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Board Governance and Debt Cost: Evidence from Technology Companies Listed on the Indonesian Capital Market

Natasha Cindy Widarmawan[1], Bram Hadianto[2*]
[1,2)] Universitas Kristen Maranatha
2252001@bus.maranatha.edu, bram.hadianto@eco.maranatha.edu

*Corresponding Author
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ABSTRACT

Debt cost is critical in strategic corporate decision-making, particularly for creditors and investors prioritizing fund recovery assurance. At the same time, top management must mitigate financial risks by establishing an optimal financing structure. This investigation aims to inspect the determinants of the cost of debt. According to the governance mechanism, one of the determinants is the supervisory board, which is quantifiable through the total number of people in this position and its independence. Furthermore, this investigation uses a quantitative design to verify the hypotheses, the saturated sampling method to select the Indonesian capital market technology companies between 2018 and 2023, the regression model with pooling data estimated by ordinary least squares (OLS), and the t-statistic to examine the hypotheses, and the generalized method of moments (GMM) to check the robustness of pooling data. Based on the estimation, both GMM and OLS provide an equal tendency, making the data robust. Overall, the size of the supervisory board has a positive influence on the cost of debt, but its independence has a negative one. Based on these circumstances, technology companies should establish a small supervisory board to reduce debt costs and consider additional outside supervisory boards to decrease this cost further.

Keywords*: supervisory board independence, supervisory board size, technology companies, the cost of the debt*

INTRODUCTION

Technological expansion often leads to major innovations during revolutions. Firstly, the 18th-century agricultural industry contributed innovations such as the seed drill and crop rotation. Secondly, the Industrial Revolution, which occurred between the 18th and 19th centuries, resulted in the development of the steam engine and textile machines. Lastly, the informational revolution in the 20th century presented computers and the internet (Kashyap, 2018).

In the development of information technology, smartphones emerged, supported by compatible applications such as private communication and social media, enabling users to interact with others (Arts et al., 2021). Additionally, other applications are e-commerce platforms to facilitate selling and buying goods [see Bukalapak, Blibli, Tokopedia (Witro et al., 2022), Shopee (Margaretha et al., 2024; Witro et al., 2022; Zaato et al., 2023) and Lazada (Chong et al., 2024; Witro et al., 2022) for instances), and hotel and flight reservations, i.e., agoda.com, booking.com, expedia.com, and priceline.com (Vartiak et al., 2023), supported by mobile banking devices, permitting users to transact financially (Shaikh et al., 2023).

Technology has become one of the sectors listed on the Indonesian Capital Market (ICM) (Sari & Setiyawan, 2023). As publicly listed companies, they are more trustworthy if borrowing money from banks or issuing bonds in the capital market (Thia & Kong, 2024). According to the pecking order theory, these companies must use retained earnings as internal funds. After that, they should use the liabilities. They refuse to issue new shares to avoid share ownership dilution for existing

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investors, sending a negative signal to the market, which can lead to overvalued stocks (Brealey et al., 2020).The debt usage requires managers to pay future cash flows, i.e., interest and principal, to creditors. Therefore, they no longer spend current cash flow at their discretion. Otherwise, they will bring their company and shareholders to the bankruptcy court (Jensen, 1986). For this reason, the company can diminish debt costs by implementing a solid governance mechanism (Al-Gamrh et al., 2024).

One of the governance mechanisms to diminish the debt cost is the supervision by the appointed board. In a one-board system, the board director supervises top managers, such as those executed in the United Kingdom, the United States, Australia, Canada (Khan et al., 2020), Thailand, Singapore, the Philippines (Priwidiantari & Viverita, 2019), and Malaysia (Priwidiantari & Viverita, 2019; Tanujaya, 2022). The commissioner board runs the supervisory function in a dual-board system, as implemented by Indonesia (Priwidiantari & Viverita, 2019; Sahabuddin & Hadianto, 2019; Tanujaya, 2022), China (Li, 2021; Noureldeen et al., 2024), Germany, and Italy (Li, 2021).

The effectiveness of the supervisory board size in reducing debt cost has attracted the attention of several researchers. As a result, they document that many people in this board position are vital to reducing this cost; therefore, an inverse relationship exists (Ali et al., 2023; Atagher & Iorlaha, 2024; Ayuningtyas & Harymawan, 2021; Kordsachia, 2021; Moura et al., 2020). On the other hand, others demonstrate that few people should be available for this board position; hence, a positive association happens (Aksoy & Yilmaz, 2023; Jantadej & Wattanatorn, 2020; Palmieri et al., 2025). Meanwhile, Budiarto and Kuang (2025) find no association.

Additionally, supervising board independence is an inseparable part of the governance mechanism (Mousa et al., 2023). Unfortunately, the effect of board independence on debt costs is contradictory. In their study, Moura et al. (2020), Kordsachia (2021), Atagher and Iorlaha (2024), and Nugroho et al. (2024) demonstrate a negative tendency. Conversely, Ayuningtyas and Harymawan (2021) Aksoy and Yilmaz (2023), and Palmieri et al. (2025) Display a positive inclination. Meanwhile, Jantadej and Wattanatorn (2020) and Budiarto and Kuang (2025) exhibit insignificant propensity.

Based on these various proofs, this study aims to investigate the impact of supervisory board size and independence on the cost of debt, employing technology companies listed on the Indonesian Stock Exchange between 2018 and 2023. Since January 25, 2021, ICM includes the companies providing (1) online applications and services, (2) informational technology and services, (3) software, (4) networking equipment, (5) computer hardware, and (6) electronic equipment, instruments, and semiconductors into this industry (Indonesian Stock Exchange, 2024).

The application of technology companies in this investigation differs from the researchers using non-financial enterprises (Aksoy & Yilmaz, 2023; Ayuningtyas & Harymawan, 2021; Budiarto & Kuang, 2025; Jantadej & Wattanatorn, 2020; Kordsachia, 2021; Moura et al., 2020), and the companies in the sector of technology, industrials, oil, gas, and consumer service, healthcare, industry, consumer goods, basic materials, and utilities (Tran, 2022) All financial and non-financial industries (Ali et al., 2023), consumer goods (Atagher & Iorlaha, 2024), pharmacy (Nugroho et al., 2024) and the firms collaborating with fintech companies (Palmieri et al., 2025).

LITERATURE REVIEW

Supervisory board size and debt cost

The supervisory board is a crucial part of internal governance, where its president and members advise and monitor management to align with the interests of stockholders (Jantadej & Wattanatorn, 2020). Within the agency theory framework, there should be a few supervisory boards (García et al., 2022; Lipton & Lorsch, 1992). Through this process, they can get to know each other, discuss topics, and reach an agreement based on their deliberation (Lipton & Lorsch, 1992). Stronger internal governance, reflected in the presence of a few supervisory boards, diminishes the likelihood of top management overinvesting. Therefore, firms will have less bankruptcy risk and lower debt costs (Tran, 2022). In their investigation, Jantadej and Wattanatorn (2020), Ali et al. (2023), Aksoy and Yilmaz (2023), and Palmieri et al. (2025) affirm a positive relationship between

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supervisory board size and the cost of debt. Based on these elucidations, this research shapes the first hypothesis as follows:
H_1: The fewer the supervisory boards, the less the cost of debt.

Supervisory board independence and debt cost

One of the agency costs is monitoring expenditures borne by stockholders (Jensen & Meckling, 1976). One related expenditure is the remuneration for supervisory board independence (Nugroho et al., 2024), which is reflected in the presence of unaffiliated individuals on this board (Bradley & Chen, 2015). In countries with a system of shareholder ownership concentrated in the hands of the controller, such as Indonesia, this board represents and protects the interests of public shareholders (Pradita & Utama, 2020). Individuals in this position are responsible for preventing financial distress and bankruptcy by pressuring managers to reduce risky investments (García et al., 2022).

Vitolla et al. (2020) highlight that supervisory board independence (SBI) is positively associated with qualified integrated reporting, promoting transparency and accountability to reduce asymmetric information and agency costs. Additionally, Moura et al. (2020) explain that this board oversees the accounting process and prevents financial reporting from being compromised by fraud, which is why creditors reduce economic costs. Ali et al. (2023) demonstrate that the more independent the supervisory boards are, the lower the debt costs are, based on estimating the related coefficient of the fixed effect regression model. The negative inclination also happens when Kordsachia (2021), Atagher and Iorlaha (2024), and Nugroho et al. (2024) inspect this association. Based on these illustrations, this research shapes the second hypothesis as follows.
H_2: The more significant the size of the supervisory board independence, the less the cost of debt.

Research Paradigm

After presenting the first and second hypotheses, this study outlines a research paradigm, as illustrated in Figure 1, which consists of several rectangles. Ghozali (2017) states that these rectangles demonstrate the directly measured variables.

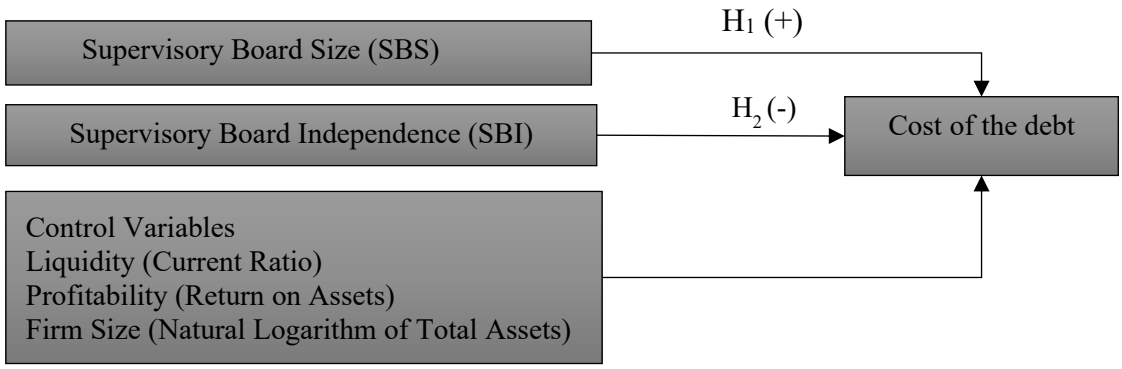

Figure 1. The Research Paradigm
Source: The formulated hypotheses

METHODS

This research uses the cost of debt as the explained variable, quantified by the financial costs-to-average debt ratio (FCADR), where the average debt is calculated as the total of short-term and long-term liabilities divided by two. It refers to Jantadej and Wattanatorn (2020), Moura et al. (2020), Ayuningtyas and Harymawan (2021), Tran (2022), Atagher and Iorlaha (2024), and Nugroho et al. (2024). Furthermore, it uses two prime determinants: the supervisory board size (SBS) and the supervisory board independence (SBI):

A. The number of people on the supervisory board quantifies SBS by mentioning Ayuningtyas and Harymawan (2021), Jantadej and Wattanatorn (2020), Aksoy and Yilmaz (2023), Atagher and Iorlaha (2024), Budiarto and Kuang (2025), and Palmieri et al. (2025) (see Table 1 as the note).
B. This study enumerates SBI based on the total number of outside supervisory boards, as mentioned by Ayuningtyas & Harymawan (2021) (see Table 1 for reference).

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Then, it applies three control variables: (1) liquidity by mentioning Aksoy and Yilmaz (2023); (2) profitability by referring to Jantadej and Wattanatorn (2020), Moura et al. (2020), Ayuningtyas and Harymawan (2021), Tran (2022), Ali et al. (2023), Aksoy and Yilmaz (2023), Atagher and Iorlaha (2024), and Budiarto and Kuang (2025); and (3) firm size by denoting Priwidiantari and Viverita (2019), Jantadej and Wattanatorn (2020), Moura et al. (2020), Ayuningtyas and Harymawan (2021), Kordsachia (2021), Tran (2022), Ali et al. (2023), Aksoy and Yilmaz (2023), Atagher and Iorlaha (2024), Nugroho et al. (2024), and Budiarto and Kuang (2025), where their measurement is obtainable in Table 1.

Table 1. Research Variable Quantification

The type of determinant	The name of the determinant	Indicator at the end of the year	Source
Prime	Supervisory board size (SBS)	Total supervisory board	Jantadej and Wattanatorn (2020), Moura et al. (2020), Ayuningtyas and Harymawan (2021), Tran (2022), Ali et al. (2023), Aksoy and Yilmaz (2023), Atagher and Iorlaha (2024), and Budiarto and Kuang (2025)
	Supervisory board independence (SBI)	Total outside supervisors	Ayuningtyas and Harymawan (2021)
Control	Liquidity	Current ratio (CR)	Aksoy and Yilmaz (2023)
	Profitability	Return on assets (ROA)	Moura et al. (2020), Ayuningtyas and Harymawan (2021), Tran (2022), Ali et al. (2023), Aksoy and Yilmaz (2023), Atagher and Iorlaha (2024), Budiarto and Kuang (2025)
	Firm size	Natural logarithm of total assets (LN(TA))	Priwidiantari and Viverita (2019), Jantadej and Wattanatorn (2020), Moura et al. (2020), Ayuningtyas and Harymawan (2021), Kordsachia (2021), Tran (2022), Ali et al. (2023), Aksoy and Yilmaz (2023), Atagher and Iorlaha (2024), Nugroho et al. (2024), and Budiarto and Kuang (2025)

The population studied consists of the technological firms listed on the Indonesian Stock Market from 2018 to 2023, totaling eleven. Unfortunately, Kioson Komersial Indonesia Tbk. (KIOS) does not incur financing costs in 2022, resulting in zero debt cost, and cannot be transformed into a natural logarithm to achieve a normal distribution. Hence, this study removes this company, and the rest become the relevant population. Considering the small number of firms as a population, this study utilizes all of them as samples, following the definition of saturated sampling technique as explained by Sugiyono (2022). The name of the ten companies intended is (1) Anabatic Technologies Tbk. (ATIC), (2) Elang Mahkota Teknologi Tbk. (EMTK), (3) Quantum Clovera Investama Tbk. (KREN), (4) Multipolar Technology Tbk. (MLPT), (5) Sat Nusapersada Tbk. (PTSN), (6) M Cash Integrasi Tbk. (MCAS), (7) NFC Indonesia Tbk. (NFCX), (9) Distribusi Voucher Nusantara Tbk. (DIVA), and (10) Sentral Mitra Informatika Tbk. (LUCK).

For data analysis, this study employs a regression model using polling data. This model combines time-series and cross-section data and estimates the coefficient utilizing the ordinary least squares (OLS) technique. Furthermore, its associated model is in Equation 1.

$$FCADR_{it} = \beta_0 + \beta_1 SBS_{it} + \beta_2 SBI_{it} + \beta_3 CR_{it} + \beta_4 ROA_{it} + \beta_5 LN(TA)_{it} + \varepsilon_{it} \ldots.(\text{Equation 1})$$

Because of the OLS technique, this study must accomplish the test of classical assumptions: multicollinearity among the determinants does not exist, heteroskedasticity and autocorrelation do not occur, and residuals must follow a normal distribution (Gujarati et al., 2019):

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(1) The variance inflation factor (VIF) checks multicollinearity. This multicollinearity will not occur if VIF is lower than 10.
(2) The Breusch-Pagan-Godfrey technique checks heteroskedasticity by shaping the model of RESID^2 = f(SBS, SBI, CR, ROA, and LN(TA)). Heteroskedasticity will not happen if each t-statistical probability for these determinants exceeds the significance level (α) of 5%.
(3) The runs based on modes detect the autocorrelation. This autocorrelation will not befall if the asymptotic significance (2-tailed) of the Z-statistic exceeds α of 5%.
(4) The Jarque-Bera (JB) test detects the normality of residuals. Normality will be assumed if the probability of the JB statistic surpassing α at 5% is available.

Furthermore, this study presents the hypothesis testing result by comparing the probability of each regression coefficient with the 5% significance level. The hypothesis is acceptable if this value is less than 5% (Ghozali, 2021). Lastly, this study examines the robustness of the data by building on Trinugroho et al. (2018) and Aksoy and Yilmaz (2023), applying the generalized method of moments (GMM) to estimate the regression coefficients. The data fulfill the robust requirement if the meaningful and constant signs in the GMM and OLS-estimated models are alike.

RESULTS

Statistics to describe the variables

Table 2 presents the descriptive statistics, i.e., minimum, maximum, average, and standard deviation for 60 observations, consisting of 10 companies as the samples over six years:

a. For the financial costs-to-average debt ratio (FCADR), the minimum, maximum, and average are 0.01, 13.27, and 0.7728 (decimal), respectively. Meanwhile, the standard deviation is 2.03794.
b. For the supervisory board size (SBS), the minimum, maximum, and average are 2.00, 8.00, and 3.3500 (decimal), respectively. Meanwhile, the standard deviation is 1.38790.
c. For the supervisory board independence (SBI), the minimum, maximum, and average are 1.00, 4.00, and 1.2667 (decimal), respectively. Meanwhile, the standard deviation is 0.63424
d. For the current ratio (CR), the minimum, maximum, and average are 0.87, 12.00, and 3.2658 (decimal), respectively. Meanwhile, the standard deviation is 2.39934.
e. For return on assets (ROA), the minimum, maximum, and average are -1.26, 0.54, and 0.0235 (decimal), respectively. Meanwhile, the standard deviation is 0.19873.
f. For the natural logarithm of total assets [LN(TA)], the minimum, maximum, and average are 15.40, 30.50, and 25.5892, respectively. Meanwhile, the standard deviation is 4.50280.

Table 2. Descriptive Statistics

Description	FCADR	SBS	SBI	CR	ROA	LN(TA)
The bottommost	0.01	2.00	1	0.87	-1.26	15.40
The uppermost	0.20	8.00	4.00	12.00	0.54	30.50
Average	0.0574	3.3500	1.2667	3.2658	0.0235	25.5892
Standard Deviation	0.04921	1.38790	0.63424	2.39934	0.19873	4.50280

Source: Output of IBM SPSS 20

The detection results of the classical assumptions

Table 3 presents the results of detecting multicollinearity, heteroskedasticity, and autocorrelation (see Panels A, B, and C for details). In Panel A, the variance inflation factor for SBS, SBI, CR, ROA, and LN(TA) is 6.317, 6.516, 1.067,1.017, and 1.080, one-to-one. They are below 10; hence, multicollinearity is not an issue.

In Panel B, the probability of the t-statistic for SB, SBI, CR, ROA, and LN(TA) is 0.1058, 0.6159, 0.7529, 0.8522, and 0.1092, partially, based on the Breusch-Pagan-Godfrey technique. They are above 5%; thus, all determinants do not affect the squared residual, indicating that heteroskedasticity does not exist. The Z-statistical asymptotic significance (2-tailed) in Panel C is 0.853, beyond 5%. Consequently, the autocorrelation does not occur.

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Table 3. The multicollinearity, heteroskedasticity, and autocorrelation detection results

Panel A. Multicolinearty detection result: CADR=f[SBS, SBI, CR, ROA, and LN(TA)]				
Determinants	VIF	Determinants	VIF	Source
SBS	6.317	ROA	1.017	Output of IBM SPSS 20
SBI	6.516	LN(TA)	1.080	
CR	1.067			
Panel B. Heteroskedasticity testing results based on Breusch-Pagan-Godfrey: RESID^2 = f(SBS, SBI, CR, ROA and LN(TA))				
Determinants	Coefficients	t-statistic	Probability	Source:
C	0.383257	1.463950	0.1490	Output of E-Views 6
SBS	0.120367	1.644667	0.1058	
BSI	-0.082066	-0.504553	0.6159	
CR	-0.005505	-0.316427	0.7529	
ROA	-0.038398	0.205059	0.8522	
LN(TA)	-0.015189	-1.628679	0.1092	
Panel C. Autocorrelation testing result based on runs				
Description		Unstandardized Residuals		Source:
Testing value (modes)		0.90		Output of IBM SPSS 20
Total runs		3		
Z-statistic		0.186		
Asymptotic significance (2-tailed)		0.853		

Figure 1 displays the normality exam results according to Jarque-Bera. In this figure, the probability is 0.530990. Fortunately, this value exceeds 5%; hence, the residuals have a normal distribution.

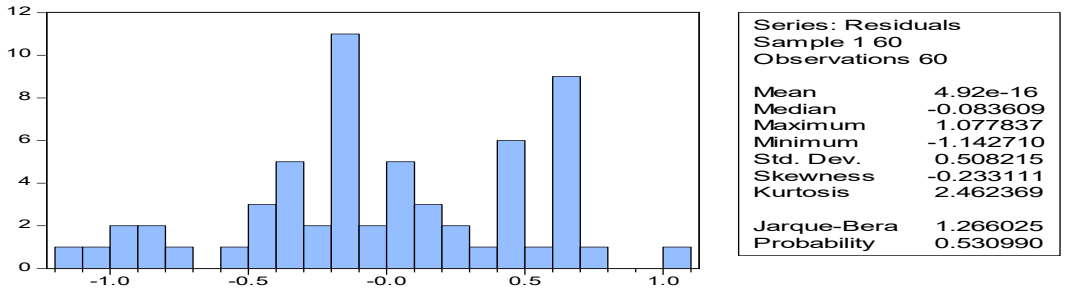

Figure 1. The normality of Jarque-Bera
Source: Output of E-Views 6

The estimation result of the regression model with pooled data

Table 4 presents the pooling data regression model results, estimated both before and after the introduction of control variables (CR, ROA, LN(TA)). Before these control variables existed, R-square and Adjusted R-square were 0.012448 and -0.022203, and the primary determinants were meaningless. After they exist, the R-square and Adjusted R-square dramatically hike to 0.662224 and 0.630949, supported by the meaningful primary determinants, i.e., a positive sign for SBS and a negative mark for SBI, at a 5% significance level (see the probability of 0.0423 and 0.0147 for SBS and SBI). The increase in R^2 and Adjusted R^2 indicates that SBS and SBI alone are insufficient predictors without considering firm-level controls.

Table 4. The estimation result of the pooling data regression model based on ordinary least squares

Determinant	Before the control variable			After the control variable		
	Coefficient	t-statistic	Probability	Coefficient	t-statistic	Probability
C	-2.141568	7.116065	0.0000	-4.704472	-9.634679	0.0000
SBS	0.157898	0.840779	0.4040	0.278030	2.075139	0.0423

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SBI	-0.300464	-0.706848	0.4825	-0.751796	-2.511140	0.0147
CR	N.A.	N.A.	N.A.	0.228175	8.219789	0.0000
ROA	N.A.	N.A.	N.A.	-0.778962	-2.055214	0.0442
LN_TA	N.A.	N.A.	N.A.	0.079216	4.551229	0.0000
R-square (R^2)	0.012448			0.662224		
Adjusted R^2	-0.022203			0.630949		

Source: Output of E-Views 6

Robustness Testing Result

Table 5 presents the regression model estimated using the generalized method of moments (GMM). In this table, the probability for SBS, SBI, CR, ROA, and LN(TA) is less than 5%: 0.0322, 0.0026, 0.0000, 0.0103, and 0.0018, supported by positive and negative coefficients for SBS and SBI after the control variable. As the control variables, CR, ROA, and LN(TA) are also significant (see probability below 5% of 0.0000, 0.0103, and 0.0018). These two conditions are the same as those in Table 4. Thus, the data meet the robustness testing.

Table 5. The estimation result of the regression model based on the GMM

Determinant	Before the control variable			After the control variable		
	Coefficient	t-statistic	Probability	Coefficient	t-statistic	Probability
C	-2.141568	-5.829771	0.0000	-4.833424	-6.614672	0.0000
SBS	0.157898	0.789218	0.4333	0.380321	2.199362	0.0322
SBI	-0.300464	-0.793013	0.4311	-1.001587	-3.156134	0.0026
CR	N.A.	N.A.	N.A.	0.229264	7.110516	0.0000
ROA	N.A.	N.A.	N.A.	-0.707892	-2.659239	0.0103
LN(TA)	N.A.	N.A.	N.A.	0.082631	3.293255	0.0018
R-square (R^2)	0.012448			0.662224		
Adjusted R^2	-0.022203			0.630949		

Source: Output of E-Views 6

DISCUSSION

In the earlier section, the first hypothesis is supported: The size of the supervisory board has a positive effect on debt cost (see probability of 0.0423 lower than 5% in Tables 4 and 5). It implies that fewer supervisory boards are vital to lower debt costs. According to García et al. (2022), small board numbers can coordinate easily, leading to speedy and modest decision-making to solve the critical financial status. According to Ning et al. (2010), as board size increases, agency problems in the boardroom intensify, resulting in more instances of free-riding and internal conflicts among its members. Indeed, a few boards are thinkable. Therefore, they suggest eight as the upper limit of small boards. With this positive sign, this research aligns with Jantadej and Wattanatorn (2020), confirming the positive association between the number of supervisory boards and the liability cost of 40 non-financial corporations in the Thai Stock Exchange from 2007 until 2016, followed by Aksoy and Yilmaz (2023) after studying 211 non-financial companies in Borsa in Istanbul from 2016 through 2020, and Palmieri et al. (2025) once investigating 176 European capital market listed companies from Belgium, France, Germany, Italy, Switzerland, United Kingdom, Spain, Sweden, and the Netherlands between 2013 and 2022.

The second hypothesis is supported, indicating that supervisory board independence has a negative influence on debt costs. This circumstance suggests that large, independent supervisory boards can reduce the cost of debt by overseeing the accounting process, preventing financial fraud (Moura et al., 2020), and mitigating the uncertainty of expected future cash flows and asymmetric information in the capital market (Atagher & Iorlaha, 2024). Furthermore, this finding confirms the applicability of agency theory within the Indonesian dual-board structure, where board independence plays a more pronounced monitoring role in complementing institutional oversight. Henceforth, this negative evidence confirms Moura et al. (2020) after investigating the total different samples each year, i.e., 209, 213, 221, 215, and 221 firms between 2012 and 2016 in

Brazil and Kordsachia (2021) employing 778 non-financial companies with environmental, social, and governance data in Europe. Besides, Ali et al. (2023), Atagher and Iorlaha (2024), and Nugroho et al. (2024) affirm this similar symbol after using 3066 firm-year observations of S&P 500 companies in the United States from 2005 until 2020, 16 consumer goods firms in Nigeria between 2012 and 2021, and nine pharmaceutical enterprises in Indonesia from 2017 to 2021, respectively.

As a practical implication, this investigation recommends that firms have a range of supervisory boards to decrease the cost of debt, with a number between two and eight people. Regarding the number of independent supervisors, this investigation suggests one person and four people as the most minor and most significant, as displayed in Table 2.

CONCLUSION

This manuscript intends to examine the impact of supervisory board size and independence on the cost of debt of 10 technology firms in the Indonesian Stock Exchange (IDX) for six years from 2018 until 2023. After processing the data to test the formulated hypothesis, this investigation reveals that the size and independence of the supervisory board determine debt cost, with both positive and negative effects, in a one-to-one causal relationship, as the uniqueness of dynamic board governance in one of the emerging capital markets.

As a theoretical limitation, this investigation only utilizes a single industrial sector listed on the IDX, i.e., technology, and employs two primary determinants of the cost of liability. Therefore, these two matters become a chance for the succeeding scholars to use (1) all technology companies across the South East Asian Stock Market and (2) the other primary determinants such as institutional ownership, leverage, and gender diversity based on supervisory boards, audit committee size, and external public accountant firms.

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