INKUBIS: Jurnal Ekonomi dan Bisnis
Volume 8, Issue 4, 2902-17
e_ISSN: 2775-3913
https://inkubis.polteksci.ac.id/index.php/ink/index
DOI: doi.org/10.59261/inkubis.v8i4.471

Corporate Governance, Leverage, and Working Capital Turnover as Predictors of Financial Health in Indonesian Logistics and Transportation Companies

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Article Info:

***Article history*:**
Received: August 06, 2026
Revised: September 22, 2026
Accepted: September 28, 2026
Available Online: October 08, 2026

***Keywords*:**
Altman Z-Score;
Financial Health;
Institutional Ownership;
Leverage;
Logistics And Transportation;
Working Capital Turnover

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Abstract

Background: Financial vulnerability remains important in capital-intensive logistics and transportation companies during periods of disruption and recovery.
Objective: This study examines the associations of leverage, Working Capital Turnover, and institutional ownership, used as a corporate governance proxy, with the financial health of Indonesian logistics and transportation companies listed on the Indonesia Stock Exchange.
Methods: A balanced panel of 75 firm-year observations from 15 companies during 2020–2024 was analyzed using Pooled OLS, Fixed Effects, and Random Effects estimators. Model selection was guided by the Chow, Breusch–Pagan Lagrange multiplier, and Hausman tests.
Results: The Random Effects model was selected. Leverage was not significantly associated with the Altman Z-Score ($\beta = 1.32$, $p = 0.294$), so H1 was not supported. Working Capital Turnover had a significant negative association ($\beta = -0.076$, $p = 0.021$); because this direction contradicted the positive hypothesis and the ratio contained extreme values linked to negative working capital, H2 was not supported. Institutional ownership had the strongest significant positive association among the predictors in the selected model ($\beta = 25.60$, $p < 0.001$), supporting H3.
Conclusion: Institutional ownership is positively associated with financial health, while the WCTO result requires cautious interpretation because of its denominator structure and overlap between the predictors and components of the Altman Z-Score.

To cite this article: Mahpudin, E., Solihin, & Karsam. (2026). Corporate governance, leverage, and working capital turnover as predictors of financial health in Indonesian logistics and transportation companies. *INKUBIS: Jurnal Ekonomi dan Bisnis*, 8(4), 2902–17. https://doi.org/10.59261/inkubis.v8i4.471

INTRODUCTION

The logistics and transportation sector facilitates the movement of goods, services, and people that supports broader economic activity. In Indonesia, geographic dispersion makes transport connectivity strategically important for economic integration. The sector is also asset intensive and exposed to fleet-financing needs, fuel-price volatility, regulatory change, and cyclical demand. These characteristics provide a relevant context for examining financial health, but their implications must be evaluated from sector-specific evidence rather than treated as uniform conditions across all firms.

Financial distress, defined broadly as a state in which a firm cannot meet its financial obligations or can do so only through fundamental operational restructuring, has been the subject of extensive scholarly inquiry since the seminal contributions of (Altman, 1968; Beaver, 1966). These early works established that financial ratios carry predictive power regarding insolvency, laying the foundation for a rich empirical tradition spanning multiple economies and sectors

(Ohlson, 1980; Zmijewski, 1984). Despite this maturity, the determinants of financial distress remain context-sensitive, and there is growing recognition that sector-specific and institutional factors, including capital structure decisions and governance mechanisms, interact in ways that aggregate-level studies obscure (Fich & Slezak, 2008).

Capital structure theory, rooted in the foundational work of Modigliani and Miller (1958) and subsequently refined through the trade-off theory Myers (1977) and the pecking-order hypothesis Myers & Majluf (1984), predicts that leverage is a central determinant of financial risk. Firms with high debt-to-asset ratios face elevated debt service obligations, reduced financial flexibility, and greater sensitivity to economic downturns (Stulz, 1990). In capital-intensive industries such as aviation and maritime transport, leverage levels are structurally elevated as fleet assets are typically financed through long-term borrowings. As a result, the Debt-to-Asset Ratio (DAR) emerges as a theoretically motivated predictor of financial distress in this sector (Fama & French, 2002; Frank & Goyal, 2009).

Working capital management, by contrast, concerns the firm's short-term liquidity position and operational efficiency. Adequate working capital ensures that firms can meet day-to-day obligations, sustain operations during revenue shortfalls, and avoid the costly disruptions associated with liquidity crises Working Capital (Deloof, 2003)

Turnover (WCTO), computed as the ratio of net sales to working capital, is a widely used metric of operational efficiency in deploying short-term capital. Firms that generate higher revenues relative to their working capital base are considered more efficient in utilizing short-term resources (Shin & Soenen, 1998). However, when working capital is negative—as is common in capital-intensive firms with large current liability positions—the interpretation of WCTO requires careful contextual adjustment.

Corporate governance has emerged as a third major determinant of financial distress, particularly in emerging market economies where ownership concentration, regulatory frameworks, and investor protection mechanisms differ markedly from those in developed markets (La Porta et al., 2000; Shleifer & Vishny, 1997). Institutional investors, who hold significant equity stakes in publicly listed firms, are theorized to exercise stronger monitoring over managerial decisions, reduce agency costs, and align management incentives with long-term value creation (Jensen & Meckling, 1976). The result is that firms with higher institutional ownership are expected to exhibit superior financial discipline and reduced vulnerability to distress (Fich & Slezak, 2008).

Despite the theoretical relevance of leverage, working capital management, and governance, sector-specific evidence for Indonesian logistics and transportation companies remains limited. The present sample shows substantial variation in leverage, Working Capital Turnover, institutional ownership, and Altman Z-Scores; consequently, broad claims about uniformly high leverage, negative working capital, or a single ownership structure are not assumed in advance. This study evaluates these variables using a balanced panel of 15 companies listed on the Indonesia Stock Exchange during 2020–2024, a window covering the COVID-19 pandemic years of 2020–2021 and the post-pandemic recovery years of 2022–2024.

Financial distress refers to difficulty in meeting financial obligations that may precede restructuring or insolvency (Wruck, 1990). Altman (1968) developed an original five-ratio model for predicting bankruptcy risk. For non-manufacturing firms, a modified four-factor formulation uses working capital to total assets, retained earnings to total assets, EBIT to total assets, and book value of equity to total debt. The resulting Z-Score is a composite indicator: lower values indicate weaker financial health, but the score is not identical to the underlying state of financial distress and must be interpreted using the specification and context applied.

Ohlson (1980) and Zmijewski (1984) offered alternative logit- and probit-based approaches that accommodate probabilistic predictions, while Beaver (1966) showed the predictive value of individual financial ratios. Together, these models indicate that financial difficulty is multidimensional and cannot be reduced to one ratio. In this study, the modified Altman Z-Score is therefore treated as a composite proxy for financial health rather than as a direct or error-free observation of financial distress.

The relationship between capital structure and financial distress is theoretically anchored in trade-off theory, which posits that firms balance the tax shield benefits of debt against the expected costs of financial distress (Myers, 1977). As leverage increases, interest obligations

consume a growing share of operating cash flow, reducing financial buffers and magnifying the probability of distress (Harris & Raviv, 1991; Stulz, 1990). Empirical studies generally confirm this negative relationship: higher Debt-to-Asset Ratios are associated with elevated distress risk across manufacturing, retail, and service sectors (Zmijewski, 1984).

In capital-intensive industries, however, the picture is more nuanced. Transportation and logistics firms routinely carry high debt loads to finance fleet assets, and creditors price this structural leverage into interest rates and covenant terms, implying that elevated DAR may be normative rather than exceptional (Frank & Goyal, 2009). Bernanke and Gertler (1989) argued that financial accelerator dynamics amplify leverage effects during downturns, particularly for firms whose collateral values are procyclical. For Indonesian logistics companies, the period 2020–2024 combined pandemic-induced revenue shocks with exchange rate pressures on foreign-currency-denominated debt, potentially intensifying leverage-distress linkages in ways not observed in pre-pandemic studies.

Working capital management encompasses decisions regarding current assets and current liabilities, with the objective of maintaining adequate liquidity while minimizing the opportunity cost of idle capital (Deloof, 2003). Shin and Soenen (1998) demonstrated that more efficient working capital management, as reflected in a shorter cash conversion cycle, is associated with higher firm profitability. Kieschnick et al. (2013) further showed that working capital directly affects shareholder wealth, particularly through its effect on financial flexibility. Hill et al. (2010) documented that net operating working capital varies systematically with firm characteristics, industry dynamics, and macroeconomic conditions.

Working Capital Turnover measures net sales generated per unit of working capital. With positive working capital, a higher ratio may indicate more intensive use of short-term resources. When the denominator is negative or close to zero, however, the sign and magnitude can change sharply: negative working capital produces a negative ratio, while a denominator approaching zero can create extreme values. Accordingly, WCTO cannot be interpreted as a uniform efficiency measure without examining the underlying current assets and current liabilities. Whether negative working capital is prevalent in the sample is assessed from the descriptive results rather than assumed theoretically.

Agency theory, as developed by Jensen and Meckling (1976), identifies conflicts among shareholders, creditors, and managers as a potential source of value loss. Governance encompasses multiple mechanisms, including ownership structure, board oversight, and investor protection (Core et al., 1999; Shleifer & Vishny, 1997). This study does not measure governance comprehensively; it uses institutional ownership as one specific monitoring proxy because consistent board-level measures were unavailable across the full panel.

Fich and Slezak (2008) provided direct evidence that corporate governance quality (measured by board independence, institutional ownership, and blockholder presence) significantly affects the probability of financial distress. Dahya et al. (2008) confirmed that dominant shareholders in emerging markets exercise board control in ways that shape financial outcomes. In the Indonesian context, where the ownership of many listed logistics firms is concentrated among founding families, government entities, or strategic partners, institutional ownership provides an important countervailing monitoring force. Claessens and Yurtoglu (2013) demonstrated that corporate governance improvements in emerging Asian markets are associated with lower cost of capital, better financial performance, and reduced distress probability. Aggarwal et al. (2010) further showed that governance practices in non-US firms converge toward institutional investor preferences when international institutional ownership is elevated. The present study contributes to this strand by providing panel evidence from a sector that has received limited scholarly attention in the Indonesian governance literature.

Although leverage, working capital management, governance, and financial distress have been examined in various settings, evidence that jointly evaluates these variables for Indonesian logistics and transportation companies remains relatively limited. The gap is sectoral, contextual, and empirical: the sample covers a capital-intensive sector during the COVID-19 pandemic and subsequent recovery, and it compares the associations of DAR, WCTO, and institutional ownership with a composite financial health measure. This context is distinctive rather than unprecedented. The analysis therefore asks which variables are most strongly associated with financial health, not which mechanism is causally most effective. The interpretation of WCTO receives particular

attention because a negative or near-zero working capital denominator can alter the ratio's sign and produce extreme values. Figure 1 presents the conceptual framework.

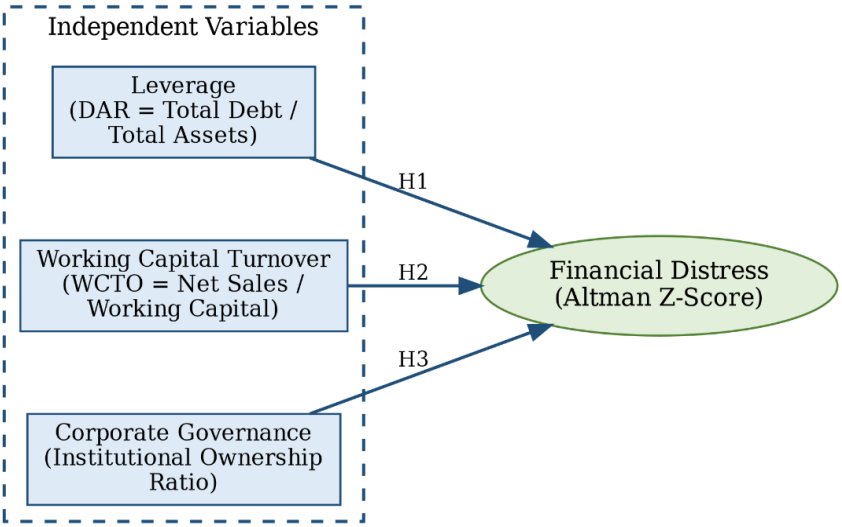

Figure 1. Conceptual Framework: Effects of Leverage, Working Capital Turnover, and Corporate Governance on Financial Distress
Source: Authors' synthesis based on (Altman, 1968; Deloof, 2003; Fich & Slezak, 2008; Jensen & Meckling, 1976).

This study pursues three specific research objectives. First, it examines whether leverage, measured by the Debt-to-Asset Ratio, is associated with financial health as measured by the Altman Z-Score. Second, it evaluates the association between Working Capital Turnover and the Altman Z-Score within the sector's working capital structure. Third, it tests whether institutional ownership, used specifically as a corporate governance proxy, is associated with the Altman Z-Score. No interaction term is estimated; therefore, the third objective concerns a direct association rather than moderation. Corresponding hypotheses are stated as follows:
H1: Leverage (DAR) is negatively and significantly associated with the financial health of Indonesian logistics and transportation companies.
H2: Working Capital Turnover (WCTO) is positively and significantly associated with the financial health of Indonesian logistics and transportation companies.
H3: Institutional ownership, used as a corporate governance proxy, is positively and significantly associated with the financial health of Indonesian logistics and transportation companies.

This study contributes sectoral and contextual evidence on financial health in Indonesian logistics and transportation companies. Empirically, it jointly evaluates leverage, Working Capital Turnover, and institutional ownership across the pandemic and post-pandemic recovery period. Theoretically, it relates the observed associations to capital structure, working capital management, and agency perspectives while recognizing that the panel design identifies associations rather than causal mechanisms. The contribution lies in the distinctive empirical context and the comparison of the three predictors within one model, not in the routine model-selection tests themselves.

METHOD

This study employed a quantitative explanatory design using a balanced panel constructed from annual reports of logistics and transportation companies listed on the Indonesia Stock Exchange. The sample comprises 15 companies with complete audited data for every fiscal year Jensen76from 2020 through 2024, yielding 75 firm-year observations (15 × 5). Companies lacking any variable required for all five years were not included; thus, every included company contributes exactly five observations. The observation window covers the COVID-19 pandemic period (2020–2021) and the post-pandemic recovery period (2022–2024). The sample companies are listed in Table 1.

Table 1
Sample Companies: Indonesian Logistics and Transportation Sector Listed on IDX (2020–2024)

No.	Code	Company Name	Sub-sector	Period	Obs.	Exchange
1	GIAA	PT. Garuda Indonesia (Persero) Tbk	Air transport	2020–2024	5	IDX
2	IMJS	PT. Indomobil Multi Jasa Tbk	Vehicle leasing/logistics	2020–2024	5	IDX
3	CMPP	PT. AirAsia Indonesia Tbk	Low-cost carrier	2020–2024	5	IDX
4	SAFE	PT. Steady Safe Tbk	Land transport/taxi	2020–2024	5	IDX
5	BPTR	PT. Batavia Prosperindo Trans Tbk	Vehicle financing/transport	2020–2024	5	IDX
6	TAXI	PT. Express Transindo Utama Tbk	Urban taxi/transport	2020–2024	5	IDX
7	TRUK	PT. Guna Timur Raya Tbk	Truck transport	2020–2024	5	IDX
8	WEHA	PT. Weha Transportasi Indonesia Tbk	Land/inter-city transport	2020–2024	5	IDX
9	HELI	PT. Jaya Trishindo Tbk	Helicopter charter	2020–2024	5	IDX
10	MIRA	PT. Mitra International Resources Tbk	Transportation services	2020–2024	5	IDX
11	SDMU	PT. Sidomulyo Selaras Tbk	Ground transport	2020–2024	5	IDX
12	LRNA	PT. Eka Sari Lorena Transport Tbk	Bus/inter-city transport	2020–2024	5	IDX
13	TRJA	PT. Transkon Jaya Tbk	Oil field transport	2020–2024	5	IDX
14	ASSA	PT. Adi Sarana Armada Tbk	Vehicle leasing/logistics	2020–2024	5	IDX
15	BLTA	PT. Berlian Laju Tanker Tbk	Sea tanker transport	2020–2024	5	IDX

Source: Authors' elaboration based on data from the Indonesia Stock Exchange (IDX).

Data were sourced exclusively from audited annual reports filed with the IDX and accessed through the official IDX platform. Required financial statement and ownership items were collected at the firm-year level and checked against company filings. Inclusion required continuous availability of all variables for 2020–2024; the resulting sample is therefore a balanced panel. The study does not rely on proprietary databases.

The dependent variable is Financial Health (FH), proxied by the modified Altman Z-Score for non-manufacturing firms:

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

where X1 = Working Capital / Total Assets, X2 = Retained Earnings / Total Assets, X3 = Earnings Before Interest and Taxes (EBIT) / Total Assets, and X4 = Book Value of Equity / Total Debt. Higher Z-Scores indicate stronger financial health and lower scores indicate greater financial vulnerability. The score is used as a continuous composite index; it is not treated as identical to a directly observed distress event.

The first independent variable is Leverage (DAR), measured as Total Debt divided by Total Assets. The second is Working Capital Turnover (WCTO), calculated as Net Sales divided by Working Capital (Current Assets minus Current Liabilities). Because a negative or near-zero denominator can generate negative or extreme values, WCTO is interpreted together with its distribution and underlying working capital position. The third predictor is institutional ownership, recorded as the proportion of outstanding shares held by institutions and labeled CG in the tables and figures solely as a corporate governance proxy (Bhagat & Bolton, 2008; Fich &

Slezak, 2008). It should not be interpreted as a comprehensive measure of governance quality.

Panel data methods were applied to account for cross-sectional and time-series variation. Pooled OLS, Fixed Effects, and Random Effects specifications were estimated. The Chow test compared Fixed Effects with Pooled OLS, the Breusch–Pagan (1980) Lagrange multiplier test compared Random Effects with Pooled OLS, and the Hausman test compared Fixed Effects and Random Effects under the assumption that individual effects are uncorrelated with the regressors. These are model-selection procedures rather than a source of substantive novelty. The estimated equation is:

$$FH_{it} = \alpha + \beta_1 DAR_{it} + \beta_2 WCTO_{it} + \beta_3 CG_{it} + \varepsilon_{it}$$

where i denotes the firm (i = 1, …, 15), t denotes the year (t = 2020, …, 2024), FH is financial health measured by the Altman Z-Score, α is the intercept, β1 through β3 are slope coefficients, and εit is the composite error term. Under the Random Effects specification, εit = μi + νit, where μi represents time-invariant individual heterogeneity and νit is the idiosyncratic error. Robust standard errors are reported to address heteroskedasticity.

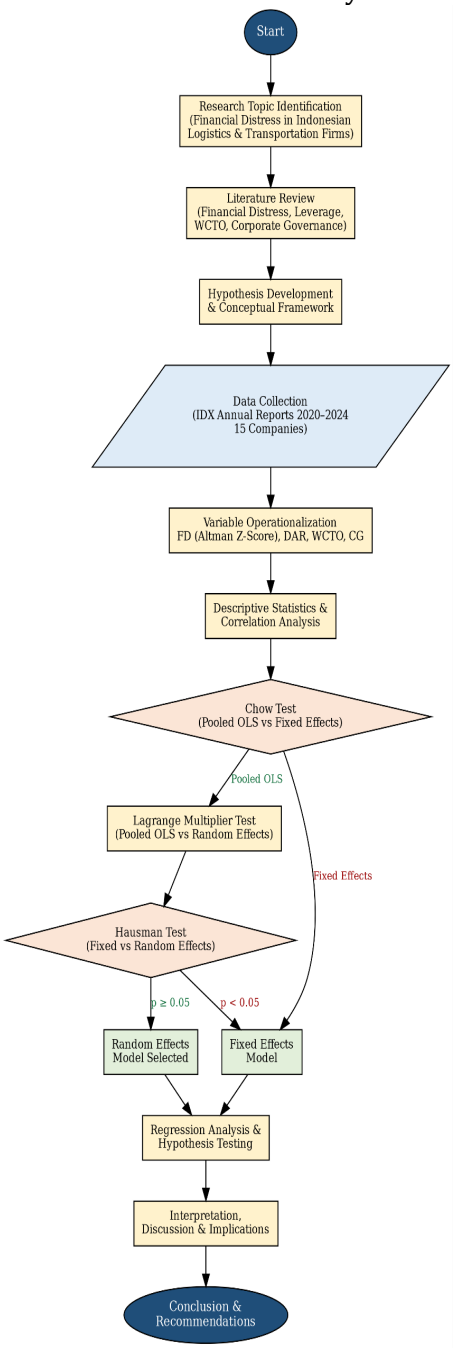

Figure 2. Research Flowchart: Panel Data Estimation Procedure.
Source: Authors' elaboration

RESULTS AND DISCUSSION

Results

Descriptive Statistics

Table 2 presents descriptive statistics for the 75 firm-year observations. The Altman Z-Score has a mean of −9.25 and a standard deviation of 15.85, indicating substantial cross-firm dispersion. The minimum is −61.61 and the maximum is 4.64. Forty-four observations (58.7%) have negative Z-Scores and 31 (41.3%) have positive values. These signs describe the sample distribution but are not, by themselves, treated as universal diagnostic cutoffs for financial distress.

Table 2

Descriptive Statistics of Panel Variables (N = 75)

Variable	N	Mean	Std. Dev.	Min.	Q1	Median	Q3	Max.	Skewness	Kurtosis
Financial Health (FH)	75	-9.2506	15.8485	- 61.6139	-14.8212	-0.9534	1.2775	4.6434	-1.6788	2.1376
Leverage (DAR)	75	0.7626	0.5902	0.0621	0.3487	0.6452	0.9019	3.1386	1.8914	4.3094
Working Capital TO (WCTO)	75	-5.0378	20.5309	-138.1447	- 5.5644	-1.7317	-0.0002	31.2705	-3.9198	24.0540
Corporate Governance (CG)	75	0.6732	0.2369	0.1806	0.4948	0.7024	0.9107	0.9965	-0.4436	-0.9507

Source: Authors' elaboration. Panel data from IDX annual reports, 2020–2024. N = 75 firm-year observations (15 companies × 5 years)

Leverage (DAR) has a mean of 0.7626 and a standard deviation of 0.5902, indicating substantial variation in the proportion of assets financed by debt across the sampled companies. The distribution is right-skewed, with a skewness value of 1.8914 and a maximum value of 3.1386. Working Capital Turnover (WCTO) exhibits the greatest variability among the variables, with a mean of −5.0378, a standard deviation of 20.5309, and values ranging from −138.1447 to 31.2705. This wide range indicates the presence of extreme WCTO observations and supports cautious interpretation of the ratio, particularly when the working capital denominator is negative or close to zero. Institutional ownership has a mean of 0.6732 and ranges from 0.1806 to 0.9965, indicating considerable variation in institutional shareholding across the observations.

Figure 3 illustrates the temporal evolution of the panel averages for FH, DAR, and the institutional ownership proxy (CG) over 2020–2024, while Figure 4 depicts company-level average Altman Z-Scores.

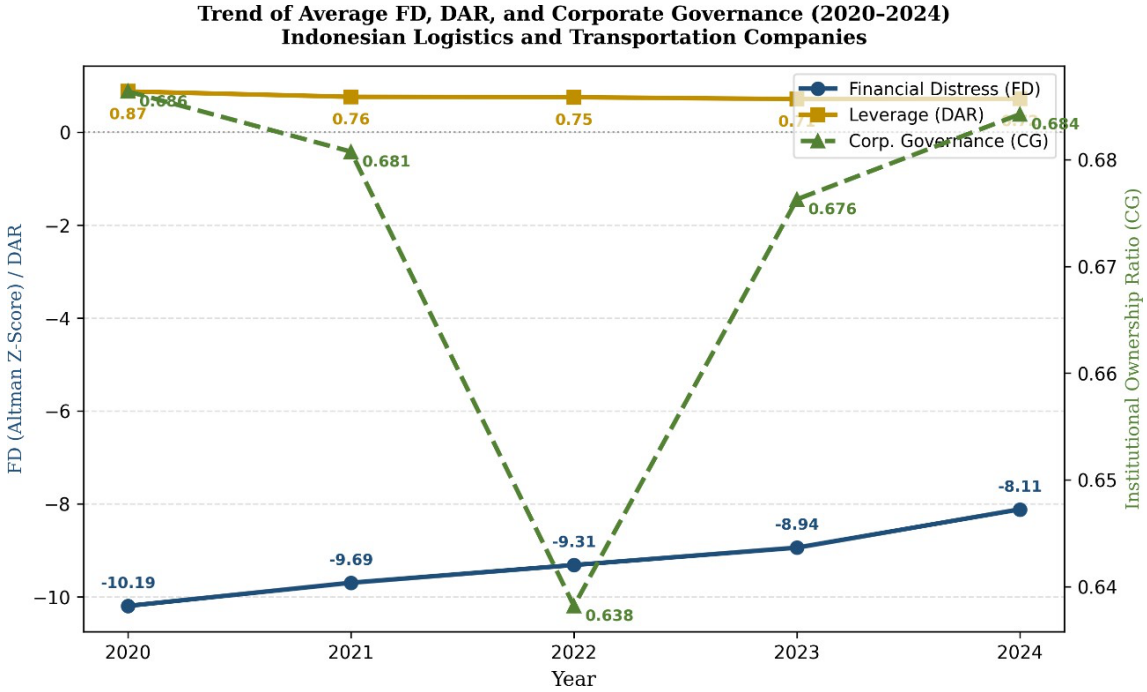

Figure 3. Trend Analysis of Average Financial Distress (FD), Leverage (DAR), and Corporate Governance (CG) among Indonesian Logistics and Transportation Companies, 2020–2024. Source: Authors' elaboration based on IDX annual report data

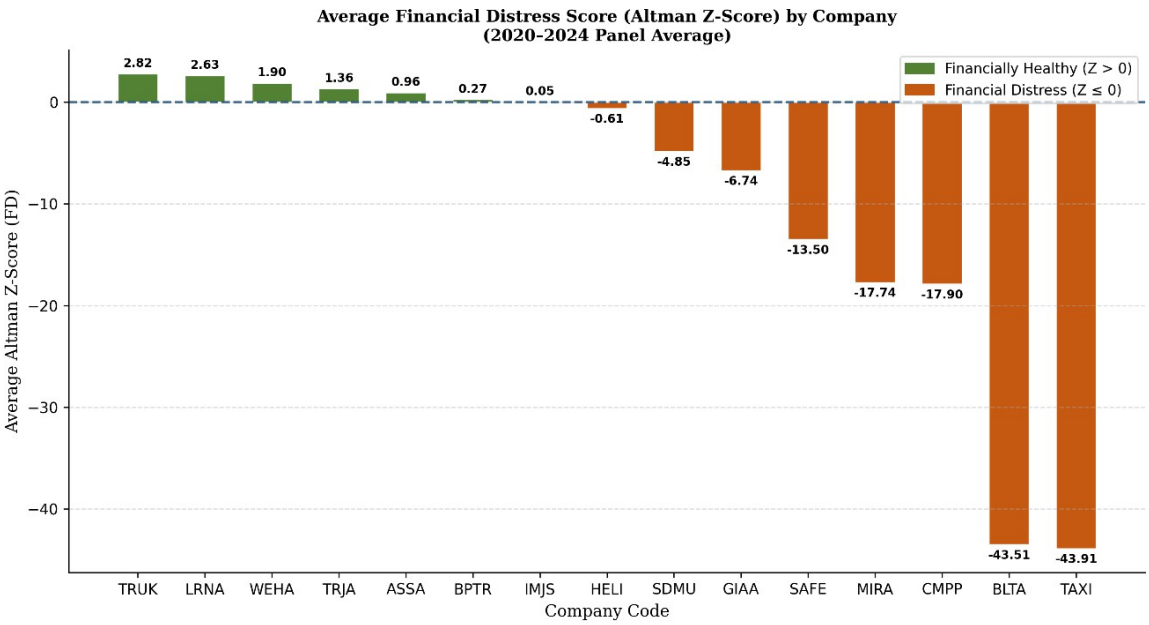

Figure 4. Average Financial Distress Score (Altman Z-Score) by Company, 2020–2024 Panel Average. Green bars indicate financially healthy companies (Z ≥ 0), while orange bars indicate financially distressed companies (Z < 0).
Source: Authors' elaboration based on IDX annual report data

Figure 3 shows that the sector-average Z-Score changed from −10.19 in 2020 to −8.11 in 2024, suggesting an improvement in the average value. This descriptive movement is not interpreted as proof of a recovery trend because no statistical trend test was performed. Average DAR declined from 0.875 to 0.717 over the same endpoints. Figure 4 shows substantial differences in company-average Z-Scores, supporting the use of a panel framework that accounts for firm-level heterogeneity.

Figure 5 illustrates the distribution of Z-Scores by year using box plots, confirming persistent negative medians and wide interquartile ranges throughout the observation window.

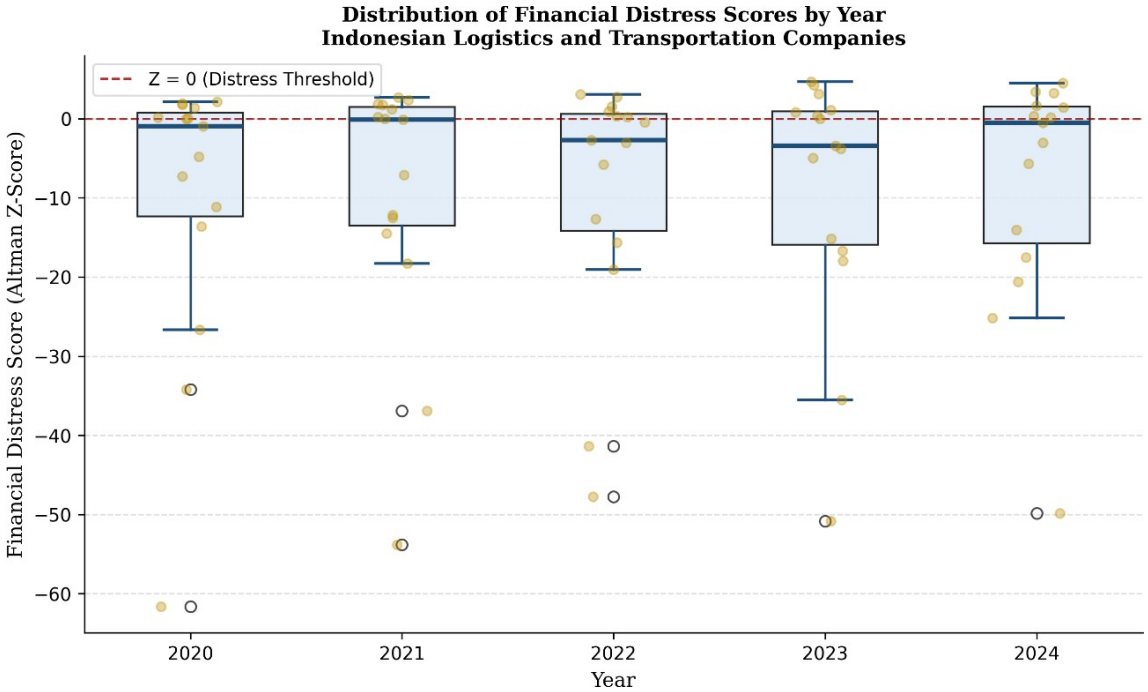

Figure 5. Distribution of Financial Distress Scores (Altman Z-Score) by Year among Indonesian Logistics and Transportation Companies, 2020–2024.
Source: Authors' elaboration. The dashed red line represents the Z = 0 distress threshold shown in the figure

Correlation Analysis

Table 3 presents the Pearson correlation matrix for all variables. The correlations between independent variables are moderate and do not exceed 0.33, indicating the absence of severe multicollinearity. The highest inter-predictor correlation is between CG and DAR (r = 0.329), suggesting a moderate tendency for more institutionally owned firms to carry higher leverage—potentially reflecting the debt-financing preferences of institutional-controlled transportation conglomerates. The bivariate correlations between FH and each predictor are in the expected direction: negative for DAR (r = −0.124) and positive for CG (r = 0.195), though individually weak, consistent with the presence of confounding individual-specific heterogeneity that the panel framework is designed to address.

Table 3

Pearson Correlation Matrix (N = 75)

Variable	FD	DAR	WCTO	CG
FH (Financial Health)	1.000			
DAR (Leverage)	-0.1244	1.000		
WCTO (Working Capital TO)	0.0780	0.0952	1.000	
CG (Institutional Ownership)	0.1946	0.3289	0.1867	1.000

Source: Authors' elaboration. Values represent Pearson correlation coefficients. No coefficient exceeds 0.33, indicating the absence of severe multicollinearity.

Panel Model Selection

Table 4 reports results of the three sequential model-selection tests. The Chow F-test yields F(14, 57) = 71.87 ($p < 0.001$), decisively rejecting the null hypothesis of no entity-fixed effects and indicating that pooled ordinary least squares is an insufficient estimator. The Breusch–Pagan Lagrange multiplier test yields $\chi^2(1) = 577.80$ ($p < 0.001$), equally rejecting the null of no random effects. The Hausman (1978) specification test, which discriminates between the Fixed Effects and Random Effects estimators under the null that individual effects are uncorrelated with the regressors, yields $\chi^2(3) = 0.148$ (p = 0.9855). Failure to reject the null strongly favors the Random Effects estimator, which is more efficient under this condition (Baltagi, 2021). The Random Effects generalized least squares estimator is therefore adopted for all inferential analyses.

Table 4

Panel Model Selection Test Results

Test	H0	Statistic	df	p-value	Decision
F-test (Chow)	No entity effects (Pooled OLS)	F = 71.87	14, 57	< 0.001	Fixed Effects preferred over Pooled OLS
Breusch–Pagan LM	No random effects (Pooled OLS)	$\chi^2 = 577.80$	1	< 0.001	Random Effects preferred over Pooled OLS
Hausman Test	RE is consistent (FE ≡ RE)	$\chi^2 = 0.148$	3	0.9855	Random Effects model selected

Source: Authors' elaboration. F-test = Chow test for entity-fixed effects; Breusch–Pagan LM = Lagrange multiplier test; Hausman (1978) test for endogeneity of entity effects.

Panel Regression Results

Table 5 presents the regression results for all three panel specifications, with the Random Effects estimator serving as the primary model for inference. The regression equation is estimated with robust standard errors to correct for potential heteroskedasticity.

Table 5
Panel Regression Results: Predictors of Financial Health (Altman Z-Score)

Variable	Pooled OLS β	Pooled p	Fixed Effects β	FE p	Random Effects β	RE Std. Err.	RE t-stat	RE p
Constant	-16.1863	0.029	-28.9003	< 0.001	-27.8699	6.5372	-4.264	< 0.001
DAR (Leverage)	-5.7246	0.021	1.5878	0.372	1.3186	1.2475	1.057	0.294
WCTO (Working Capital TO)	0.0391	0.729	-0.0794	0.033	-0.0758	0.0322	-2.355	0.021
CG (Institutional Ownership)	17.0801	0.060	26.7963	0.001	25.5981	5.2315	4.893	< 0.001
R-squared	0.0802	—	0.3265 (within)	—	0.2732	—	—	—
Observations	75	—	75	—	75	—	—	—

Dependent variable: Financial Health (Altman Z-Score).

Association of Leverage (DAR) with Financial Health

Under the selected Random Effects specification, leverage (DAR) has a positive but statistically non-significant coefficient (β = 1.32, SE = 1.25, t = 1.057, p = 0.294). H1 is therefore not supported. The coefficient does not establish an effect; it indicates that DAR is not significantly associated with the Altman Z-Score in the selected model.

Several considerations may explain this result. First, the Altman Z-Score includes book value of equity relative to total debt, creating conceptual and mechanical overlap with DAR. Second, elevated leverage may be a routine financing feature in a capital-intensive sector. Third, the Random Effects specification models time-invariant firm-level heterogeneity under the assumption supported by the Hausman test; it does not eliminate heterogeneity or establish causality. The insignificant positive coefficient should therefore be interpreted only as an estimated association within this sample.

Association of Working Capital Turnover (WCTO) with Financial Health

Working Capital Turnover has a statistically significant negative coefficient in the Random Effects model (β = −0.076, SE = 0.032, t = −2.355, p = 0.021). Because H2 predicted a positive association, the significant opposite sign means that H2 is not supported. The result indicates an association with lower Altman Z-Scores, not a causal effect.

The WCTO result requires attention to its mathematical form. WCTO equals net sales divided by working capital. When working capital is negative, the ratio is negative; when the denominator approaches zero from either side, small changes can generate very large positive or negative values. The observed range from −138.14 to 31.27 and standard deviation of 20.53 confirm this sensitivity. Moreover, working capital also enters the Altman Z-Score through X1, creating mechanical overlap between WCTO and the dependent measure. The coefficient may therefore reflect denominator behavior and the joint movement of other Z-Score components rather than operational efficiency alone.

Association of Institutional Ownership with Financial Health

Institutional ownership, used as the study's corporate governance proxy, has the strongest significant positive coefficient among the three predictors in the selected Random Effects model (β = 25.60, SE = 5.23, t = 4.893, p < 0.001). H3 is supported. This estimate represents an association with the Altman Z-Score and does not establish that institutional monitoring causally improves financial health.

This finding is consistent with theoretical expectations from agency theory and the broader corporate governance literature. Jensen and Meckling (1976) predicted that institutional monitoring reduces managerial opportunism and the agency costs of debt, both of which manifest

in the financial ratios underlying the Altman Z-Score. Fich and Slezak (2008) demonstrated empirically that governance quality significantly reduces distress probability, and Bhagat and Bolton (2008) confirmed positive governance–performance linkages across

U.S. firms. The particularly strong effect observed in this study may reflect the emerging market context: in Indonesia, where minority investor protections are weaker than in developed markets and where family-controlled and state-controlled ownership are prevalent, institutional shareholders provide a credible external monitoring mechanism that firms with dispersed or inactive ownership structures cannot replicate (Claessens & Yurtoglu, 2013; La Porta et al., 2000).

Figure 6 displays the association between institutional ownership and the Altman Z-Score across firm-year observations, with points color-coded by leverage category. The fitted gradient is descriptive and does not establish a causal governance effect.

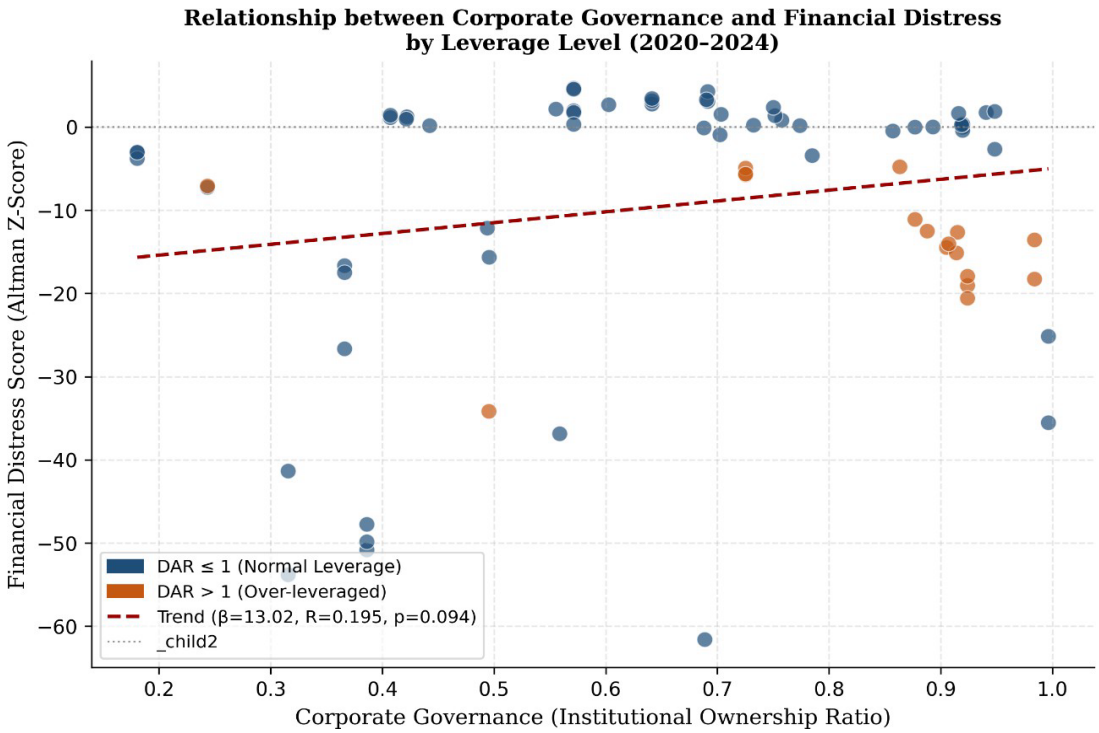

Figure 6. Relationship between Corporate Governance and Financial Distress by Leverage Level, 2020–2024.
Source: Authors' elaboration

Orange circles represent firm-year observations with DAR > 1 (over-leveraged), while blue circles represent observations with DAR ≤ 1. The dashed red line indicates the linear trend.

Hypothesis Testing Summary

Of the three hypotheses, H1 is not supported; H2 is not supported because its statistically significant coefficient is opposite to the hypothesized positive direction; and H3 is supported by a significant positive association between institutional ownership and the Altman Z-Score.

Table 6
Hypothesis Testing Summary

Hypothesis	Independent Variable	Expected Sign	Coefficient	p-value	Decision
H1	Leverage (DAR)	Negative	1.3186	0.294	Not Supported
H2	Working Capital Turnover (WCTO)	Positive	-0.0758	0.021*	Not Supported (significant opposite sign)
H3	Corporate Governance (CG)	Positive	25.5981	< 0.001***	Supported

*Source: Authors' elaboration based on Random Effects panel regression results. *** p < 0.001; * p <*

0.05. FH measured by the Altman Z-Score; positive coefficient indicates improvement in financial health.

Robustness and Theoretical Implications

The selected-model findings receive partial support from the Fixed Effects results. Institutional ownership is positive and significant in the Fixed Effects ($\beta = 26.80$, $p = 0.001$) and Random Effects models ($\beta = 25.60$, $p < 0.001$), but its Pooled OLS coefficient is not significant at the 5% level ($p = 0.060$). It should therefore not be described as uniformly significant across all specifications.

The findings offer three interpretive contributions. First, DAR is not significantly associated with the Altman Z-Score after the selected panel specification is applied, although mechanical overlap limits interpretation. Second, the negative WCTO coefficient shows that the ratio is not a uniform efficiency measure when working capital is negative or near zero. Third, institutional ownership is the strongest significant positive predictor among the variables examined in the selected model; this does not establish that it is a dominant or causally effective governance mechanism.

Discussion

The Association of Leverage with Financial Health

Leverage, measured by DAR, is not significantly associated with the financial health of the sampled companies in the selected Random Effects model ($\beta = 1.3186$, $p = 0.294$). H1 is not supported. Because the Altman Z-Score includes book value of equity relative to total debt, conceptual and mechanical overlap may reduce the incremental information provided by DAR.

This result differs from the prediction of capital structure and trade-off theories, which generally associate higher leverage with greater financial distress risk. Trade-off theory argues that firms balance the tax advantages of debt against the expected costs of financial distress. As debt obligations increase, firms face higher fixed financial commitments, potentially reducing financial flexibility and increasing their vulnerability to adverse economic conditions (Modigliani & Miller, 1958; Myers, 1977). Similarly, Harris and Raviv (1991) and Stulz (1990) suggest that excessive debt can constrain managerial flexibility and increase the probability of financial difficulties.

However, the insignificant relationship observed in this study can be understood from the structural characteristics of the logistics and transportation sector. The sector is highly capital intensive, requiring substantial investment in aircraft, vehicles, vessels, transportation equipment, and related infrastructure. Consequently, relatively high debt levels may represent a normal financing mechanism rather than an exceptional indicator of financial weakness. The descriptive statistics support this interpretation, as the average DAR reaches 0.7626, indicating that approximately three-quarters of the assets of the sampled companies are financed by debt. DAR declined descriptively from 0.875 in 2020 to 0.717 in 2024; this endpoint comparison is not treated as a statistically tested recovery trend.

Another important explanation concerns the measurement of financial distress. The Altman Z-Score used as the dependent variable already incorporates a leverage-related component through the ratio of book value of equity to total debt (X4). Therefore, the relationship between DAR and the Z-Score may partly overlap conceptually and mathematically. This overlap can reduce the ability of DAR as an independent explanatory variable to provide additional predictive information beyond that already incorporated into the dependent variable.

The Random Effects estimator accounts for modeled time-invariant firm-level heterogeneity under the maintained assumption that the individual effects are uncorrelated with the regressors. The Hausman result ($p = 0.9855$) did not reject that assumption, but it does not show that heterogeneity has been eliminated or that the coefficient is causal.

The finding is therefore consistent with the argument of Pindado and Rodrigues (2005) that financial distress costs may be heterogeneous and influenced by firm-specific conditions. It also corresponds with the financial accelerator perspective of Bernanke and Gertler (1989), which emphasizes the role of firms' net worth and financial conditions rather than relying solely on leverage ratios. In the present context, transportation firms may adjust their financing structures, assets, retained earnings, and operating strategies simultaneously, making the isolated effect of

DAR on financial health difficult to detect.

Accordingly, the results imply that leverage should not be interpreted as a standalone indicator of financial distress in Indonesian logistics and transportation companies. Rather, the quality of debt, repayment capacity, operating cash flows, asset productivity, and firm-specific financial structure may be more important in determining whether leverage ultimately translates into financial distress.

The Association of Working Capital Turnover with Financial Health

WCTO is significantly but negatively associated with financial health in the selected model ($\beta = -0.0758$, $p = 0.021$). Because the hypothesized direction was positive, H2 is not supported. The coefficient must be interpreted cautiously because negative and near-zero working capital denominators can reverse the sign and generate extreme ratio values.

At first glance, this result appears inconsistent with conventional working capital management theory. Higher working capital efficiency is generally expected to enable firms to generate greater sales from the capital invested in short-term operating resources. Shin and Soenen (1998) associate efficient working capital management with improved corporate profitability, while Kieschnick et al. (2013) emphasize that working capital management can influence shareholder wealth through its effects on liquidity and financial flexibility. Under conventional conditions, therefore, greater WCTO would be expected to be associated with better financial health.

The negative coefficient observed in this study becomes more understandable when the structural characteristics of working capital in the sampled companies are considered. The descriptive statistics show that WCTO has a mean of −5.0378 and a very large standard deviation of 20.5309. Its minimum reaches −138.1447, while the maximum reaches 31.2705. This wide dispersion reflects the unusual structure of working capital in the logistics and transportation industry, where current liabilities can substantially exceed current assets.

Negative working capital can arise from the sector's dependence on short-term financing, vehicle and aircraft financing obligations, fuel payables, maintenance liabilities, and customer advance receipts. Consequently, WCTO may not function in the same manner as it does in firms with positive working capital. Because WCTO is calculated as net sales divided by working capital, a negative denominator can produce negative or extremely large ratio values. Therefore, a high absolute value of WCTO does not necessarily indicate superior operational efficiency.

This distinction is particularly important because financial distress can coexist with apparently high working capital turnover. A company experiencing a severe working capital deficit may generate substantial sales relative to a very small or negative working capital base, resulting in a high WCTO value without necessarily possessing strong liquidity or financial resilience. In other words, the ratio may capture the severity of the working capital deficit rather than pure efficiency in utilizing short-term resources.

The negative and significant coefficient may therefore reflect a compositional effect in the sampled firms. Companies with relatively high sales compared with their negative working capital may still experience accumulated retained losses, weak operating earnings, and unfavorable balance-sheet structures. These conditions can reduce the Altman Z-Score even when the WCTO ratio appears comparatively high. This interpretation is consistent with Hill et al. (2010), who emphasize that net operating working capital is strongly influenced by industry characteristics and firm-specific conditions, and with Kieschnick et al. (2013), who show that the financial implications of working capital management depend on the broader financial structure of the firm.

The finding also highlights the importance of interpreting financial ratios according to industry context. A conventional assumption that higher WCTO automatically indicates better financial health may be misleading when the underlying working capital position is structurally negative. In the Indonesian logistics and transportation sector, managers should therefore avoid evaluating working capital efficiency solely through turnover ratios. Instead, WCTO should be interpreted together with liquidity, cash flow, current liabilities, operating profitability, and the composition of short-term financing.

Thus, the coefficient is statistically significant, but H2 is not supported because the observed sign is opposite to the prediction. The result chiefly demonstrates that WCTO is sensitive to the underlying working capital structure and should not be read as a direct measure of

efficiency in this sample.

The Association of Institutional Ownership with Financial Health

Among the three predictors, institutional ownership has the strongest significant positive coefficient in the selected Random Effects model ($\beta = 25.5981$, SE = 5.2315, $t = 4.893$, $p < 0.001$). H3 is supported. The result concerns one ownership-based proxy and should not be generalized to corporate governance as a whole.

The magnitude and significance of this relationship are particularly important. The institutional ownership ratio has an average value of 0.6732, meaning that approximately two-thirds of the shares of the sampled companies are held by institutional investors. The regression coefficient implies that a one-unit increase in institutional ownership, representing a movement from zero to complete institutional ownership, is associated with an increase of approximately 25.60 points in the Altman Z-Score. Although such a one-unit change is theoretical, the magnitude illustrates the economically meaningful relationship between institutional monitoring and financial health.

This finding is strongly consistent with agency theory. Jensen and Meckling (1976) argue that separation between ownership and managerial control creates agency conflicts that can generate inefficient managerial decisions and value destruction. Institutional investors can reduce these agency problems by monitoring management, evaluating strategic decisions, and exerting pressure when managerial actions threaten shareholder value. Jensen (1986) further highlights the role of monitoring mechanisms in reducing managerial discretion that can result in inefficient use of corporate resources.

The empirical evidence is also consistent with Fich and Slezak (2008), who demonstrate that corporate governance mechanisms can reduce the likelihood of financial distress and bankruptcy. Bhagat and Bolton (2008) similarly establish a positive relationship between corporate governance and firm performance. The current study extends these findings to Indonesian logistics and transportation companies by showing that institutional ownership is not merely associated with general corporate performance but is strongly related to the specific financial health indicator captured by the Altman Z-Score.

The magnitude of the governance effect may be particularly relevant in the Indonesian emerging-market context. The literature suggests that governance mechanisms become especially important in environments where investor protection and corporate ownership structures differ from those of developed markets (La Porta et al., 2000). Indonesian listed transportation companies may involve concentrated ownership by families, government entities, or strategic investors. Under such circumstances, institutional investors can serve as an additional monitoring mechanism that helps constrain managerial opportunism and improve financial discipline.

The coefficient is positive in all three specifications, but statistical significance is not fully consistent: Pooled OLS yields $p = 0.060$, Fixed Effects yields $p = 0.001$, and Random Effects yields $p < 0.001$. Accordingly, the association is significant in the Fixed Effects and selected Random Effects models, but not in Pooled OLS at the 5% level.

The descriptive and graphical evidence is directionally consistent with the regression result. Observations with higher institutional ownership generally appear at higher positions in the Altman Z-Score distribution, although substantial dispersion remains across companies and years. This pattern provides descriptive support for the positive association identified in the selected Random Effects model. However, neither the scatter plot nor the regression coefficient establishes that institutional monitoring causally improves financial health or protects companies from financial distress.

Therefore, institutional ownership is the strongest significant positive predictor among the variables examined in the selected model. This circumscribed conclusion does not imply that institutional ownership is the dominant governance mechanism or that it causally produces financial resilience.

Integrated Discussion and Theoretical Implications

Taken together, the findings show that the Altman Z-Score varies with the three predictors in different ways: DAR is not significantly associated, WCTO has a significant negative association, and institutional ownership has a significant positive association in the selected model. These

relationships should not be described as causal interactions because no interaction terms or causal identification strategy were used.

The findings provide several theoretical implications. First, they qualify the conventional capital structure perspective by showing that leverage may not have uniform predictive power in capital-intensive industries. In the logistics and transportation sector, relatively high debt can be structurally necessary for fleet and infrastructure financing. Consequently, the mere magnitude of debt may be less informative than the firm's ability to generate sufficient operating cash flows and manage its debt obligations.

Second, the findings challenge the assumption that WCTO can be interpreted uniformly as an indicator of financial efficiency. The observed WCTO distribution, including its negative mean, large standard deviation, and extreme minimum and maximum values, indicates that the ratio is sensitive to the underlying working capital denominator. When working capital is negative or approaches zero, WCTO may produce negative or unusually large values that do not necessarily represent superior operating efficiency. This result supports the argument of Hill et al. (2010) that working capital behavior is industry-specific and should be interpreted together with liquidity, cash flow, current liabilities, and other firm-level financial conditions.

Third, the strong corporate governance effect reinforces agency theory as an important framework for understanding financial resilience. Institutional ownership can provide external monitoring that constrains managerial opportunism, strengthens financial discipline, and encourages decisions oriented toward long-term corporate sustainability. The result is particularly relevant to emerging-market companies where governance mechanisms may play a greater role in mitigating information asymmetry and agency conflicts.

The results suggest that institutional ownership may be considered alongside financial indicators when assessing firm-level financial health. Policies concerning debt, working capital, and ownership monitoring should be evaluated with additional evidence before they are presented as mechanisms for preventing distress or improving resilience.

Overall, financial health during 2020–2024 is more strongly associated with the institutional ownership proxy than with DAR in the selected model. The change in the sector-average Altman Z-Score from −10.19 in 2020 to −8.11 in 2024 suggests an improvement in the average value, but it does not establish a post-pandemic recovery trend without formal trend testing. The dispersion of scores and WCTO values indicates continuing heterogeneity across firms.

CONCLUSION

This study examined the associations of DAR, WCTO, and institutional ownership with financial health, measured by the modified Altman Z-Score, in a balanced panel of 15 Indonesian logistics and transportation companies during 2020–2024. DAR was not significantly associated with the Z-Score ($\beta = 1.32$, $p = 0.294$), so H1 was not supported. WCTO had a significant negative coefficient ($\beta = -0.076$, $p = 0.021$); because the sign contradicted the hypothesized positive relationship, H2 was not supported. Institutional ownership had the strongest significant positive association among the predictors in the selected Random Effects model ($\beta = 25.60$, $p < 0.001$), supporting H3. These estimates describe associations and do not establish causal effects, mitigation, or prevention.

The findings support interpreting institutional ownership as one relevant monitoring proxy and interpreting WCTO jointly with current assets, current liabilities, liquidity, and cash flow. They are subject to several limitations: the sample contains 15 listed firms; the Altman Z-Score is a composite proxy rather than a directly observed distress event; DAR overlaps mechanically with the Z-Score's debt-related component; WCTO overlaps through working capital and is sensitive to negative or near-zero denominators and extreme values; and institutional ownership does not represent all dimensions of governance. Potential endogeneity also prevents causal inference. Future research should use broader samples, alternative financial-health measures, additional governance proxies, and methods that address endogeneity and ratio-denominator sensitivity.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the Indonesia Stock Exchange (IDX) for providing publicly accessible annual report data used in this study. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The authors also declare no conflict of interest. The data supporting the findings were sourced from publicly available annual reports filed with the IDX and are accessible through its official website; the processed panel data are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTION STATEMENT

Endang Mahpudin, Solihin, and Karsam contributed to the preparation of the manuscript. All authors approved the final version of the manuscript.

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