacts firm performance (Darmadi, 2013). Directors with diverse academic backgrounds enhance board diversity, enriching intellectual capital and improving decision quality under external pressures (Goyal et al., 2019). Boards with strong academic credentials tend to hold more cash, with its value particularly elevated in financially constrained firms (Mahadeo et al., 2012). Educational backgrounds reflect not only directors' professional knowledge but also their resilience and capacity for risk control in complex environments (Hau & Thum, 2009). Moreover, directors' educational background, gender, and age significantly influence a firm's innovation capacity (Cumming & Leung, 2021). Board members with advanced academic training tend to be more open and adaptable, often supporting investment in R&D and product development, thereby strengthening the firm's market responsiveness (Wang et al., 2019). Firms increasingly prioritize directors with higher degrees and robust professional expertise to ensure that decision makers can effectively navigate complex business challenges and enhance global competitiveness (Tihanyi et al., 2000).

While prior literature highlights the governance role of board members' education, its implications for financial distress and credit risk remain less clearly understood. Recent studies have begun to explore whether educationally qualified directors contribute to reducing corporate default risk through improved oversight, innovation, and strategic decision-making.

Research on corporate governance emphasizes the relevance of directors' personal attributes, educational attainment, domain expertise, and professional experience, all of which should be disclosed in governance reports to improve market performance forecasts (Rossignoli et al., 2021). Board members' educational backgrounds significantly influence governance quality, particularly in dynamic market conditions, where highly educated directors provide stronger financial oversight and strategic input (Darmadi, 2013). Directors with advanced academic credentials enhance monitoring and advisory functions, thereby reinforcing governance effectiveness (Wang et al., 2017). The corporate governance index has proven predictive of higher market valuation and improved firm profitability (Ararat et al., 2017). Switzer and Wang (2013) further demonstrate that sound governance structures materially reduce corporate credit risk. Highly educated directors often apply their broad expertise to assess and manage corporate risks more comprehensively, offering a strategic advantage amid financial uncertainty (Darmadi, 2013). Academically qualified directors are better equipped to assess and mitigate risk, particularly under market uncertainty (Kang et al., 2007; Cumming & Leung, 2021). In addition, board directors holding advanced degrees are associ-

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ated with greater R&D expenditures (Wang et al., 2019), and firms with strong innovation capacity typically exhibit enhanced competitiveness, thereby improving financial stability and reducing default risk (Hsu et al., 2015). These findings suggest that board members' educational attainment may shape firms' financial stability through its influence on governance quality, innovation strategy, and risk oversight.

In summary, the existing literature on corporate default risk has predominantly emphasized financial indicators and macroeconomic conditions, such as leverage, firm size, and business cycles, while largely overlooking board-level characteristics. Emerging research on corporate governance highlights how directors' demographic and professional attributes, such as gender diversity, independence, and experience, can shape firm performance and risk-taking. Among these, board members' educational attainment has been linked to enhanced oversight, innovation capacity, and financial decision-making. However, empirical studies specifically addressing the relationship between director education and default risk remain scarce. Building on this gap, and motivated by the view that human capital at the board level is a critical governance asset, this study aims to examine whether higher educational qualifications among board directors are associated with reduced default risk in the context of Chinese listed companies.

2. METHODOLOGY

The empirical analysis utilizes an unbalanced panel of A-share firms traded on the Shanghai and Shenzhen stock exchanges over the period 2003 to 2023. The sample period begins in 2003, as the financial distress measure is available starting in 2000, and the ownership concentration data are available since 2003. Firm-level data are obtained from the China Stock Market & Accounting Research (CSMAR) database (https://data.csmar.com).

We begin by extracting firm-specific data on financial distress, director education, and a comprehensive set of control variables. To mitigate the influence of outliers, all continuous variables are winsorized at the 1st and 99th percentiles. After excluding missing observations, the final dataset comprises 4,751 distinct firms and 48,380 firm-year observations.

The dependent variable is corporate default risk, proxied by financial distress measures obtained from the CSMAR database. Predicting financial distress is a key component of forecasting corporate default and bankruptcy, as it captures the actual or potential difficulties a firm faces in meeting its financial obligations (Sun et al., 2014). Accordingly, financial distress is commonly regarded as a leading indicator of a firm's likelihood of default. This study employs two financial distress indices, the Z-Score (Altman, 1968) and Merton Distance to Default (Merton, 1974), to estimate default risk. The Z-Score model incorporates several financial ratios to differentiate between distressed and solvent firms (Altman, 1968). The Merton Distance to Default model, based on option pricing theory, uses a firm's asset value and debt structure to assess default risk, capturing market dynamics and enhancing the prediction of default probabilities (Bharath & Shumway, 2008). A larger Z-Score or Merton Distance to Default indicates a lower likelihood of default.

The key independent variable is board members' educational background, retrieved from the CSMAR database. Educational attainment is assessed based on academic qualifications (Hillman & Dalziel, 2003). Board members' education is initially classified into seven categories: technical secondary school or below as 1, college as 2, bachelor's degree as 3, master's degree as 4, doctoral degree as 5, others as 6, and MBA/EMBA as 7. Following Zhang et al. (2023a), the classification is revised by assigning MBA/EMBA as 5 and doctoral degree as 6, reflecting the generally higher academic standing of doctoral degrees, and excluding a few observations categorized as "other." The average education level of board members within a firm at a given time is computed to represent the firm's overall board education level.

The following fixed-effects regression model is employed to investigate the relationship between directors' educational background and the corporate default risk:

$$
\begin{aligned}
Default_{i,t} &= \beta_0 + \beta_1 BoardEdu_{i,t} \\
&+ \beta_2 FirmSize_{i,t} + \beta_3 FirmAge_{i,t} \\
&+ \beta_4 Tangibility_{i,t} + \beta_5 SaleGrow_{i,t} + \beta_6 SOE_{i,t} \\
&+ \beta_7 BoardSize_{i,t} + \beta_8 BoardIndep_{i,t} \\
&+ \beta_9 Duality_{i,t} + \beta_{10} TMTAge_{i,t} + \beta_{11} TMTPay_{i,t} \\
&+ \beta_{12} TMTGen_{i,t} + YearFE + \varepsilon_{i,t},
\end{aligned} \tag{1}
$$

where subscript *i* denotes firm *i* and subscript *t* denotes year *t*. The dependent variable, *Default*, represents either the Merton Distance to Default (*MertonDD*) or the Z-Score (*ZScore*). The primary independent variable, *BoardEdu*, denotes the average educational level of the board of directors. *FirmSize* is defined as the natural logarithm of total assets. *FirmAge* captures the natural logarithm of the number of years since firm inception. *Tangibility* is the ratio of tangible to total assets. *SaleGrow* reflects the annual percentage growth in sales revenue. *SOE* is a binary variable equal to one if the firm is a state-owned enterprise (SOE) and zero otherwise. *BoardSize* is the natural logarithm of the number of board directors. *BoardIndep* is the fraction of independent directors, calculated as the number of independent directors divided by total board size. *Duality* equals one if the board chair and CEO roles are held by the same person, and zero otherwise. *TMTAge* denotes the average age of the top management team (TMT), comprising directors, supervisors, and senior executives. *TMTPay* is the natural logarithm of total compensation received by the TMT. *TMTGen* is defined as the proportion of female managers within the TMT. *YearFE* captures year fixed effects. ε is the regression error term.

3. RESULTS

Table 1 reports descriptive statistics for the sample variables. *MertonDD* has a mean of 7.705 and a standard deviation of 3.673. *ZScore* has a mean of 4.594 and a standard deviation of 5.288, indicating greater variation compared to *MertonDD*. *BoardEdu* has a mean of 3.765, a standard deviation of 0.713, and a minimum value of 2.000, suggesting that a college degree is the minimum qualification for board membership. *FirmSize* averages 22.010 with a standard deviation of 1.300. *Tangibility* ranges from 0.564 to 1.000, implying that most firms hold a substantial level of tangible assets. *SaleGrow* has a mean of 16.9% and a standard deviation of 39.8%. The mean value of *SOE* is 0.350, indicating that 35.0% of the firms are SOEs. *BoardSize* has a mean of 2.134 and a standard deviation of 0.205. *BoardIndep* ranges from 0.000 to 0.571, showing that the highest proportion of independent directors is 57.1%. The average *TMTAge* is 48.826, and the mean *TMTPay* is 15.104. *TMTGen* ranges from 0.000 to 0.500, suggesting that the maximum female representation among TMT members is 50.0%.

Table 2 presents the correlations among the variables. As expected, *MertonDD* and *ZScore* exhibit

Table 1. Descriptive statistics

Variable	Obs.	Mean	St. Dev.	Min	P25	Median	P75	Max
MertonDD	48,380	7.705	3.673	2.429	5.143	6.900	9.392	23.181
ZScore	48,380	4.594	5.288	−0.768	1.753	2.954	5.227	33.524
BoardEdu	48,380	3.765	0.713	2.000	3.286	3.778	4.222	6.000
FirmSize	48,380	22.010	1.300	19.505	21.083	21.821	22.721	26.257
FirmAge	48,380	2.819	0.404	1.386	2.565	2.890	3.091	3.526
Tangibility	48,380	0.934	0.080	0.564	0.923	0.961	0.982	1.000
SaleGrow	48,380	0.169	0.398	−0.594	−0.027	0.110	0.276	2.428
SOE	48,380	0.350	0.477	0.000	0.000	0.000	1.000	1.000
BoardSize	48,380	2.134	0.205	1.609	1.946	2.197	2.197	2.708
BoardIndep	48,380	0.371	0.055	0.000	0.333	0.333	0.429	0.571
Duality	48,380	0.273	0.445	0.000	0.000	0.000	1.000	1.000
TMTAge	48,380	48.826	3.355	40.450	46.560	48.890	51.130	56.570
TMTPay	48,380	15.104	0.953	12.440	14.613	15.189	15.719	17.319
TMTGen	48,380	0.188	0.114	0.000	0.105	0.174	0.261	0.500

Note: This table presents descriptive statistics for all variables. The sample consists of 48,380 firm-year observations from 4,751 unique firms over the period from 2003 to 2023.

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Table 2. Pairwise correlations

	MertonDD	ZScore	BoardEdu	FirmSize	FirmAge	Tangibility	SaleGrow	SOE	BoardSize	BoardIndep	Duality	TMTAge	TMTPay	TMTGen
MertonDD	1													
ZScore	0.353***	1												
BoardEdu	–0.014***	0.036***	1											
FirmSize	–0.157***	–0.285***	0.212***	1										
FirmAge	–0.086***	0.001	0.153***	0.235***	1									
Tangibility	0.037***	0.023***	–0.068***	–0.056***	–0.096***	1								
SaleGrow	–0.049***	0.017***	0.016***	0.034***	–0.092***	–0.071***	1							
SOE	–0.019***	–0.171***	0.083***	0.286***	0.013***	0.074***	–0.026***	1						
BoardSize	0.010**	–0.130***	–0.011**	0.208***	–0.086***	0.026***	0.017***	0.277***	1					
BoardIndep	–0.006	0.048***	0.114***	0.044***	0.088***	–0.031***	–0.017***	–0.085***	–0.493***	1				
Duality	0.004	0.107***	–0.009*	–0.137***	–0.002	–0.019***	0.008*	–0.289***	–0.184***	0.113***	1			
TMTAge	0.008*	–0.042***	0.072***	0.400***	0.304***	0.001	–0.088***	0.227***	0.131***	0.021***	–0.106***	1		
TMTPay	–0.064***	0.037***	0.257***	0.507***	0.392***	–0.076***	–0.010**	–0.066***	0.016***	0.093***	0.054***	0.321***	1	
TMTGen	0.010**	0.121***	0.013***	–0.131***	0.170***	–0.042***	–0.023***	–0.248***	–0.199***	0.096***	0.151***	–0.141***	0.097***	1

Note: This table shows the pairwise correlations between variables. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

a significantly positive correlation of 0.353, indicating that the two financial distress measures are related. *BoardEdu* shows a positive correlation of 0.036 with *ZScore*, significant at the 1% level, suggesting that higher board education levels are associated with lower default risk. In contrast, the correlation between *BoardEdu* and *MertonDD* is negative, which is counterintuitive. This underscores the importance of addressing such relationships in subsequent fixed-effects multivariate regressions to mitigate omitted variable bias. The control variables display significant correlations with the dependent variables. For instance, *Tangibility* is positively correlated with both *MertonDD* and *ZScore*, with coefficients of 0.037 and 0.023, respectively, both significant at the 1% level. This suggests that firms with more tangible assets tend to have lower default risk.

Table 3 reports the results of the baseline fixed-effects regressions, based on Equation (1). The coefficient on *BoardEdu* is statistically significant at the 1% to 5% levels across both univariate and multivariate specifications, using *MertonDD* or *ZScore* as the dependent variable. The findings suggest that higher board education levels are associated with lower default risk. The coefficient on *BoardEdu* is also economically meaningful. For example, based on the multivariate results in Column 4, a one-standard-deviation increase in *BoardEdu* leads to a 0.344 (=0.713×0.482) increase in the Z-Score, which accounts for 7% (=0.344/5.288) of its standard deviation. Among the control variables, *BoardIndep*, *TMTAge*, *TMTPay*, and *TMTGen* are significantly positively associated with *MertonDD* or *ZScore*, suggesting that firms with more independent directors, older TMTs, higher TMT compensation, and greater female representation face lower default risk.

Table 3. Baseline regressions

	(1)	(2)	(3)	(4)
	MertonDD	**MertonDD**	**ZScore**	**ZScore**
BoardEdu	0.054**	0.179***	0.075**	0.482***
	(0.022)	(0.022)	(0.034)	(0.032)
FirmSize		−0.603***		−1.640***
		(0.015)		(0.023)
FirmAge		−0.320***		−0.599***
		(0.047)		(0.070)
Tangibility		−0.052		2.843***
		(0.190)		(0.280)
SaleGrow		−0.502***		0.467***
		(0.038)		(0.056)
SOE		0.220***		−0.251***
		(0.038)		(0.056)
BoardSize		0.324***		−0.525***
		(0.091)		(0.134)
BoardIndep		1.188***		0.989**
		(0.318)		(0.469)
Duality		−0.035		0.242***
		(0.035)		(0.052)
TMTAge		0.102***		0.104***
		(0.005)		(0.008)
TMTPay		0.291***		0.923***
		(0.025)		(0.037)
TMTGen		1.078***		1.976***
		(0.142)		(0.210)
Constant	7.503***	10.560***	4.311***	19.238***
	(0.083)	(0.484)	(0.130)	(0.714)
YearFE	Yes	Yes	Yes	Yes
Observations	48,380	48,380	48,380	48,380
Adj. *R*-squared	0.183	0.218	0.045	0.178

Note: This table reports the results of fixed-effects regressions of corporate default risk on directors' educational background and various control variables. The standard errors are shown in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4 reports regression results examining the moderating role of institutional monitoring. Burns et al. (2010) document that greater institutional ownership concentration significantly curtails misreporting risk, consistent with more concentrated ownership enhancing monitoring intensity. Following Lai et al. (2022), ownership concentration is defined using a Herfindahl index calculated from the top 10 shareholder ownership, where a higher value denotes greater concentration and thus stronger monitoring. Data on the Herfindahl index are obtained from the CSMAR database, where the index is computed as the sum of the squared ownership percentages held by these top 10 shareholders. Firms are stratified into strong and weak institutional monitoring groups based on the annual median Herfindahl index. In Columns 1 and 2, the estimated coefficients on *BoardEdu* are 0.148 and 0.166 for strong and weak monitoring groups, respectively, indicating that the attenuating effect of board education on default risk is stronger when monitoring is weaker. Similarly, Columns 3 and 4 report coefficients of 0.374 and 0.561 for the strong and weak groups,

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respectively, reinforcing the pattern. Collectively, the findings in Table 4 suggest that the effect of board educational attainment in mitigating default risk becomes more pronounced in settings with weaker institutional monitoring.

Table 4. Effect of institutional monitoring

	(1)	(2)	(3)	(4)
	Strong Institutional Monitoring	Weak Institutional Monitoring	Strong Institutional Monitoring	Weak Institutional Monitoring
	MertonDD	MertonDD	ZScore	ZScore
BoardEdu	0.148***	0.166***	0.374***	0.561***
	(0.033)	(0.029)	(0.042)	(0.049)
FirmSize	−0.466***	−0.885***	−1.467***	−1.961***
	(0.022)	(0.022)	(0.028)	(0.037)
FirmAge	−0.688***	0.400***	−0.448***	−0.494***
	(0.070)	(0.066)	(0.090)	(0.113)
Tangibility	−0.798***	0.481**	2.768***	2.856***
	(0.307)	(0.233)	(0.395)	(0.398)
SaleGrow	−0.722***	−0.297***	0.267***	0.623***
	(0.059)	(0.049)	(0.076)	(0.083)
SOE	0.284***	−0.007	−0.447***	−0.245***
	(0.059)	(0.049)	(0.076)	(0.083)
BoardSize	0.721***	−0.059	0.187	−1.279***
	(0.135)	(0.120)	(0.174)	(0.204)
BoardIndep	2.895***	−0.955**	2.357***	−0.709
	(0.467)	(0.423)	(0.601)	(0.720)
Duality	0.057	−0.079*	0.164**	0.320***
	(0.054)	(0.045)	(0.070)	(0.077)
TMTAge	0.115***	0.067***	0.125***	0.066***
	(0.008)	(0.007)	(0.010)	(0.012)
TMTPay	0.309***	0.396***	0.730***	1.237***
	(0.037)	(0.033)	(0.048)	(0.056)
TMTGen	1.225***	1.120***	1.248***	2.953***
	(0.216)	(0.184)	(0.278)	(0.313)
Constant	6.987***	15.873***	15.658***	24.622***
	(0.737)	(0.630)	(0.948)	(1.074)
YearFE	Yes	Yes	Yes	Yes
Observations	24,185	24,195	24,185	24,195
Adj. *R*-squared	0.189	0.277	0.184	0.185

Note: The table reports regression results analyzing the impact of institutional monitoring on the relationship between directors' educational background and corporate default risk. Strong and weak institutional monitoring are classified according to the annual median value of the Herfindahl index of top 10 shareholder ownership. The standard errors are shown in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5 presents subsample regression results for SOEs and non-SOEs, examining the relationship between board education and corporate default risk. For *MertonDD*, as shown in Columns 1 and 2, the coefficient on *BoardEdu* is 0.114 for SOEs and 0.192 for non-SOEs, both significant at the 1% level. For *ZScore*, as reported in Columns 3 and 4, the coefficient on *BoardEdu* is 0.292 for SOEs and 0.566 for non-SOEs, also significant at the 1% level. These results indicate that while higher board education levels are associated with lower default risk in both SOEs and non-SOEs, the effect is more pronounced in non-SOEs.

Table 5. SOEs vs. non-SOEs

	(1)	(2)	(3)	(4)
	SOEs	Non–SOEs	SOEs	Non–SOEs
	MertonDD	MertonDD	ZScore	ZScore
BoardEdu	0.114***	0.192***	0.292***	0.566***
	(0.035)	(0.028)	(0.043)	(0.044)
FirmSize	−0.558***	−0.705***	−1.397***	−1.891***
	(0.022)	(0.021)	(0.027)	(0.033)
FirmAge	−1.001***	0.089	−0.939***	−0.196**
	(0.082)	(0.059)	(0.100)	(0.093)
Tangibility	−2.243***	0.816***	1.695***	3.389***
	(0.324)	(0.233)	(0.395)	(0.370)
SaleGrow	−0.413***	−0.516***	0.303***	0.531***
	(0.062)	(0.048)	(0.075)	(0.076)
BoardSize	0.270**	0.228*	−0.232	−0.871***
	(0.134)	(0.122)	(0.163)	(0.194)
BoardIndep	1.878***	0.171	0.830	−0.244
	(0.480)	(0.423)	(0.583)	(0.672)
Duality	−0.104	−0.008	−0.066	0.261***
	(0.080)	(0.040)	(0.098)	(0.063)
TMTAge	0.161***	0.073***	0.133***	0.084***
	(0.010)	(0.006)	(0.012)	(0.010)
TMTPay	0.356***	0.314***	0.799***	1.084***
	(0.038)	(0.033)	(0.046)	(0.052)
TMTGen	1.380***	1.087***	0.534*	2.667***
	(0.259)	(0.170)	(0.315)	(0.269)
Constant	9.884***	12.386***	16.188***	22.367***
	(0.787)	(0.635)	(0.957)	(1.007)
YearFE	Yes	Yes	Yes	Yes
Observations	16,957	31,423	16,957	31,423
Adj. *R*-squared	0.265	0.209	0.171	0.160

Note: The table compares SOEs and non-SOEs in their regression results on the impact of directors' educational background on corporate default risk. The standard errors are shown in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6 compares small and large firms in the relationship between board members' educational background and corporate default risk. Firms are classified as small or large based on the annual median firm size. In Columns 1 and 2 for *MertonDD*, the coefficients on *BoardEdu* are 0.196 and 0.083

for small and large firms, respectively, both significant at the 1% level. Similarly, in Columns 3 and 4 for *ZScore*, the coefficients on *BoardEdu* are 0.644 and 0.185 for small and large firms, respectively, also significant at the 1% level. These findings suggest that board education has a stronger stabilizing effect in smaller firms relative to larger firms.

Table 6. Small vs. large firms

	(1)	(2)	(3)	(4)
	Small Firms	Large Firms	Small Firms	Large Firms
	MertonDD	MertonDD	ZScore	ZScore
BoardEdu	0.196***	0.083***	0.644***	0.185***
	(0.033)	(0.028)	(0.055)	(0.032)
FirmSize	–1.079***	–0.295***	–3.172***	–0.954***
	(0.044)	(0.023)	(0.074)	(0.026)
FirmAge	0.056	–0.643***	–0.498***	–0.660***
	(0.069)	(0.064)	(0.115)	(0.073)
Tangibility	1.758***	–1.889***	4.360***	0.360
	(0.304)	(0.234)	(0.508)	(0.266)
SaleGrow	–0.286***	–0.627***	0.549***	0.433***
	(0.058)	(0.049)	(0.096)	(0.056)
SOE	0.420***	0.091*	–0.063	–0.343***
	(0.061)	(0.047)	(0.101)	(0.053)
BoardSize	0.123	0.429***	–1.153***	–0.087
	(0.141)	(0.114)	(0.235)	(0.130)
BoardIndep	–0.233	1.518***	–0.647	0.505
	(0.494)	(0.402)	(0.824)	(0.457)
Duality	–0.016	–0.076	0.129	0.353***
	(0.048)	(0.051)	(0.081)	(0.058)
TMTAge	0.053***	0.155***	0.108***	0.085***
	(0.007)	(0.007)	(0.012)	(0.008)
TMTPay	0.114***	0.503***	1.053***	0.960***
	(0.040)	(0.031)	(0.067)	(0.035)
TMTGen	0.837***	1.609***	2.276***	1.714***
	(0.200)	(0.197)	(0.334)	(0.224)
Constant	23.758***	0.142	48.944***	6.642***
	(1.088)	(0.676)	(1.816)	(0.768)
YearFE	Yes	Yes	Yes	Yes
Observations	24,197	24,183	24,197	24,183
Adj. *R*-squared	0.204	0.248	0.169	0.112

Note: The table compares small and large firms in their regression results on the impact of directors' educational background on corporate default risk. Small and large firms are defined using the annual median firm size. The standard errors are shown in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Endogeneity concerns arise in the regression estimation of Equation (1). Higher default risk may reduce a firm's emphasis on board educational background. Alternatively, unobserved omitted variables may simultaneously affect board education and default risk, generating a spurious negative correlation between these potentially unrelated factors. To address this endogeneity issue, we follow Wang et al. (2024) and Liu et al. (2024) and use the one-year-lagged independent variable, board education, in the regression analysis:

$$\begin{aligned} Default_{i,t} &= \beta_0 + \beta_1 BoardEdu_{i,t-1} \\ &+ \beta_2 FirmSize_{i,t} + \beta_3 FirmAge_{i,t} \\ &+ \beta_4 Tangibility_{i,t} + \beta_5 SaleGrow_{i,t} + \beta_6 SOE_{i,t} \\ &+ \beta_7 BoardSize_{i,t} + \beta_8 BoardIndep_{i,t} \\ &+ \beta_9 Duality_{i,t} + \beta_{10} TMTAge_{i,t} + \beta_{11} TMTPay_{i,t} \\ &+ \beta_{12} TMTGen_{i,t} + YearFE + \varepsilon_{i,t}. \end{aligned} \quad (2)$$

Consistent with expectations, the results in Table 7 indicate that the one-year-lagged *BoardEdu* has a significantly positive effect on *MertonDD* or *ZScore*. The coefficients on lagged *BoardEdu* are 0.124 and 0.484, comparable to 0.179 and 0.482 reported in Table 3, and both are statistically significant at the 1% level. The adjusted *R*-squared values are 0.267 and 0.182, slightly higher than the 0.218 and 0.178 reported in Table 3. Overall, the findings in Table 7 suggest that board education reduces corporate default risk rather than the reverse.

Table 7. Lagged board education

	(1)	(2)
	MertonDD	ZScore
Lagged BoardEdu	0.124***	0.484***
	(0.021)	(0.035)
FirmSize	–0.552***	–1.725***
	(0.014)	(0.024)
FirmAge	0.257***	–0.708***
	(0.047)	(0.079)
Tangibility	–1.131***	3.058***
	(0.174)	(0.293)
SaleGrow	–0.542***	0.494***
	(0.036)	(0.061)
SOE	0.325***	–0.248***
	(0.035)	(0.059)
BoardSize	0.190**	–0.532***
	(0.086)	(0.145)
BoardIndep	1.111***	0.752
	(0.301)	(0.508)
Duality	–0.143***	0.284***
	(0.033)	(0.056)
TMTAge	0.122***	0.109***
	(0.005)	(0.008)
TMTPay	0.295***	1.029***
	(0.023)	(0.039)

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Table 7 (cont.). Lagged board education

	(1)	(2)
	MertonDD	ZScore
TMTGen	1.104***	1.848***
	(0.134)	(0.225)
Constant	8.030***	19.539***
	(0.453)	(0.764)
YearFE	Yes	Yes
Observations	42,907	42,907
Adj. *R*-squared	0.267	0.182

Note: This table presents fixed-effects regression results of corporate default risk on the one-year-lagged directors' educational background and a set of control variables. The standard errors are shown in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

To further address the endogeneity concern, we employ a two-stage least squares (2SLS) regression, using the industry-median board education as the instrumental variable, following Hu et al. (2023):

$$\begin{aligned} BoardEdu_{i,t} &= \beta_0 + \beta_1 MedBoardEdu_{i,t} \\ &+ \beta_2 FirmSize_{i,t} + \beta_3 FirmAge_{i,t} \\ &+ \beta_4 Tangibility_{i,t} + \beta_5 SaleGrow_{i,t} + \beta_6 SOE_{i,t} \\ &+ \beta_7 BoardSize_{i,t} + \beta_8 BoardIndep_{i,t} \\ &+ \beta_9 Duality_{i,t} + \beta_{10} TMTAge_{i,t} + \beta_{11} TMTPay_{i,t} \\ &+ \beta_{12} TMTGen_{i,t} + YearFE + \varepsilon_{i,t}. \end{aligned} \quad (3)$$

$$\begin{aligned} Default_{i,t} &= \beta_0 + \beta_1 PredBoardEdu_{i,t} \\ &+ \beta_2 FirmSize_{i,t} + \beta_3 FirmAge_{i,t} \\ &+ \beta_4 Tangibility_{i,t} + \beta_5 SaleGrow_{i,t} + \beta_6 SOE_{i,t} \\ &+ \beta_7 BoardSize_{i,t} + \beta_8 BoardIndep_{i,t} \\ &+ \beta_9 Duality_{i,t} + \beta_{10} TMTAge_{i,t} + \beta_{11} TMTPay_{i,t} \\ &+ \beta_{12} TMTGen_{i,t} + YearFE + \varepsilon_{i,t}. \end{aligned} \quad (4)$$

In the first stage (Equation (3)), board education is regressed on the industry-median board education (*MedBoardEdu*), which serves as the instrumental variable. The second stage uses the predicted value (*PredBoardEdu*) from the first stage to estimate *MertonDD* or *ZScore* in Equation (4). The rationale for this instrument is that firms within the same industry typically exhibit similar board education levels, implying that a firm's board education is influenced by the industry median. However, industry-median board education is unlikely to directly affect an individual firm's default risk, which is largely determined by firm-specific characteristics.

Table 8 reports the results of the 2SLS regression. The first-stage result in Column 1, based on Equation (3), shows that the coefficient on the industry-median board education is 0.764 and statistically significant at the 1% level, alleviating concerns about weak instruments. In the second stage, consistent with Equation (4), the results in Columns 2 and 3 reveal a statistically significant positive association between the predicted board education from the first stage and default risk, with coefficients of 0.791 and 2.475, respectively, both significant at the 1% level. This evidence supports the validity of the instrument and suggests that board education affects corporate default risk, rather than the reverse. Following Yang et al. (2023), the one-year-lagged board education is also used as the instrumental variable; the unreported results remain statistically significant. Overall, the 2SLS results address endogeneity concerns and corroborate the baseline findings in Table 3.

Table 8. Two-stage least squares regressions

	(1)	(2)	(3)
	BoardEdu	MertonDD	ZScore
Predicted BoardEdu		0.791***	2.475***
		(0.099)	(0.150)
Median BoardEdu	0.764***		
	(0.015)		
FirmSize	0.037***	−0.630***	−1.729***
	(0.003)	(0.016)	(0.024)
FirmAge	−0.007	−0.317***	−0.591***
	(0.010)	(0.048)	(0.073)
Tangibility	−0.285***	0.147	3.491***
	(0.038)	(0.194)	(0.294)
SaleGrow	0.029***	−0.524***	0.395***
	(0.008)	(0.039)	(0.059)
SOE	0.170***	0.100**	−0.642***
	(0.008)	(0.043)	(0.065)
BoardSize	0.103***	0.265***	−0.716***
	(0.018)	(0.092)	(0.140)
BoardIndep	1.190***	0.415	−1.526***
	(0.064)	(0.342)	(0.521)
Duality	−0.015**	−0.027	0.269***
	(0.007)	(0.036)	(0.054)
TMTAge	−0.018***	0.115***	0.144***
	(0.001)	(0.006)	(0.009)
TMTPay	0.091***	0.223***	0.701***
	(0.005)	(0.027)	(0.041)

Table 8 (cont.). Two-stage least squares regressions

	(1)	(2)	(3)
	BoardEdu	**MertonDD**	**ZScore**
TMTGen	−0.203***	1.161***	2.246***
	(0.029)	(0.144)	(0.219)
Constant	−0.799***	12.310***	15.100***
	(0.109)	(0.490)	(0.745)
YearFE	Yes	Yes	Yes
Observations	48,380	48,380	48,380
Adj. *R*-squared	0.155	0.206	0.114

Note: This table presents results from two-stage least squares regressions examining the relationship between directors' educational level and corporate default risk, using the annual industry median board education as the instrumental variable. The standard errors are shown in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

4. DISCUSSION

This study examines the effect of board directors' educational backgrounds on corporate default risk in China. The findings consistently indicate that firms with highly educated boards face a lower likelihood of financial distress, as measured by both the Z-Score and Merton Distance to Default. This inverse relationship remains robust across alternative model specifications, firm subsamples, lagged variable analyses, and 2SLS regressions that address potential endogeneity concerns.

To benchmark the findings with prior studies, we identify existing research linking board education and default risk. Such research remains exceedingly scarce. We find no existing studies connecting the two variables, even in international contexts. Some of the closest related studies are summarized and compared below. Zhang et al. (2024) document the significant role of CEO academic experience in mitigating corporate debt default risk. Zheng et al. (2024) report that executive educational background negatively influences default risk. These two studies are consistent with our finding that board education mitigates default risk, although both focus on executives rather than board directors. Chi and Gooda (2024) show that CEO education affects the relationship between internal control, default risk, and real earnings management, although their treatment of CEO education primarily serves as a moderating factor. Berger et al. (2014) show that executive teams with a greater number of Ph.D. holders reduce portfolio risk, consistent with our findings, despite their focus on portfolio risk. For general corporate governance measures, Ali et al. (2018) show that corporate governance is significantly and negatively associated with default risk. Similarly, García et al. (2022) find that smaller boards (indicative of stronger governance) mitigate default risk, as reflected in a larger Merton's Distance to Default. These two findings are broadly consistent with our result that board directors with higher educational attainment (reflecting stronger governance) are associated with lower default risk.

The findings are also consistent with the theoretical expectation that human capital at the governance level plays a critical role in shaping corporate outcomes. Directors with advanced educational backgrounds likely possess superior analytical and strategic capabilities, enhancing their ability to evaluate risk and provide effective financial oversight. This evidence supports the resource-based view of the firm (Barney et al., 2001), wherein director education functions as a valuable intangible asset that strengthens organizational resilience.

A closer inspection of subsample analyses reveals more nuanced patterns. The impact of board education on reducing default risk is more pronounced in non-SOEs, smaller firms, and those subject to weaker institutional monitoring. This suggests that educational capital plays a greater role when institutional support, such as government backing, external oversight, or the internal control infrastructure common to larger firms, is constrained. In the case of non-SOEs, which typically operate in more competitive and less protected environments, highly educated directors may enhance adaptability and governance quality, thereby reducing exposure to default. Among firms with lower institutional ownership concentration and diminished monitoring, the influence of board education becomes increasingly critical in alleviating default risk.

These findings extend the existing literature in several important directions. While prior studies have thoroughly explored the influence of CEO or TMT characteristics on corporate outcomes (e.g., Bertrand and Schoar, 2003; Zhang

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et al., 2023b), this paper demonstrates that board-level education independently contributes to financial outcomes, particularly default risk. This reinforces the emerging view that boards function not merely as symbolic monitors but as active agents in governance and risk oversight (Darmadi, 2013; Switzer & Wang, 2013). Moreover, the results align with Switzer et al. (2018), who underscore the role of governance in reducing default risk, while the current study advances this work by focusing on educational capital as a key governance mechanism within the Chinese context.

This study also contributes to the default risk literature by introducing governance-level variables into a field traditionally centered on financial ratios, macroeconomic indicators, and capital structure factors (Altman, 1968; Campbell et al., 2008). Most default prediction models have largely overlooked the composition of the board and how directors' backgrounds may affect corporate viability. The findings show that incorporating governance characteristics, especially director education, enhances the explanatory power of default risk models and may serve as an early-warning signal for investors and regulators.

Nonetheless, the study's findings also open avenues for future research. One limitation lies in using educational attainment as a proxy for board effectiveness. Although academic qualifications reflect cognitive ability and technical expertise, they fail to capture soft skills such as leadership, integrity, and collaboration, all of which are critical for effective board performance. Future work could enhance the analysis by incorporating board members' professional experience or academic field of specialization.

Moreover, the study focuses exclusively on China, which, while appropriate given its distinctive institutional context, constrains the generalizability of the findings. Comparative analyses involving other emerging economies or developed markets would provide useful insights into whether the observed effects persist across varying regulatory and cultural environments. The importance of board education may differ depending on the strength of investor protections, disclosure standards, or enforcement mechanisms.

Another promising avenue for future research involves examining how education interacts with other board attributes, such as gender diversity, independence, or tenure. A multidimensional perspective on board composition may offer deeper insights into how boards collectively influence firm outcomes. It would also be instructive to explore the mechanisms through which education affects default risk; for instance, whether education enhances risk management by improving financial literacy or by promoting more rigorous internal control systems.

Additionally, in light of the growing digital transformation in corporate governance and risk analytics, it would be worthwhile to examine whether educational background interacts with technological adoption or data-driven decision-making at the board level. Do more educated boards more readily adopt fintech innovations that mitigate risk exposure? Such extensions could enhance the practical and policy relevance of the findings.

CONCLUSION

This study utilizes a comprehensive dataset of 4,751 publicly listed firms in China from 2003 to 2023, providing rich insights into board members' educational backgrounds, corporate financial indicators, and default risk measures. The findings offer strong evidence that highly educated board members significantly mitigate corporate default risk. This effect is particularly salient under weak institutional monitoring, where educational qualifications serve as a critical moderating factor. Subsample analyses reveal that the influence of board education is more substantial in small firms and non-SOEs, underscoring its heterogeneous effects across firm types. In addition, lagged effect analyses show that board education in prior periods meaningfully reduces subsequent default risk. Lastly, 2SLS regressions establish a robust causal link between board education and lower default risk, further enhancing the credibility of the results.

This study offers several important contributions. First, it advances the understanding of the relationship between board members' educational qualifications and corporate default risk, shifting the analytical focus from traditional top management roles to the board level. Using empirical evidence from China's dynamic economic context, the findings emphasize the unique role of board-level education in lowering default risk, highlighting the importance of governance-level human capital in fostering financial stability. Second, the research expands the scope of default risk analysis by incorporating governance variables. While traditional models primarily emphasize financial indicators and macroeconomic conditions, this study shows that governance characteristics, especially board education, play a critical role in enhancing firm resilience during periods of financial stress. This governance-oriented approach provides a more comprehensive framework for assessing default risk. Finally, the study fills an important gap by exploring board education within the context of an emerging market, offering new insights into governance structures in China. By analyzing the impact of directors' educational backgrounds on default risk in this distinct institutional setting, the findings deepen the understanding of governance mechanisms in developing economies and their relevance to financial stability.

Future research may disaggregate educational attributes by examining whether specific dimensions, such as field of study, degree level, or international background, exert differential effects on default risk, thereby providing a more nuanced understanding of governance capital. Further investigation into the underlying mechanisms, such as whether board education enhances financial oversight, strategic decision-making, or risk management practices, could clarify how educational capital translates into reduced default risk. Finally, cross-country comparative analyses would help assess the extent to which institutional environments shape the governance-risk nexus, offering broader insights into the generalizability of the findings across diverse market contexts.

AUTHOR CONTRIBUTIONS

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