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Intellectual Capital Mediates Corporate Governance And Financial Performance In Indonesian Manufacturing Firms

Intellectual Capital Memediasi Tata Kelola Perusahaan dan Kinerja Keuangan Perusahaan Manufaktur Indonesia

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Abstract

Statutory corporate governance structures in Indonesian manufacturing corporations often operate as formalistic compliance mechanisms amid earnings volatility, while prior studies rely on ownership proxies that obscure organ level intangible efficiency. Using pooled and random effects regressions with clustered bootstrap mediation, this study evaluated how the board of directors, board of commissioners, and audit committee related to return on assets through intellectual capital across 65 listed manufacturers during 2020 to 2024. Empirical results show that all three governance structures are positively associated with return on assets, with executive boards leading in private firms and supervisory boards in state enterprises. While directors and commissioners significantly enhance human and physical capital efficiency, the audit committee shows no significant link with intellectual capital once concurrent boards, size, and leverage are controlled, confirming selective partial mediation for profitability. This disaggregated framework integrates agency and resource theories, guiding regulators to mandate standardized corporate value added disclosures.

Abstrak

Struktur tata kelola perusahaan pada korporasi manufaktur Indonesia sering beroperasi sebagai mekanisme kepatuhan formalistik di tengah volatilitas laba, sedangkan studi terdahulu mengandalkan proksi kepemilikan yang mengaburkan efisiensi takberwujud dewan. Menggunakan regresi gabungan dan efek acak dengan mediasi bootstrap terklaster, studi ini mengevaluasi bagaimana dewan direksi, dewan komisaris, serta komite audit berhubungan dengan imbal hasil aset melalui modal intelektual pada 65 emiten manufaktur selama periode 2020 hingga 2024. Hasil empiris menunjukkan bahwa ketiga struktur tata kelola berasosiasi positif dengan imbal hasil aset, dengan direksi eksekutif mendominasi pada perusahaan swasta dan komisaris pengawas pada badan usaha milik negara. Sementara direksi dan komisaris secara signifikan meningkatkan efisiensi modal manusia serta fisik, komite audit tidak menunjukkan hubungan signifikan dengan modal intelektual setelah dewan lain, ukuran, dan utang dikendalikan, sehingga mengonfirmasi mediasi parsial selektif bagi profitabilitas industri. Kerangka terpilah ini mengintegrasikan teori keagenan dan sumber daya, memandu regulator mewajibkan pengungkapan nilai tambah korporasi secara terstandar.

A. INTRODUCTION

1. Background

Industrial capital formation in emerging economies frequently confronts a structural divergence between expanding corporate balance sheets and stagnating asset profitability. Within the Indonesian macroeconomic landscape, the manufacturing sector remains the primary engine of non-oil export revenue, industrial employment, and gross domestic product (GDP) formation, yet its microeconomic return profile has exhibited substantial post-pandemic fragility. According to official Indonesia Stock Exchange (IDX) registry records following the transition from the Jakarta Stock Industrial Classification (JASICA) to the IDX Industrial Classification (IDX-IC), the number of active year-end listed manufacturing issuers expanded from 193 corporations in 2020 to 210 corporations in 2024, while the cumulative registry of unique manufacturing entities listed at any point across the 2020–2024 five-year window reached 228 corporations.[1]

Despite this sustained capital market expansion, corporate earnings trajectories between 2021 and 2024 experienced pronounced cross-sectional dispersion and cyclical compression across key industrial sub-sectors. High-capitalization consumer and pharmaceutical issuers—such as PT Indofood CBP Sukses Makmur Tbk, PT Indofood Sukses Makmur Tbk, PT Unilever Indonesia Tbk, and PT Kalbe Farma Tbk—experienced progressive margin compression between 2021 and 2023 before stabilizing in 2024, whereas capital-intensive basic industry, cement, and petrochemical enterprises—including state-owned PT Semen Indonesia (Persero) Tbk alongside private issuers PT Indocement Tunggal Prakarsa Tbk, PT Chandra Asri Pacific Tbk, and PT Barito Pacific Tbk—recorded acute earnings volatility. When evaluated against expanding book assets, declining or volatile net income compresses Return on Assets (ROA), signaling an underlying microeconomic efficiency deficit in converting physical and financial capital into sustainable industrial earnings.[2] From a state and development economics perspective, persistent asset underutilization across listed industrial corporations threatens to lock emerging economies into premature deindustrialization and the middle-income trap, wherein capital accumulation fails to generate total factor productivity

[1] Otoritas Jasa Keuangan, *Capital Market Fact Book 2020* (Jakarta: Otoritas Jasa Keuangan, 2020), 42–45; PT Bursa Efek Indonesia, *IDX Yearly Statistics 2024* (Jakarta: PT Bursa Efek Indonesia, 2024), 12–19.
[2] Nathaniel Pamela Santosa, Apriani Dorkas Rambu Atahau, and Samuel Martono, "Pengaruh Struktur Modal Terhadap Nilai Perusahaan Dengan Profitabilitas Sebagai Variabel Mediasi," *Jurnal Riset Akuntansi dan Keuangan* 10, no. 2 (2022): 315–328, https://doi.org/10.17509/jrak.v10i2.37971.

growth.[3]

This microeconomic asset-efficiency deficit is closely intertwined with institutional and regulatory frictions inside Indonesia's corporate governance architecture. Under Law No. 40 of 2007 on Limited Liability Companies (*Undang-Undang Perseroan Terbatas*, Articles 1(2), 92, and 108) and Financial Services Authority (*Otoritas Jasa Keuangan*, OJK) Regulation No. 33/POJK.04/2014, Indonesian public corporations and listed state-owned enterprises (SOEs) operate under a mandatory Continental European two-tier board regime that legally separates the executive Board of Directors (*Direksi*, responsible for day-to-day operational management and resource allocation) from the non-executive Board of Commissioners (*Dewan Komisaris*, responsible for supervisory monitoring and strategic advising).[4] To reinforce financial accountability, Article 121 of Law No. 40 of 2007 and OJK Regulation No. 55/POJK.04/2015 mandate that the Board of Commissioners establish a specialized Audit Committee (*Komite Audit*)—chaired by an Independent Commissioner and comprising at least three members—tasked with verifying financial statements, evaluating internal control systems, and overseeing statutory audit compliance, while OJK Regulation No. 29/POJK.04/2016 mandates annual public disclosure of these governance practices.[5]

In institutional practice, however, formal adherence to statutory board and committee mandates frequently functions as ceremonial regulatory compliance (*symbolic isomorphism*) that fails to prevent strategic capital misallocation or financial reporting

[3] Barry Eichengreen, Donghyun Park, and Kwanho Shin, "Growth Slowdowns Redux: New Evidence on the Middle-Income Trap," *Japan and the World Economy* 32 (2014): 65–84, https://doi.org/10.1016/j.japwor.2014.07.003.

[4] Republic of Indonesia, *Undang-Undang Republik Indonesia Nomor 40 Tahun 2007 tentang Perseroan Terbatas* [Law of the Republic of Indonesia No. 40 of 2007 on Limited Liability Companies], State Gazette of the Republic of Indonesia Year 2007 No. 106, Supplement to the State Gazette No. 4756, arts. 1(2), 92(1), and 108(1); Otoritas Jasa Keuangan, *Peraturan Otoritas Jasa Keuangan Nomor 33/POJK.04/2014 tentang Direksi dan Dewan Komisaris Emiten atau Perusahaan Publik* [OJK Regulation No. 33/POJK.04/2014 on the Board of Directors and Board of Commissioners of Issuers or Public Companies], State Gazette of the Republic of Indonesia Year 2014 No. 375, Supplement to the State Gazette No. 5644, arts. 2 and 20.

[5] Republic of Indonesia, *Undang-Undang Nomor 40 Tahun 2007*, art. 121(1); Otoritas Jasa Keuangan, *Peraturan Otoritas Jasa Keuangan Nomor 55/POJK.04/2015 tentang Pembentukan dan Pedoman Pelaksanaan Kerja Komite Audit* [OJK Regulation No. 55/POJK.04/2015 on the Establishment and Implementation Guidelines of the Audit Committee], State Gazette of the Republic of Indonesia Year 2015 No. 306, Supplement to the State Gazette No. 5780, arts. 4 and 7; Otoritas Jasa Keuangan, *Peraturan Otoritas Jasa Keuangan Nomor 29/POJK.04/2016 tentang Laporan Tahunan Emiten atau Perusahaan Publik* [OJK Regulation No. 29/POJK.04/2016 on Annual Reports of Issuers or Public Companies], State Gazette of the Republic of Indonesia Year 2016 No. 150, Supplement to the State Gazette No. 5911, arts. 4(1)(g) and 7; PT Bursa Efek Indonesia, *Pedoman Tata Kelola Perusahaan PT Bursa Efek Indonesia Versi 2.0* [Corporate Governance Guidelines of PT Bursa Efek Indonesia Version 2.0] (Jakarta: PT Bursa Efek Indonesia, 2024), 14–28.

irregularities across both state-owned and private industrial enterprises. Within the state-owned industrial energy sector, PT Pertamina (Persero) has faced sustained fiscal and parliamentary scrutiny over protracted delays in executing seven strategic refinery modernization mandates initiated in 2018, recurring operational risk incidents such as the Dumai refinery fire, and strategic planning inconsistencies regarding foreign Build-Operate-Transfer (BOT) refinery partnerships—factors that perpetuate national fiscal exposure to refined fuel imports. Parallel governance breakdowns occur among private listed manufacturers: in February 2026, OJK imposed administrative monetary sanctions against the corporate leadership of PT Indo Pureco Pratama Tbk for material financial misstatements across the 2021–2023 reporting periods involving improper capitalization of non-productive assets, and against the directors, commissioners, and auditors of chemical manufacturer PT Tianrong Chemical Industry Tbk (formerly PT Tridomain Performance Materials Tbk) for concealing ultimate controlling shareholders, bypassing affiliated-party transaction procedures, and violating statutory Annual General Meeting mandates.[6] These regulatory enforcement actions illustrate a pervasive institutional disconnect between the formal existence of two-tier governance structures and the substantive stewardship of corporate assets.

Scholarly debates investigating whether internal corporate governance structures resolve agency conflicts and improve financial performance remain divided across two competing theoretical and empirical traditions. Grounded in classical Agency Theory pioneered by Jensen and Meckling and Fama and Jensen, the first analytical stream posits that separating decision management (executive directors) from decision control (supervisory commissioners and audit committees) mitigates managerial opportunism, curbs perquisite consumption, and reduces information asymmetry between corporate insiders and external capital providers.[7] Supporting this monitoring hypothesis, empirical studies demonstrate that larger executive boards, active supervisory boards, and robust audit committees are positively associated with corporate profitability (ROA and Return

[6] Otoritas Jasa Keuangan, "Siaran Pers: OJK Tetapkan Sanksi Pelanggaran Pasar Modal PT IPPE, Pihak Terkait Kasus PT TDPM, dan Pihak Terkait Lainnya," Press Release No. SP 42/GKPB/OJK/II/2026, February 2026, https://ojk.go.id/id/berita-dan-kegiatan/siaran-pers/Pages/OJK-Tetapkan-Sanksi-Pelanggaran-Pasar-Modal-PT-IPPE-Pihak-Terkait-Kasus-PT-TDPM-dan-Pihak-Terkait-Lainnya.aspx.

[7] Michael C. Jensen and William H. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics* 3, no. 4 (1976): 305–360, https://doi.org/10.1016/0304-405X(76)90026-X; Eugene F. Fama and Michael C. Jensen, "Separation of Ownership and Control," *The Journal of Law and Economics* 26, no. 2 (1983): 301–325, https://doi.org/10.1086/467037.

on Equity, ROE) and market valuation (Tobin's *Q*), as documented in Indian manufacturing firms by Mondal and Sahu,[8] in listed Indonesian SOEs by Ramadhani and Agustin,[9] across Indonesian LQ45 and manufacturing issuers by Liza and Daljono and Habibi and Muid,[10] and within the Indonesian banking sector by Syahputri and Saragih.[11] Conversely, a prominent counter-stream rooted in the board-size coordination literature of Yermack, Adams, Hermalin, and Weisbach, and Wintoki, Linck, and Netter contends that expanding corporate boards beyond an optimal threshold induces communication bottlenecks, free-rider problems among monitors, and bureaucratic inertia while being endogenously shaped by past firm performance.[12] Consistent with this skepticism, several Indonesian manufacturing studies report contradictory or null governance effects: Sari, Ahmad, and Kurnianti find that while Board of Directors size positively influences manufacturing ROA and Tobin's *Q*, both Board of Commissioners size and Audit Committee size are statistically insignificant for ROA;[13] Agasva and Budiantoro document negative performance associations for institutional ownership and audit committee independence;[14] Febriansyah and Fahreza report negative effects of commissioners and

[8] Subhas Mondal and Tarak Nath Sahu, "Is Corporate Governance Relevant to Firm Performance? Evidence from Indian Manufacturing Companies," *International Journal of Business Governance and Ethics* 18, no. 1 (2024): 1–24, https://doi.org/10.1504/IJBGE.2024.10060226.

[9] Aulia Ramadhani and Henri Agustin, "Pengaruh Intellectual Capital dan Corporate Governance Terhadap Kinerja Keuangan (Studi Empiris Pada Perusahaan BUMN yang Terdaftar di Bursa Efek Indonesia Tahun 2015–2019)," *Jurnal Eksplorasi Akuntansi* 3, no. 1 (2021): 67–81, https://doi.org/10.24036/jea.v3i1.336.

[10] Ruth Theodora Liza and Daljono, "Pengaruh Good Corporate Governance Terhadap Kinerja Keuangan Perusahaan (Studi Empiris pada Perusahaan Manufaktur yang Terdaftar pada Bursa Efek Indonesia Periode 2016–2020)," *Diponegoro Journal of Accounting* 11, no. 4 (2022): 1–10, https://ejournal3.undip.ac.id/index.php/accounting/article/view/36366; Masandy Muhammad Rais Habibi and Dul Muid, "Pengaruh Good Corporate Governance Terhadap Kinerja Keuangan Perusahaan (Studi Empiris pada Perusahaan LQ45 yang Terdaftar di Bursa Efek Indonesia Tahun 2019–2021)," *Diponegoro Journal of Accounting* 13, no. 3 (2024): 1–15, https://ejournal3.undip.ac.id/index.php/accounting/article/view/46065.

[11] Lili Syahputri and Fitriani Saragih, "Pengaruh Good Corporate Governance Terhadap Profitabilitas Pada Perusahaan Perbankan Yang Terdaftar Di Bursa Efek Indonesia," *Owner: Riset & Jurnal Akuntansi* 8, no. 1 (2024): 673–685, https://doi.org/10.33395/owner.v8i1.1763.

[12] David Yermack, "Higher Market Valuation of Companies with a Small Board of Directors," *Journal of Financial Economics* 40, no. 2 (1996): 185–211, https://doi.org/10.1016/0304-405X(95)00844-5; Renée B. Adams, Benjamin E. Hermalin, and Michael S. Weisbach, "The Role of Boards of Directors in Corporate Governance: A Conceptual Framework and Survey," *Journal of Economic Literature* 48, no. 1 (2010): 58–107, https://doi.org/10.1257/jel.48.1.58; M. Babajide Wintoki, James S. Linck, and Jeffry M. Netter, "Endogeneity and the Dynamics of Internal Corporate Governance," *Journal of Financial Economics* 105, no. 3 (2012): 581–606, https://doi.org/10.1016/j.jfineco.2012.03.005.

[13] Rini Nurmala Sari, Gatot Nazir Ahmad, and Destria Kurnianti, "Pengaruh Karakteristik CEO dan Good Corporate Governance terhadap Kinerja Perusahaan pada Perusahaan Manufaktur di BEI," *Jurnal Bisnis, Manajemen, dan Keuangan* 4, no. 1 (2023): 294–314, https://doi.org/10.21009/jbmk.0401.21.

[14] Bagas Andrean Agasva and Harry Budiantoro, "Pengaruh Good Corporate Governance dan Ukuran Perusahaan Terhadap Kinerja Perusahaan (Studi Pada Perusahaan Manufaktur Yang Terdaftar Di BEI Tahun 2014–2017)," *Journal of Economics and Business Aseanomics* 5, no. 1 (2020): 33–53, https://doi.org/10.33476/j.e.b.a.v5i1.1403.

audit committees on ROA;[15] and Yuandri and Keristin find a negative association between executive board size and ROA in consumer non-cyclical firms.[16]

To explain why formal governance structures yield inconsistent financial returns, a second theoretical stream integrates the Resource-Based View (RBV) of Barney and Stakeholder Theory of Freeman, arguing that internal governance organs cannot generate sustainable profitability through compliance policing alone unless they actively foster value-creating intangible resources.[17] In knowledge-intensive manufacturing industries, Intellectual Capital—comprising human capital (workforce skills, engineering expertise, and productivity), structural capital (organizational routines, production databases, and process systems), and relational/capital-employed networks—constitutes the core strategic resource driving asset efficiency. Operationalized widely through Pulic's Value Added Intellectual Coefficient (VAIC™), which aggregates Capital Employed Efficiency (VACA), Human Capital Efficiency (VAHU), and Structural Capital Efficiency (STVA), intellectual capital efficiency has been shown to positively influence firm profitability in Indonesian banking, listed SOEs, and manufacturing industries.[18] Nevertheless, the intellectual capital literature also confronts both empirical divergence and

[15] Erwin Febriansyah and Rakhel Fahreza, "Pengaruh Pengungkapan Akuntansi Lingkungan dan Mekanisme Good Corporate Governance Terhadap Kinerja Keuangan (Studi Empiris pada Perusahaan yang Terdaftar di Bursa Efek Indonesia)," *Jurnal Pasar Modal dan Bisnis* 2, no. 2 (2020): 129–154, https://doi.org/10.37194/jpmb.v2i2.49.

[16] Ria Yuandri and Usnia Wati Keristin, "Peran Intellectual Capital, Dewan Direksi dan Komisaris Independen Dalam Meningkatkan Kinerja Keuangan," *SOLUSI: Jurnal Ilmiah Bidang Ilmu Ekonomi* 23, no. 1 (2025): 110–125, https://doi.org/10.26623/slsi.v23i1.11260.

[17] Jay Barney, "Firm Resources and Sustained Competitive Advantage," *Journal of Management* 17, no. 1 (1991): 99–120, https://doi.org/10.1177/014920639101700108; Jay Barney, Mike Wright, and David J. Ketchen Jr., "The Resource-Based View of the Firm: Ten Years After 1991," *Journal of Management* 27, no. 6 (2001): 625–641, https://doi.org/10.1177/014920630102700601; R. Edward Freeman, *Strategic Management: A Stakeholder Approach* (Boston: Pitman Publishing, 1984), 31–48; Alan S. Gutterman, *Stakeholder Theory* (Oakland, CA: Sustainable Entrepreneurship Project, 2023), 12–34.

[18] Ante Pulic, "VAIC™ – An Accounting Tool for IC Management," *International Journal of Technology Management* 20, nos. 5–8 (2000): 702–714, https://doi.org/10.1504/IJTM.2000.002891; Noorlailie Soewarno and Bambang Tjahjadi, "Measures That Matter: An Empirical Investigation of Intellectual Capital and Financial Performance of Banking Firms in Indonesia," *Journal of Intellectual Capital* 21, no. 6 (2020): 1085–1106, https://doi.org/10.1108/JIC-09-2019-0225; Ramadhani and Agustin, "Pengaruh Intellectual Capital," 67–81; Lesatanova Tricahya Avilya and Imam Ghozali, "Pengaruh Intellectual Capital, Good Corporate Governance dan Corporate Social Responsibility Terhadap Kinerja Keuangan Dengan Manajemen Laba Sebagai Variabel Mediasi," *Diponegoro Journal of Accounting* 11, no. 4 (2022): 1–15, https://ejournal3.undip.ac.id/index.php/accounting/article/view/36387 [Official OJS permalink; journal does not assign Crossref DOIs]; Pipit Rengganis et al., "Intellectual Capital and Firm Performance: The Mediating Role of Governance," *NCAF: Proceeding of National Conference on Accounting & Finance* 5 (2023): 465–474, https://doi.org/10.20885/ncaf.vol5.art1; Rr. Sri Saraswati et al., "Corporate Governance, Intellectual Capital, and Organizational Culture: Their Influence on Lean Manufacturing and Firm Value," *Cogent Business & Management* 11, no. 1 (2024): 2382335, https://doi.org/10.1080/23311975.2024.2382335.

methodological scrutiny: Allan, Sondakh, and Gamaliel report a negative association between intellectual capital and manufacturing equity returns,[19] while foundational accounting critiques by Andriessen, Ståhle, Ståhle, and Aho, and Iazzolino and Laise emphasize that VAIC™ measures the operational value-added efficiency of labor and capital inputs rather than raw intangible asset stocks, and exhibits partial algebraic overlap with accounting earnings that requires component-level disaggregation and modified specifications.[20]

Crucially, recent empirical attempts to model Intellectual Capital as a mediating mechanism linking Good Corporate Governance to financial performance in Indonesian manufacturing have encountered a major analytical blind spot. Analyzing 178 IDX manufacturing firms from 2015 to 2021, Jalih, Widyowati, and Rani found that Intellectual Capital failed to mediate the relationship between corporate governance and ROA.[21] However, Jalih et al. operationalized corporate governance exclusively through external equity ownership proxies (*managerial ownership* and *institutional ownership*), while Avilya and Ghozali tested earnings management rather than intellectual capital as a composite mediator. Because passive external shareholdings do not directly execute operational budgets or supervise workforce and structural efficiency inside Indonesia's two-tier legal regime, prior literature has left unresolved whether the distinct internal governance structures—the Board of Directors, the Board of Commissioners, and the Audit Committee—differentially influence ROA through Intellectual Capital efficiency.

Unlike previous studies that rely on ownership concentration metrics, aggregated governance indices, or single-variable mediation models that omit concurrent board structures and firm-level controls, this study introduces a disaggregated, joint-organ mediation framework evaluating how the Board of Directors, the Board of

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[19] Fransisco Allan, Jullie J. Sondakh, and Hendrik Gamaliel, "Pengaruh Intellectual Capital, Corporate Social Responsibility dan Good Corporate Governance Terhadap Kinerja Perusahaan (Studi pada Perusahaan Manufaktur yang Terdaftar di Bursa Efek Indonesia)," *Jurnal Riset Akuntansi dan Auditing "Goodwill"* 11, no. 1 (2020): 44–58, https://doi.org/10.35800/jjs.v11i1.29034.

[20] Daniel Andriessen, *Making Sense of Intellectual Capital: Designing a Method for the Valuation of Intangibles* (Burlington, MA: Elsevier Butterworth-Heinemann, 2004), 92–108; Pirjo Ståhle, Sten Ståhle, and Samuli Aho, "Value Added Intellectual Coefficient (VAIC): A Critical Analysis," *Journal of Intellectual Capital* 12, no. 4 (2011): 531–551, https://doi.org/10.1108/14691931111181715; Gianpaolo Iazzolino and Domenico Laise, "Value Added Intellectual Coefficient (VAIC): A Methodological and Empirical Critique," *Journal of Intellectual Capital* 14, no. 4 (2013): 547–563, https://doi.org/10.1108/JIC-12-2012-0107; Sriranga Vishnu and Vijay Kumar Gupta, "Intellectual Capital and Performance of Pharmaceutical Firms in India," *Journal of Intellectual Capital* 15, no. 1 (2014): 83–99, https://doi.org/10.1108/JIC-04-2013-0049.

[21] Jara Hardiyanti Jalih, Lestari Adhi Widyowati, and Inta Hartaningtyas Rani, "Mediasi Intellectual Capital: Good Corporate Governance dan Return on Assets pada Perusahaan Manufaktur," *Reviu Akuntansi dan Bisnis Indonesia* 8, no. 2 (2024): 136–155, https://doi.org/10.18196/rabin.v8i2.19145.

Commissioners, and the Audit Committee are directly and indirectly associated with Return on Assets (ROA) through Intellectual Capital (VAIC^{TM} and its disassembled components VACA,VAHU,STVA). Examining a balanced panel of 65 consistently profitable manufacturing corporations (325 firm-year observations) listed on the Indonesia Stock Exchange from 2020 to 2024—supplemented by sensitivity checks across positive value-added ($VA > 0$) loss-incurring firms, state-owned (SOE) versus private ownership subsamples, panel fixed/random effects, and firm-clustered bootstrap inference—this study advances the central thesis that internal governance mechanisms operate through differentiated functional pathways. Specifically, while all three governance mechanisms exhibit positive direct associations with manufacturing ROA, Intellectual Capital functions as a selective partial mediator that transmits a statistically significant portion of the executive Board of Directors' and supervisory Board of Commissioners' associations with profitability, whereas the Audit Committee is associated with higher ROA strictly through direct financial oversight and internal control compliance rather than intangible value-added efficiency.

2. Research Questions and Hypothesis Development

To address the institutional and theoretical tensions outlined above, this investigation is structured around four primary research questions:

a. To what extent are the internal mechanisms of Good Corporate Governance—specifically the Board of Directors, the Board of Commissioners, and the Audit Committee—directly associated with the financial performance (ROA) of listed Indonesian manufacturing corporations?

b. How are the Board of Directors, the Board of Commissioners, and the Audit Committee differentially associated with corporate Intellectual Capital efficiency (VAIC^{TM}) when controlling for concurrent board structures, firm size, and financial leverage?

c. To what extent is Intellectual Capital efficiency directly associated with the financial performance (ROA) of listed Indonesian manufacturing corporations?

d. Does Intellectual Capital efficiency significantly mediate the relationships between the Board of Directors, the Board of Commissioners, and the Audit Committee and corporate financial performance (ROA)?

To answer these questions rigorously, ten testable hypotheses (H_1–H_{10}) are derived

from the synthesis of Agency Theory, Stakeholder Theory, and the Resource-Based View:

Direct Governance–Performance Hypotheses (H_1–H_3). In Fama and Jensen's agency framework, the executive Board of Directors (*Direksi*) holds statutory authority over decision management (initiating and implementing operational and investment proposals), whereas the Board of Commissioners (*Dewan Komisaris*) and its specialized Audit Committee (*Komite Audit*) exercise decision control (ratifying and monitoring managerial actions).[22] Although Yermack cautions that excessively large boards can incur coordination costs, complex manufacturing enterprises require functional specialization across production, supply-chain logistics, finance, and marketing. A larger Board of Directors expands executive managerial capacity and internal checks against unilateral chief-executive rent-seeking, improving asset utilization (ROA). Simultaneously, a larger Board of Commissioners broadens supervisory expertise and reduces agency costs between controlling shareholders and management, while a larger Audit Committee strengthens financial reporting verification and internal control compliance under POJK No. 55/POJK.04/2015, curbing earnings manipulation and resource leakage. Accordingly, we hypothesize positive direct associations for all three governance mechanisms:

a. H_1**:** *Board of Directors size (*DD*) is positively associated with corporate financial performance (*ROA*) (*$\theta_1 > 0$*).*
b. H_2**:** *Board of Commissioners size (*DK*) is positively associated with corporate financial performance (*ROA*) (*$\theta_2 > 0$*).*
c. H_3**:** *Audit Committee size (*KA*) is positively associated with corporate financial performance (*ROA*) (*$\theta_3 > 0$*).*

Direct Governance–Intellectual Capital Hypotheses (H_4–H_6). Under Barney's Resource-Based View and Freeman's Stakeholder Theory, sustained competitive advantage requires governance structures that optimize the efficiency of human capital (VAHU), structural routines (STVA), and physical/financial capital employed (VACA).[23] Executive directors directly manage workforce deployment, operational workflows, and capital budgeting, enabling larger executive boards to enhance value-added output relative to labor and capital inputs. Concurrently, through its strategic advisory and long-term monitoring roles, the Board of Commissioners counteracts short-term managerial

[22] Fama and Jensen, "Separation of Ownership and Control," 304–311; Jensen and Meckling, "Theory of the Firm," 308–315.
[23] Barney, "Firm Resources," 101–112; Freeman, *Strategic Management*, 52–64.

myopia and encourages management to sustain productive human and structural systems. Furthermore, if the Audit Committee's oversight of internal control procedures strengthens organizational process reliability and information transparency (a component of structural capital), audit oversight may also support intellectual capital efficiency. We therefore test the following first-stage predictions:

a. H_4**:** *Board of Directors size (*DD*) is positively associated with Intellectual Capital efficiency (*VAIC*) (*$\beta_1 > 0$*).*
b. H_5**:** *Board of Commissioners size (*DK*) is positively associated with Intellectual Capital efficiency (*VAIC*) (*$\beta_2 > 0$*).*
c. H_6**:** *Audit Committee size (*KA*) is positively associated with Intellectual Capital efficiency (*VAIC*) (*$\beta_3 > 0$*).*

Direct Intellectual Capital–Performance and Structural Mediation Hypotheses (H_7–H_{10}). In Pulic's (2000) value-creation model and the RBV framework, firms that generate higher value added per unit of human capital, structural capital, and capital employed achieve superior operational productivity, directly elevating accounting profitability (ROA). Integrating Agency Theory with the RBV following Zhao, Lynch, and Chen's (2010) mediation typology implies that internal governance organs improve financial performance not only through direct cost monitoring (c'_k), but also indirectly ($a_k \times b_k$) by enhancing Intellectual Capital efficiency, which subsequently translates into higher ROA. Consequently, we formulate the final four hypotheses:

a. H_7**:** *Intellectual Capital efficiency (*VAIC*) is positively associated with corporate financial performance (*ROA*) (*$\lambda > 0$*).*
b. H_8**:** *Intellectual Capital efficiency (*VAIC*) positively mediates the relationship between Board of Directors size (*DD*) and corporate financial performance (*ROA*) (*$\beta_1 \times \lambda > 0$*).*
c. H_9**:** *Intellectual Capital efficiency (*VAIC*) positively mediates the relationship between Board of Commissioners size (*DK*) and corporate financial performance (*ROA*) (*$\beta_2 \times \lambda > 0$*).*
d. H_{10}**:** *Intellectual Capital efficiency (*VAIC*) positively mediates the relationship between Audit Committee size (*KA*) and corporate financial performance (*ROA*) (*$\beta_3 \times \lambda > 0$*).*

Table 1. Conceptual Framework and Theoretical Sign Predictions (H_1–H_{10})

Hypothesis	Structural Pathway	Theoretical Anchor	Predicted Sign	Test Parameter
H_1	$DD_{it} \rightarrow ROA_{it}$ (Direct)	Agency Theory & Functional Capacity	Positive (+)	$\theta_1 > 0$
H_2	$DK_{it} \rightarrow ROA_{it}$ (Direct)	Agency Monitoring & Advisory Control	Positive (+)	$\theta_2 > 0$
H_3	$KA_{it} \rightarrow ROA_{it}$ (Direct)	Financial Compliance & Audit Control	Positive (+)	$\theta_3 > 0$
H_4	$DD_{it} \rightarrow VAIC_{it}$ (Stage 1)	RBV & Executive Resource Allocation	Positive (+)	$\beta_1 > 0$
H_5	$DK_{it} \rightarrow VAIC_{it}$ (Stage 1)	RBV, Stakeholder & Horizon Alignment	Positive (+)	$\beta_2 > 0$
H_6	$KA_{it} \rightarrow VAIC_{it}$ (Stage 1)	Internal Control & Process Reliability	Positive (+)	$\beta_3 > 0$
H_7	$VAIC_{it} \rightarrow ROA_{it}$ (Stage 2)	Resource-Based View & Value Creation	Positive (+)	$\lambda > 0$
H_8	$DD_{it} \rightarrow VAIC_{it} \rightarrow ROA_{it}$	Integrated Agency–RBV Mediation	Positive (+)	$\beta_1\lambda > 0$
H_9	$DK_{it} \rightarrow VAIC_{it} \rightarrow ROA_{it}$	Integrated Agency–RBV Mediation	Positive (+)	$\beta_2\lambda > 0$
H_{10}	$KA_{it} \rightarrow VAIC_{it} \rightarrow ROA_{it}$	Integrated Compliance–RBV Mediation	Positive (+)	$\beta_3\lambda > 0$

Source: Authors' theoretical synthesis based on Jensen and Meckling, Barney, Pulic, and Zhao, Lynch, and Chen.

Table 1 summarizes the structural pathways, theoretical foundations, predicted signs, and econometric test parameters for all ten hypotheses, establishing direct traceability from the research questions to the empirical estimations.

3. Research Methods

a. Economic Research Design and Epistemological Approach

This study employs a quantitative, positivist econometric research design utilizing panel structural path analysis and bootstrap mediation modeling to evaluate the direct and indirect associations between internal corporate governance mechanisms, intellectual capital efficiency, and financial performance. Operating at the microeconomic firm level (*unit of analysis*), the empirical design utilizes a balanced five-year panel dataset ($T = 5$, covering fiscal years 2020 through 2024) of manufacturing corporations listed on the Indonesia Stock Exchange.[24] This longitudinal window captures critical macroeconomic regimes, spanning the 2020 COVID-19 industrial contraction, the 2021–2022 post-pandemic supply-chain recovery, and the 2022–2024 global and domestic monetary tightening cycle.

[24] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* [Quantitative, Qualitative, and R&D Research Methods] (Bandung: Alfabeta, 2019), 80–115; Unggul Purwohedi, *Metode Penelitian: Prinsip dan Praktik* [Research Methodology: Principles and Practice] (Jakarta: Raih Asa Sukses, 2022), 84–96.

To ensure econometric rigor and address the panel structure of the firm-year observations, our estimation strategy proceeds in two stages. First, we report the baseline pooled Ordinary Least Squares (OLS) and Hayes' PROCESS Macro Model 4 estimations executed in IBM SPSS 26, ensuring full transparency with the primary archival dataset. Second, because board sizes are persistent within firms over time—inducing within-firm serial correlation of residuals—we subject the baseline specifications to formal panel model selection diagnostics (the Chow F-test for poolability, the Breusch-Pagan Lagrange Multiplier test for random effects, and the Hausman specification test for fixed versus random effects), incorporate year fixed effects (τ_t) and ownership/sub-sector controls (distinguishing state-owned enterprises from private issuers), compute firm-clustered robust standard errors following Petersen, and execute joint multivariable cluster-bootstrapped mediation tests alongside temporally lagged ($\text{GCG}_{i,t-1} \rightarrow \text{VAIC}_{i,t} \rightarrow \text{ROA}_{i,t+1}$) and two-step System Generalized Method of Moments (System-GMM) endogeneity checks.[25]

b. Data Sources and Variable Specifications

All empirical data are sourced from audited annual financial statements (*laporan keuangan tahunan*) and mandatory corporate annual reports (*laporan tahunan*) officially published on the Indonesia Stock Exchange electronic disclosure portal (www.idx.co.id) and corporate investor-relations repositories for the 2020–2024 fiscal years. Variables are operationalized as follows:

1) Dependent Variable (Y): Corporate Financial Performance is measured by Return on Assets (ROA_{it}), defined in corporate finance and accounting literature as net income after tax divided by total book assets at fiscal year-end:[26]

[25] Andrew F. Hayes, *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 3rd ed. (New York: The Guilford Press, 2022), 79–118; Mitchell A. Petersen, "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches," *The Review of Financial Studies* 22, no. 1 (2009): 435–480, https://doi.org/10.1093/rfs/hhn053; Jeffrey M. Wooldridge, *Econometric Analysis of Cross Section and Panel Data*, 2nd ed. (Cambridge, MA: MIT Press, 2010), 281–315; Manuel Arellano and Olympia Bover, "Another Look at the Instrumental Variable Estimation of Error-Components Models," *Journal of Econometrics* 68, no. 1 (1995): 29–51, https://doi.org/10.1016/0304-4076(94)01642-D; Xinshu Zhao, John G. Lynch Jr., and Qimei Chen, "Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis," *Journal of Consumer Research* 37, no. 2 (2010): 197–206, https://doi.org/10.1086/651257.

[26] Robert N. Anthony and Vijay Govindarajan, *Management Control Systems*, 12th ed. (New York: McGraw-Hill/Irwin, 2007), 254–262; Restu Frandana Putra, Evi Zahroh Almufidah, and Chairil Anwar, "Pengukuran Kinerja Keuangan Perusahaan dengan Fokus pada Rasio Likuiditas, Profitabilitas, dan Solvabilitas," *Nusantara Entrepreneurship and Management Review* 2, no. 2 (2024): 78–85, https://doi.org/10.55732/nemr.v2i2.1436.

$$\text{ROA}_{it} = \frac{\text{Net Income After Tax}_{it}}{\text{Total Assets}_{it}}$$

To prevent decimal-rounding distortion in regression outputs and elasticity calculations, ROA_{it} is reported both as a decimal ratio (with regression coefficients reported to four decimal places) and rescaled into percentage points ($\text{ROA\%}_{it} = \text{ROA}_{it} \times 100$).

2) Independent Variables (X): Good Corporate Governance is disaggregated into three internal governance structures extracted from the corporate governance disclosure chapter of each annual report:
   a) Board of Directors Size (DD_{it}): Total number of active executive directors serving on the *Direksi* of firm i at the close of fiscal year t ($\text{DD}_{it} = \sum \text{Directors}_{it}$) under Law No. 40/2007 Art. 92 and POJK No. 33/POJK.04/2014.
   b) Board of Commissioners Size (DK_{it}): Total number of active supervisory commissioners (independent and non-independent) serving on the *Dewan Komisaris* of firm i at the close of fiscal year t ($\text{DK}_{it} = \sum \text{Commissioners}_{it}$) under Law No. 40/2007 Art. 108 and POJK No. 33/POJK.04/2014.
   c) Audit Committee Size (KA_{it}): Total number of members serving on the *Komite Audit* of firm i at the close of fiscal year t ($\text{KA}_{it} = \sum \text{Audit Committee Members}_{it}$). Because the Audit Committee is a board committee established by the Board of Commissioners and chaired by an Independent Commissioner under Law No. 40/2007 Art. 121 and POJK No. 55/POJK.04/2015, KA_{it} shares structural overlap with DK_{it}, making simultaneous multivariable control of all three organs essential for unbiased identification.[27]
3) Mediating Variable (Z): Intellectual Capital Efficiency (VAIC_{it}) is operationalized via Pulic's (2000) Value Added Intellectual Coefficient (VAIC^{TM}). Corporate Value Added (VA_{it}) is computed from the audited income

[27] Andrew Christian Sudjono and Amelia Setiawan, "Audit Committee's Roles & Effectiveness: Evidence from Indonesia," *Sriwijaya International Journal of Dynamic Economics and Business* 8, no. 2 (2024): 183–208, https://doi.org/10.29259/sijdeb.v8i2.183-208; Nur Fadjrih Asyik et al., "Good Corporate Governance or Corporate Social Responsibility: Which Affects the Firm Value and Performance?," *Cogent Social Sciences* 10, no. 1 (2024): 2378540, https://doi.org/10.1080/23311886.2024.2378540.

statement and notes to the financial statements as total operating revenue (OUT_{it}) minus non-labor operating expenses (IN_{it}, defined as cost of goods sold and operating expenses excluding employee compensation):

$$\mathrm{VA}_{it} = \mathrm{OUT}_{it} - \mathrm{IN}_{it}$$

Human Capital input (HC_{it}) is extracted directly from the mandatory financial statement note on Employee Benefits Expense (*Beban Imbalan Kerja* under PSAK 24 / IAS 19, encompassing direct factory wages, administrative salaries, bonuses, social security contributions, and employee training outlays). Capital Employed (CE_{it}) is defined as total book equity (net assets, $\text{Total Assets}_{it} - \text{Total Liabilities}_{it}$), and Structural Capital (SC_{it}) is derived as $\mathrm{VA}_{it} - \mathrm{HC}_{it}$. The three efficiency components and composite index are specified as:

$$\mathrm{VACA}_{it} = \frac{\mathrm{VA}_{it}}{\mathrm{CE}_{it}}, \quad \mathrm{VAHU}_{it} = \frac{\mathrm{VA}_{it}}{\mathrm{HC}_{it}}, \quad \mathrm{STVA}_{it} = \frac{\mathrm{SC}_{it}}{\mathrm{VA}_{it}} = 1 - \frac{1}{\mathrm{VAHU}_{it}}$$

$$\mathrm{VAIC}_{it} = \mathrm{VACA}_{it} + \mathrm{VAHU}_{it} + \mathrm{STVA}_{it}$$

In accordance with the methodological critiques of Ståhle, Ståhle, and Aho (2011) and Iazzolino and Laise (2013), two structural properties of VAIC_{it} are explicitly accounted for in our empirical design: (1) VAHU_{it} is an *efficiency ratio* (value added per Rupiah of labor cost) rather than a raw training expenditure volume, and $\mathrm{STVA}_{it} = 1 - (1/\mathrm{VAHU}_{it})$ is a nonlinear monotonic transformation of VAHU_{it}; and (2) because $\mathrm{VA}_{it} - \mathrm{HC}_{it}$ equals operating profit before depreciation and amortization (EBITDA), VAIC_{it} shares an accounting link with the numerator of ROA_{it}. To address these properties, we report descriptive statistics and component-level regressions for VACA_{it}, VAHU_{it}, and STVA_{it} separately, test an extended Modified VAIC (MVAIC_{it}) incorporating R&D and relational marketing intensity following Vishnu and Gupta (2014), and estimate lagged mediation models ($\mathrm{VAIC}_{i,t-1} \rightarrow \mathrm{ROA}_{i,t}$).

4) Control Variables (C): Two firm-level controls are included in all equations:
   a) Firm Size (Size_{it}): Natural logarithm of total book assets ($\ln[\text{Total Assets}_{it}]$).
   b) Financial Leverage (Lev_{it}): Total Debt-to-Assets Ratio ($\mathrm{DAR}_{it} = \text{Total Liabilities}_{it}/\text{Total Assets}_{it}$). Because DAR_{it} encompasses both interest-bearing debt and non-interest-bearing operating trade payables—which are substantial in fast-moving consumer goods

manufacturers—we distinguish total liability intensity from interest-bearing financial debt in our analytical interpretation and robustness checks.[28]

Table 2. Operational Definitions and Measurement Specifications of Variables

Variable	Symbol	Role	Operational Measurement	Source Note
Return on Assets	ROA_{it}	Dependent (Y)	Net Income After Tax_{it} / Total $Assets_{it}$ (Ratio & %)	Income Statement & Balance Sheet
Board of Directors	DD_{it}	Independent (X_1)	$\sum$ Executive $Directors_{it}$ at year-end	Annual Report (GCG Chapter)
Board of Commissioners	DK_{it}	Independent (X_2)	$\sum$ Supervisory $Commissioners_{it}$ at year-end	Annual Report (GCG Chapter)
Audit Committee	KA_{it}	Independent (X_3)	$\sum$ Audit Committee $Members_{it}$ at year-end	Annual Report (Audit Report)
Intellectual Capital	$VAIC_{it}$	Mediator (Z)	$VACA_{it} + VAHU_{it} + STVA_{it}$	Notes on Revenue & PSAK 24 Labor
Firm Size	$Size_{it}$	Control (C_1)	ln(Total $Assets_{it}$) in Million IDR$)$	Audited Balance Sheet
Financial Leverage	Lev_{it}	Control (C_2)	Total $Liabilities_{it}$/Total $Assets_{it}$ (DAR)	Audited Balance Sheet

Source: Authors' compilation based on IDX financial reporting standards and PSAK (2026).

Table 2 synthesizes the operational definitions, mathematical formulas, and exact financial-statement extraction sources for each variable in the empirical system.

c. Data Collection, Sample Reconciliation, and Pre-Estimation Data Cleaning

From the cumulative registry of 228 unique manufacturing corporations recorded on the IDX between 2020 and 2024 (comprising 193 active issuers in 2020, net new IPO additions expanding active listings to 210 in 2024, and 18 delisted or sector-reclassified entities across the five-year span), a five-step purposive screening protocol was executed (Table 3):

1) Consecutive Listing Filter: 51 firms that listed via IPO after January 1, 2020, or delisted prior to December 31, 2024, were removed to establish a balanced five-year panel (leaving 177 firms).
2) Disclosure Completeness Filter: 24 firms lacking complete audited financial

[28] Hanis Galih Pramesti, Beti Nurbaiti, and Pratiwi Nila Sari, "Pengaruh Good Corporate Governance dan Leverage Terhadap Kinerja Keuangan Perusahaan (Studi Empiris Pada Perusahaan Manufaktur Sub Sektor Makanan dan Minuman yang Terdaftar di Bursa Efek Indonesia Periode Tahun 2019–2022)," *Indonesian Journal of Economics and Strategic Management* 2, no. 1 (2024): 7–22, https://journal.drafpublisher.com/ijesm/article/view/111; Damodar N. Gujarati and Dawn C. Porter, *Basic Econometrics*, 5th ed. (New York: McGraw-Hill/Irwin, 2009), 65–92, 315–420; Imam Ghozali, *Aplikasi Analisis Multivariate dengan Program IBM SPSS 26*, 10th ed. (Semarang: Badan Penerbit Universitas Diponegoro, 2021), 105–168.

statements or detailed PSAK 24 labor-cost and governance notes across all five years were excluded (leaving 153 firms).

3) Positive Earnings / Value-Added Filter: In the baseline thesis sample, 79 firms that recorded negative earnings before tax ($\text{EBT}_{it} \leq 0$) in one or more years during the 2020–2024 window were excluded to prevent negative or near-zero Value Added ($\text{VA}_{it} \leq 0$) from inverting the denominator of $\text{STVA}_{it} = \text{SC}_{it}/\text{VA}_{it}$ (leaving 74 firms). Recognizing that excluding firms with any loss year truncates the sample to consistently profitable survivors ($\min \text{ROA} = 0.19\%$) and that firms with $\text{EBT}_{it} \leq 0$ may still generate positive Value Added ($\text{VA}_{it} > 0$), we explicitly conduct a sample-selection sensitivity analysis in Section B retaining all firm-years satisfying the strict Pulic condition ($\text{VA}_{it} > 0, \text{HC}_{it} > 0$).

4) Currency Homogeneity Filter: 9 firms reporting financial statements in US Dollars rather than Indonesian Rupiah (IDR) were excluded to avoid exchange-rate translation noise, yielding the baseline balanced panel of $N = 65$ manufacturing corporations across $T = 5$ years (325 firm-year observations).

Table 3. Purposive Sampling Reconciliation and Sectoral Breakdown (2020–2024)

Step	Screening Criterion / Subsample Classification	Firms (N)	Firm-Years (N×T)	Share (%)
1	Cumulative unique manufacturing firms registered on IDX (2020–2024)	228	—	100.0%
2	Less: Firms not consecutively listed across 2020–2024 (IPOs/delistings)	(51)	—	(22.4%)
3	Less: Firms with incomplete annual report or PSAK 24 labor disclosures	(24)	—	(10.5%)
4	Less: Firms recording negative pre-tax earnings (EBT ≤ 0) in any year	(79)	—	(34.6%)
5	Less: Firms reporting audited financial statements in foreign currency	(9)	—	(3.9%)
Base	**Final Balanced Panel Sample (Consistently Profitable Issuers)**	**65**	**325**	**28.5%**
Sub-1	*By Ownership: State-Owned Enterprises (SOEs & SOE Subsidiaries)*	*5*	*25*	*7.7%*
Sub-2	*By Ownership: Private Domestic & Foreign-Affiliated Corporations*	*60*	*300*	*92.3%*
Sub-3	*By Sub-Sector: Consumer Non-Cyclicals & Pharmaceuticals*	*28*	*140*	*43.1%*
Sub-4	*By Sub-Sector: Basic Materials, Chemicals, Cement & Metals*	*21*	*105*	*32.3%*
Sub-5	*By Sub-Sector: Industrials, Automotive & Consumer Cyclicals*	*16*	*80*	*24.6%*

Source: Authors' compilation from IDX registry and audited financial statements (2020–2024).

Table 3 also documents the institutional composition of the 65 sample corporations requested by the reviewers: the panel comprises 5 state-owned manufacturing enterprises (including state cement and pharmaceutical issuers) and 60 private corporations across three major industrial sub-sectors. Pre-estimation data auditing and cleaning protocols addressed three specific empirical anomalies in the raw archival files: (1) *Outlier & Winsorization Protocol*: extreme ratio values in ROA_{it} and VAIC_{it} were winsorized/screened using Studentized deleted residuals ($|\text{SDR}| < 3.0$) and 1st/99th percentile bounds (which caps extreme post-restructuring ROA observations, such as PT Unilever Indonesia Tbk's pre-2022 return spike, at the upper distribution threshold while retaining its 2024 total liability ratio of 0.8661, and verifies robustness when consolidated parent-subsidiary pairs such as PT Indofood Sukses Makmur Tbk and PT Indofood CBP Sukses Makmur Tbk are tested with and without parent-level clustering); and (2) *Audit Committee Minimum Verification*: the minimum KA_{it} value of 2.00 reflects temporary mid-year commissioner/committee vacancies prior to replacement appointment at a small subset of firm-years, whereas 96.3% of observations maintain $\text{KA}_{it} \geq 3$ in compliance with POJK No. 55/POJK.04/2015.

d. Data Analysis Techniques and Model Validation

The structural system is specified via two multivariable linear equations. Model 1 (the first-stage mediator equation) estimates the association between the three internal governance structures, firm controls, and Intellectual Capital efficiency:

$$\text{VAIC}_{it} = \alpha_0 + \beta_1 \text{DD}_{it} + \beta_2 \text{DK}_{it} + \beta_3 \text{KA}_{it} + \gamma_1 \text{Lev}_{it} + \gamma_2 \text{Size}_{it} + \mu_i + \tau_t + \varepsilon_{1,it} \quad (1)$$

Model 2 (the second-stage outcome equation) estimates the direct associations of the three governance structures and Intellectual Capital efficiency with Return on Assets:

$$\text{ROA}_{it} = \delta_0 + \theta_1 \text{DD}_{it} + \theta_2 \text{DK}_{it} + \theta_3 \text{KA}_{it} + \lambda \text{VAIC}_{it} + \phi_1 \text{Lev}_{it} + \phi_2 \text{Size}_{it} + \eta_i + \tau_t + \varepsilon_{2,it} \quad (2)$$

where $i = 1, \ldots, 65$ indexes firms; $t = 2020, \ldots, 2024$ indexes years; μ_i, η_i denote unobserved firm-specific effects (set to zero in baseline pooled OLS and parameterized in Fixed/Random Effects panel specifications); τ_t denotes year fixed effects; and $\varepsilon_{1,it}, \varepsilon_{2,it}$ are idiosyncratic error terms.

Diagnostic validation strictly separates finite-sample distributional checks from Gauss-Markov assumptions. First, residual normality—which is required for exact finite-sample t and F inference rather than the Gauss-Markov theorem itself—is evaluated via the One-Sample Kolmogorov-Smirnov (K-S) test ($p > 0.05$) and Normal P-P plots. Second,

absence of perfect or severe multicollinearity is verified via Tolerance (> 0.10) and Variance Inflation Factors (VIF < 10.0). Third, homoscedasticity is tested via the Glejser auxiliary regression of absolute residuals ($|\hat{\varepsilon}_{it}|$) on all regressors ($p > 0.05$). Fourth, regarding serial correlation, the Durbin-Watson statistic $d \in [0,4]$ equals 2.0 under zero first-order autocorrelation ($d \approx 2(1 - \hat{\rho})$). Although the initial thesis benchmarked $d = 0.658$ (Model 1) and $d = 0.756$ (Model 2) against an informal textbook interval of $(-2, +2)$, comparison against the exact Savin-White lower critical bound ($d_L \approx 1.78$ for $N = 325, k = 5$–6) demonstrates that pooled OLS residuals exhibit strong positive within-firm serial correlation ($\hat{\rho} \approx 0.62$–0.67), corroborated by Wooldridge's (2010) panel autocorrelation F-test. Because positive serial correlation biases conventional OLS standard errors downward, we validate all hypothesis verdicts (H_1–H_7, stated strictly as Supported or Not Supported) using firm-clustered robust standard errors (Petersen 2009) and panel Random/Fixed Effects estimators, and employ a linear Wald F-test ($H_0: \beta_1 = \beta_2$) before comparing the relative magnitudes of DD_{it} and DK_{it}.

Finally, to test the mediation hypotheses (H_8–H_{10}) without the omitted-variable bias of single-predictor models, we contrast bivariate PROCESS Macro Model 4 runs against a joint multivariable mediation specification in which all three governance organs ($\mathrm{DD}_{it}, \mathrm{DK}_{it}, \mathrm{KA}_{it}$) and both controls ($\mathrm{Lev}_{it}, \mathrm{Size}_{it}$) are entered simultaneously as covariates, using 5,000 firm-level cluster-bootstrapped resamples to construct 95% bias-corrected confidence intervals (BootLLCI,BootULCI) for every indirect path ($\beta_k \times \lambda$, for $k \in \{1,2,3\}$). Following Zhao, Lynch, and Chen, mediation is supported if and only if $0 \notin$ [BootLLCI,BootULCI], and is classified as complementary partial mediation when both $\beta_k \times \lambda$ and the direct path θ_k are statistically significant in the same direction.

B. RESULTS

1. Panel Data Profile, Intangible Component Disaggregation, and Serial Correlation Diagnostics

Descriptive statistics for the balanced panel of 65 consistently profitable manufacturing corporations listed on the Indonesia Stock Exchange (IDX) from 2020 to 2024 ($N = 325$ firm-year observations) are summarized in Table 4. To eliminate decimal-rounding distortion in marginal effect and elasticity calculations, corporate financial performance (ROA_{it}) is reported both as a decimal ratio and rescaled into percentage points ($\mathrm{ROA\%}_{it} = \mathrm{ROA}_{it} \times 100$). Across the five-year observation window, $\mathrm{ROA\%}_{it}$

registers a sample mean of 10.33% (0.1033) and a standard deviation of 4.97% (0.0497), spanning from 0.19% (0.0019) to 22.78% (0.2278) following pre-estimation studentized residual screening. Disaggregating $ROA\%_{it}$ by fiscal year contextualizes the post-pandemic earnings trajectory within the surviving manufacturing cohort: mean profitability rose from 9.42% during the 2020 pandemic contraction to 10.89% in 2021, moderated to 10.61% in 2022 and 10.14% in 2023 amid global input-cost inflation and monetary tightening, and stabilized at 10.59% in 2024.

Table 4. Descriptive Statistics of Panel Variables ($N = 325$)

Variable (Unit)	Minimum	Maximum	Mean	Std. Deviation
ROA (Decimal Ratio)	0.0019	0.2278	0.1033	0.0497
ROA% (Percentage Points)	0.1900	22.7800	10.3300	4.9700
DD (Directors Headcount)	2.0000	11.0000	5.6954	2.2600
DK (Commissioners Headcount)	2.0000	9.0000	4.8585	2.0348
KA (Audit Committee Headcount)	2.0000	5.0000	3.3754	0.7162
VAIC (Composite Index)	2.4664	48.4952	25.8425	10.9806
VACA (Capital Employed Efficiency)	0.0812	1.9420	0.4618	0.2845
VAHU (Human Capital Efficiency)	1.8210	45.5740	24.4265	10.8912
STVA (Structural Capital Efficiency)	0.4509	0.9781	0.9542	0.0418
Lev (Total Liabilities / Assets)	0.0327	0.8661	0.3320	0.1723
Size (ln Total Assets)	25.0790	32.9379	28.8672	1.4913

Source: Authors' calculation based on audited IDX financial statements (2020–2024).

Among the internal corporate governance variables in Table 4, the executive Board of Directors (DD_{it}) and supervisory Board of Commissioners (DK_{it}) exhibit moderate cross-sectional dispersion, with sample means of 5.6954 directors (SD = 2.2600) and 4.8585 commissioners (SD = 2.0348), respectively. By contrast, Audit Committee size (KA_{it}) is tightly concentrated around a mean of 3.3754 members (SD = 0.7162). Although 96.3% of firm-year observations maintain at least three audit committee members in compliance with Financial Services Authority Regulation (POJK) No. 55/POJK.04/2015, the observed minimum of 2.0000 reflects temporary mid-year committee vacancies awaiting replacement appointments at a small subset of issuers.

To clarify the scale of the composite Intellectual Capital index ($VAIC_{it}$), which averages 25.8425 (SD = 10.9806, range 2.4664 to 48.4952), Table 4 disaggregates $VAIC_{it}$ into its three underlying components.[29] Value Added Capital Employed ($VACA_{it}$) averages

[29] Ante Pulic, "VAIC™ – An Accounting Tool for IC Management," *International Journal of Technology Management* 20, nos. 5–8 (2000): 702–714, https://doi.org/10.1504/IJTM.2000.002891; Pirjo Ståhle, Sten Ståhle, and Samuli Aho, "Value Added Intellectual Coefficient (VAIC): A Critical Analysis," *Journal of Intellectual Capital* 12, no. 4 (2011): 531–551, https://doi.org/10.1108/14691931111181715; Gianpaolo Iazzolino and Domenico Laise, "Value Added Intellectual Coefficient (VAIC): A Methodological and Empirical Critique," *Journal of Intellectual Capital* 14, no. 4 (2013): 547–563, https://doi.org/10.1108/JIC-12-2012-0107.

0.4618 (SD = 0.2845), while Structural Capital Value Added ($\text{STVA}_{it} = 1 - 1/\text{VAHU}_{it}$) is bounded below unity with a mean of 0.9542 (SD = 0.0418). Consequently, 94.5% of the composite VAIC_{it} mean and nearly all of its cross-sectional variance originate from Value Added Human Capital ($\text{VAHU}_{it} = \text{VA}_{it}/\text{HC}_{it}$), which averages 24.4265 (SD = 10.8912) due to high revenue value-added relative to disclosed direct employee benefit expenses in automated and capital-intensive manufacturing lines. Regarding the control variables, the total liabilities-to-assets ratio (Lev_{it}) averages 0.3320 (SD = 0.1723, reaching 0.8661 in consumer manufacturers with substantial operating trade payables), while Size_{it} (ln Total Assets) averages 28.8672 (SD = 1.4913).

Table 5. Residual Diagnostics and Panel Specification Tests ($N = 325$)

Diagnostic / Specification Statistic	Model 1 (VAIC)	Model 2 (ROA%)	Reference Benchmark	Diagnostic Verdict
Kolmogorov-Smirnov Z (p-value)	0.048 (0.066)	0.046 (0.092)	$p > 0.050$	Asymptotic Normality
Max VIF (Min Tolerance)	2.060 (0.485)	2.087 (0.479)	VIF < 10.0	No Multicollinearity
Glejser Min p-value (Variable)	0.081 (DD)	0.079 (VAIC)	$p > 0.050$	Homoscedastic Errors
Durbin-Watson d-stat (d_L, d_U)	0.658 (1.78, 1.84)	0.756 (1.77, 1.85)	$d < d_L$ ($0 \leq d \leq 4$)	Positive Autocorrelation
Wooldridge Panel AR(1) F (p-val)	48.310 (0.000)	41.850 (0.000)	$p < 0.050$	Within-Firm Persistence
Chow Poolability F-stat (p-val)	11.420 (0.000)	9.870 (0.000)	$p < 0.050$	Reject Pooled OLS
Breusch-Pagan LM χ^2 (p-val)	214.60 (0.000)	186.40 (0.000)	$p < 0.050$	Panel Effects Present
Hausman Specification χ^2 (p-val)	7.530 (0.184)	8.270 (0.219)	$p > 0.050$	Random Effects Preferred

Source: Authors' econometric estimation using IBM SPSS 26 and Stata 18 (2026).

Table 5 separates finite-sample residual diagnostics from panel specification tests. In the baseline pooled Ordinary Least Squares (OLS) estimations, One-Sample Kolmogorov-Smirnov tests confirm that unstandardized residuals do not significantly depart from normality at the 5% level ($p = 0.066$ in Model 1; $p = 0.092$ in Model 2), supporting finite-sample t-test approximation. Variance Inflation Factors remain well below 10.0 ($\max \text{VIF} = 2.060$ in Model 1 and 2.087 in Model 2), and Glejser auxiliary regressions yield $p > 0.05$ across all regressors ($\min p = 0.081$ for DD in Model 1; $\min p = 0.079$ for VAIC in Model 2), confirming orthogonal regressors and homoscedastic error variance.

Crucially, however, properly evaluating the Durbin-Watson statistic $d \in [0,4]$ against the Savin-White lower critical bound ($d_L \approx 1.77$–1.78 for $N = 325, k = 5$–6) rather than an informal $(-2, +2)$ interval reveals that $d = 0.658$ (Model 1) and $d = 0.756$

(Model 2) indicate strong positive first-order serial correlation ($\hat{\rho}_1 \approx 0.671, \hat{\rho}_2 \approx 0.622$) across consecutive firm-years.[30] Wooldridge's panel autocorrelation test confirms significant within-firm error persistence ($F = 48.310$ and $41.850, p < 0.001$) caused by time-invariant corporate heterogeneity and slow-moving board headcounts. Formal panel specification tests reject unclustered pooled OLS: both the Chow F-test ($p < 0.001$) and Breusch-Pagan Lagrange Multiplier test ($\chi^2 = 214.60$ and $186.40, p < 0.001$) confirm significant firm-specific effects, whereas the Hausman test ($\chi^2 = 7.530, p = 0.184$ in Model 1; $\chi^2 = 8.270, p = 0.219$ in Model 2) does not reject the orthogonality of random firm effects.[31] Accordingly, to prevent downward-biased standard errors in borderline hypotheses ($p \in [0.02,0.05]$), Table 6 reports both the baseline pooled OLS estimates and the panel Random Effects Generalized Least Squares (RE-GLS) estimates with year fixed effects and firm-clustered robust standard errors.[32]

2. Direct Associations of Board Organs with Intangible Efficiency and Asset Profitability

Table 6 presents the multivariable structural estimates for Model 1 (dependent variable VAIC_{it}), Model 2a (baseline ROA_{it} excluding VAIC_{it}), and Model 2b (full second-stage ROA_{it} including VAIC_{it}), alongside exact four-decimal ratio coefficients, percentage-point coefficients (ROA%), standardized beta weights (β), sample-mean elasticities ($\epsilon_{Y,X} = B_{\text{exact}} \times [\bar{X}/\bar{Y}]$), and panel RE-GLS firm-clustered p-values. Both baseline structural equations are globally significant ($F = 13.572, p < 0.001$,Adjusted $R^2 = 0.162$ in Model 1; $F = 12.612, p < 0.001$,Adjusted $R^2 = 0.177$ in Model 2b).

Table 6. Multivariable Structural Regression Estimates ($N = 325$)

Model & Pathway	Exact B (SE) [Ratio / Index]	ROA% B [Beta β]	OLS t-stat (p-val)	Clustered RE p [Elasticity ϵ]
Model 1: VAIC_{it}	**Intercept** $= -10.232$ **(**12.646**)**	$R^2 = 0.175$	$F = 13.572$ **(**0.000**)**	Adj. $R^2 = 0.162$
$\text{DD}_{it} \rightarrow \text{VAIC}_{it}$ (H_4)	0.7190 (0.3547)	— [0.148]	2.027 (0.044)	0.048 [+0.1585]
$\text{DK}_{it} \rightarrow \text{VAIC}_{it}$ (H_5)	1.5790 (0.3714)	— [0.293]	4.251 (0.000)	0.001 [+0.2969]
$\text{KA}_{it} \rightarrow \text{VAIC}_{it}$ (H_6)	-0.8590 (0.9357)	— [-0.056]	-0.918 (0.359)	0.412 [-0.1122]
$\text{Lev}_{it} \rightarrow \text{VAIC}_{it}$	-9.8240 (3.7297)	— [-0.154]	-2.634 (0.009)	0.016 [-0.1262]

[30] N. Eugene Savin and Kenneth J. White, "The Durbin-Watson Test for Serial Correlation with Extreme Sample Sizes or Many Regressors," *Econometrica* 45, no. 8 (1977): 1989–1996, https://doi.org/10.2307/1914122; Jeffrey M. Wooldridge, *Econometric Analysis of Cross Section and Panel Data*, 2nd ed. (Cambridge, MA: MIT Press, 2010), 282–286.
[31] Trevor S. Breusch and Adrian R. Pagan, "The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics," *The Review of Economic Studies* 47, no. 1 (1980): 239–253, https://doi.org/10.2307/2297111; Jerry A. Hausman, "Specification Tests in Econometrics," *Econometrica* 46, no. 6 (1978): 1251–1271, https://doi.org/10.2307/1913827.
[32] Mitchell A. Petersen, "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches," *The Review of Financial Studies* 22, no. 1 (2009): 435–480, https://doi.org/10.1093/rfs/hhn053.

$\text{Size}_{it} \rightarrow \text{VAIC}_{it}$	1.0560 (0.4591)	— [0.143]	2.300 (0.022)	0.031 [+0.0041]
Model 2a: ROA_{it} **(No** VAIC**)**	**Intercept** $= 0.1102$ **(**0.0574**)**	**11.020 [—]**	$F = 13.284$ **(**0.000**)**	Adj. $R^2 = 0.159$
$\text{DD}_{it} \rightarrow \text{ROA}_{it}$	0.0053 (0.0016)	0.530 [0.241]	3.298 (0.001)	0.004 [+0.2922]
$\text{DK}_{it} \rightarrow \text{ROA}_{it}$	0.0046 (0.0017)	0.462 [0.189]	2.742 (0.006)	0.012 [+0.2175]
$\text{KA}_{it} \rightarrow \text{ROA}_{it}$	0.0087 (0.0042)	0.870 [0.125]	2.054 (0.041)	0.046 [+0.2842]
$\text{Lev}_{it} \rightarrow \text{ROA}_{it}$	-0.0340 (0.0169)	-3.400 [-0.118]	-2.012 (0.045)	0.049 [-0.1093]
$\text{Size}_{it} \rightarrow \text{ROA}_{it}$	-0.0027 (0.0021)	-0.269 [-0.081]	-1.298 (0.195)	0.240 [-0.0026]
Model 2b: ROA_{it} **(Full)**	**Intercept** $= 0.1170$ **(**0.0567**)**	**11.700 [—]**	$F = 12.612$ **(**0.000**)**	Adj. $R^2 = 0.177$
$\text{DD}_{it} \rightarrow \text{ROA}_{it}$ (H_1)	0.0048 (0.0016)	0.479 [0.218]	2.987 (0.003)	0.008 [+0.2643]
$\text{DK}_{it} \rightarrow \text{ROA}_{it}$ (H_2)	0.0035 (0.0017)	0.352 [0.144]	2.057 (0.040)	0.047 [+0.1654]
$\text{KA}_{it} \rightarrow \text{ROA}_{it}$ (H_3)	0.0093 (0.0042)	0.930 [0.134]	2.216 (0.027)	0.038 [+0.3038]
$\text{VAIC}_{it} \rightarrow \text{ROA}_{it}$ (H_7)	0.0007 (0.0003)	0.070 [0.155]	2.795 (0.006)	0.011 [+0.1755]
$\text{Lev}_{it} \rightarrow \text{ROA}_{it}$	-0.0271 (0.0170)	-2.711 [-0.094]	-1.598 (0.111)	0.148 [-0.0871]
$\text{Size}_{it} \rightarrow \text{ROA}_{it}$	-0.0034 (0.0021)	-0.343 [-0.103]	-1.648 (0.100)	0.135 [-0.0033]

Source: Authors' estimation (2026).

Notes: In standard 3-decimal SPSS printout, Model 2b coefficients round to 0.005 (DD), 0.004 (DK), 0.009 (KA), 0.001 (VAIC, $SE = 0.000$), -0.027 (Lev), and -0.003 (Size). Exact 4-decimal values ($B = \beta \times [\text{SD}_Y/\text{SD}_X]$) and ROA% coefficients eliminate rounding bias. For log-transformed Size, ϵ denotes relative semi-elasticity per 10% asset expansion ($B \times \ln[1.10]\,/\bar{Y} \approx 0.10B/\bar{Y}$); per 1-unit change in ln(Assets) ($\approx +171.8\%$ expansion), relative semi-elasticities are $+0.0409$ (Model 1) and -0.0332 (Model 2b).

Evaluating the direct governance hypotheses in Model 2b (Table 6) yields three primary findings:

a. Board of Directors (H_1 Supported): DD_{it} is positively and significantly associated with ROA_{it} ($B_{\text{exact}} = 0.0048$ [SPSS 3-decimal: 0.005], ROA%$B = 0.479$ pp, $SE = 0.0016, \beta = 0.218, t = 2.987, p = 0.003$; firm-clustered RE $p = 0.008$). Adding one executive director is associated with a 47.9-basis-point (0.479 pp) increase in ROA, corresponding to a sample-mean elasticity of $\epsilon_{\text{ROA, DD}} = +0.2643$ (+2.64% higher ROA per 10% board expansion).

b. Board of Commissioners (H_2 Supported): DK_{it} exhibits a positive and statistically significant association with ROA_{it} ($B_{\text{exact}} = 0.0035$ [SPSS 3-decimal: 0.004], ROA%$B = 0.352$ pp, $SE = 0.0017, \beta = 0.144, t = 2.057, p = 0.040$; firm-clustered RE $p = 0.047$). Each additional commissioner is associated with a 35.2-basis-point (0.352 pp) increase in ROA, representing a corrected sample-mean elasticity of $\epsilon_{\text{ROA, DK}} = +0.1654$.

c. Audit Committee (H_3 Supported): KA_{it} is positively and significantly associated with ROA_{it} ($B_{\text{exact}} = 0.0093$ [SPSS 3-decimal: 0.009], ROA%$B = 0.930$ pp, $SE = 0.0042, \beta = 0.134, t = 2.216, p = 0.027$; firm-clustered RE

$p = 0.038$), equivalent to 93.0 basis points per additional committee member and a sample-mean elasticity of $\epsilon_{\text{ROA, KA}} = +0.3038$.

In the first-stage mediator specification (Model 1 in Table 6), governance associations with Intellectual Capital efficiency (VAIC_{it}) diverge across board structures:

a. Executive and Supervisory Boards on VAIC (H_4 Supported; H_5 Supported): Both DD_{it} ($B = 0.7190, SE = 0.3547, \beta = 0.148, t = 2.027, p = 0.044$, clustered RE $p = 0.048, \epsilon_{\text{VAIC, DD}} = +0.1585$) and DK_{it} ($B = 1.5790, SE = 0.3714, \beta = 0.293, t = 4.251, p < 0.001$, clustered RE $p = 0.001, \epsilon_{\text{VAIC, DK}} = +0.2969$) are positively and significantly associated with VAIC_{it}. However, a linear Wald test of coefficient equality ($H_0: \beta_1 = \beta_2$) yields $\Delta B = 1.5790 - 0.7190 = 0.8600$ ($SE_{\Delta} = 0.5824, F_{\text{Wald}} = 2.18, p = 0.141$), indicating that while the supervisory point estimate is numerically larger, the difference between DK_{it} and DD_{it} slopes is not statistically significant at the 5% level.

b. Audit Committee on VAIC (H_6 Not Supported): KA_{it} yields a statistically non-significant point estimate of $B = -0.8590$ ($SE = 0.9357, \beta = -0.056, t = -0.918, p = 0.359$; clustered RE $p = 0.412$), with a wide 95% confidence interval of $[-2.700, +0.982]$ that encompasses both negative and positive values. Accordingly, H_6 is Not Supported.

c. Intellectual Capital on ROA (H_7 Supported): In Model 2b, VAIC_{it} is positively and significantly associated with ROA_{it} ($B_{\text{exact}} = 0.0007015$ [SPSS 3-decimal: 0.001], ROA%$B = 0.0702$ pp, $SE = 0.000251, \beta = 0.155, t = 2.795, p = 0.006$; clustered RE $p = 0.011$). Using the exact unrounded slope, a one-standard-deviation increase in VAIC_{it} ($+10.9806$ units) is associated with a 0.77 percentage-point (77.0 bps, or 7.46% of mean ROA) increase in asset profitability, corresponding to a corrected elasticity of $\epsilon_{\text{ROA, VAIC}} = +0.1755$.

Comparing the baseline outcome specification without VAIC_{it} (Model 2a) against the full specification (Model 2b) formally quantifies the attenuation of the control variables. In Model 1, Lev_{it} is negatively associated with VAIC_{it} ($B = -9.8240, p = 0.009, \epsilon = -0.1262$), whereas Size_{it} is positively associated with VAIC_{it} ($B = 1.0560, p = 0.022$, corresponding to $+0.41\%$ higher VAIC per 10% asset expansion). In Model 2a (excluding VAIC_{it}), Lev_{it} exhibits a statistically significant negative total association with ROA% ($B = -3.400$ pp, $t = -2.012, p = 0.045$), which attenuates by 20.3% to -2.711 pp ($t = -1.598, p = 0.111$) once VAIC_{it} is controlled in Model 2b, whereas Size_{it} is statistically

non-significant in both Model 2a ($p = 0.195$) and Model 2b ($p = 0.100$).

3. Joint Multivariable Cluster-Bootstrapped Mediation Versus Bivariate Specification Bias

To resolve the methodological discrepancy between single-variable PROCESS runs (which omit concurrent board organs and firm controls) and the multivariable regression system, Table 7 reports both the unadjusted bivariate PROCESS Model 4 outputs and the joint multivariable mediation estimates (controlling simultaneously for DD_{it}, DK_{it}, KA_{it}, Lev_{it}, and Size_{it}) using 5,000 firm-clustered bootstrap resamples.[33]

Table 7. Bivariate Versus Joint Multivariable Cluster-Bootstrapped Mediation ($N = 325$)

Pathway & Specification	**Stage 1 (ak) & Stage 2 (b)**	**Direct Effect ck′ [ROA%]**	**Indirect Effect akb [ROA%]**	**95% Cluster BootCI [Share / Verdict]**
Panel A: Bivariate PROCESS	**No Controls**	**(Omitted-Board Bias)**	**Obs. Bootstrap**	**Unadjusted Benchmark**
DD → VAIC → ROA	$a_1 = 1.5415, b = 0.0008$	0.0059 [0.590 pp]	0.0013 [0.130 pp]	[0.0005, 0.0022] (18.06%)
DK → VAIC → ROA	$a_2 = 1.9633, b = 0.0007$	0.0071 [0.710 pp]	0.0015 [0.150 pp]	[0.0004, 0.0026] (17.44%)
KA → VAIC → ROA	$a_3 = 2.2491, b = 0.0011$	0.0171 [1.710 pp]	0.0024 [0.240 pp]	[0.0009, 0.0043] (12.31%)
Panel B: Joint Multivariable	**All Organs & Controls**	**Exact Ratio [ROA%]**	**Exact $a_k b$ [ROA%]**	**Firm-Clustered** BootCI
DD → VAIC → ROA (H_8)	$\beta_1 = 0.7190, \lambda = 0.0007$	0.0048 [0.479 pp]	0.0005 [0.050 pp]	[0.0001, 0.0011] (9.52% Supported)
DK → VAIC → ROA (H_9)	$\beta_2 = 1.5790, \lambda = 0.0007$	0.0035 [0.352 pp]	0.0011 [0.111 pp]	[0.0003, 0.0021] (23.95% Supported)
KA → VAIC → ROA (H_{10})	$\beta_3 = -0.8590, \lambda = 0.0007$	0.0093 [0.930 pp]	-0.0006 [-0.060 pp]	[-0.0021, 0.0007] (Not Supported)
Lev → VAIC → ROA (Aux.)	$\gamma_1 = -9.8240, \lambda = 0.0007$	-0.0271 [-2.711 pp]	-0.0069 [-0.689 pp]	[-0.0134, -0.0016] (20.26% Indirect)

Source: Authors' estimation using SPSS PROCESS Macro Model 4 with covariates and Stata 18 firm-clustered bootstrap (5,000 resamples, 2026).
Notes: In Panel B, exact unrounded second-stage slope $\lambda = 0.0007015$ (0.0702 pp) is applied; if evaluated at the 3-decimal rounded slope ($\lambda = 0.001$), joint indirect point estimates equal +0.0007 (DD, 12.7% share), +0.0016 (DK, 31.4% share), and −0.0009 (KA).

Comparing Panel A and Panel B in Table 7 demonstrates why applying a uniform multivariable standard across all three governance organs is essential:

a. Omitted-Variable Inflation in Bivariate Models (Panel A): When each governance mechanism is entered alone into PROCESS Model 4 without controlling for the other two organs, Lev_{it}, and Size_{it}, positive collinearity

[33] Andrew F. Hayes, *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 3rd ed. (New York: The Guilford Press, 2022), 79–118; Xinshu Zhao, John G. Lynch Jr., and Qimei Chen, "Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis," *Journal of Consumer Research* 37, no. 2 (2010): 197–206, https://doi.org/10.1086/651257.

among board sizes (VIF $\in [1.44,2.09]$) inflates first-stage slopes to $a_1 = 1.5415$ (DD), $a_2 = 1.9633$ (DK), and $a_3 = 2.2491$ (KA), yielding apparent indirect effects of 0.0013 (18.06% mediated share for DD), 0.0015 (17.44% mediated share for DK), and 0.0024 (KA).

b. Joint Multivariable Mediation for Board of Directors (H_8 Supported, Panel B): When DK_{it}, KA_{it}, Lev_{it}, and Size_{it} are jointly controlled, the first-stage executive slope moderates to $\beta_1 = 0.7190$, yielding an exact multivariable indirect effect of $\beta_1\lambda = 0.7190 \times 0.0007015 = 0.000504$ (+0.050 pp or 5.04 bps per director; +0.0007 under rounded $\lambda = 0.001$). Because the 95% firm-clustered bootstrap confidence interval [0.0001,0.0011] ([0.010 pp, 0.110 pp]) excludes zero, H_8 remains Supported as complementary partial mediation, but the true mediated share of the total executive effect ($c_1 = 0.004794 + 0.000504 = 0.005298$) is 9.52% (or 12.68% under rounded λ), roughly half of the unadjusted bivariate estimate.

c. Joint Multivariable Mediation for Board of Commissioners (H_9 Supported, Panel B): Controlling for concurrent organs and firm characteristics yields a multivariable indirect effect for DK_{it} of $\beta_2\lambda = 1.5790 \times 0.0007015 = 0.001108$ (+0.111 pp or 11.08 bps per commissioner; +0.0016 under rounded $\lambda = 0.001$), with a 95% firm-clustered confidence interval of [0.0003,0.0021] ([0.030 pp, 0.210 pp]) that strictly excludes zero. Relative to the multivariable total supervisory effect ($c_2 = 0.003517 + 0.001108 = 0.004625$), Intellectual Capital mediates 23.95% of the Board of Commissioners' total association with ROA, confirming complementary partial mediation (H_9 Supported).

d. Joint Multivariable Non-Mediation for Audit Committee (H_{10} Not Supported, Panel B): Once DD_{it} and DK_{it} (which shares an independent commissioner with KA_{it} under POJK No. 55/POJK.04/2015) are controlled, the indirect path for KA_{it} is $\beta_3\lambda = -0.8590 \times 0.0007015 = -0.000602$ (−0.060 pp; −0.0009 under rounded λ), with a 95% firm-clustered bootstrap confidence interval of $[-0.0021, +0.0007]$ ([−0.210 pp, +0.070 pp]) that straddles zero. Hypothesis H_{10} is therefore Not Supported.

e. Auxiliary Indirect Channel of Leverage: Panel B also formally tests the indirect pathway of Lev_{it} through VAIC_{it} ($\gamma_1\lambda = -9.8240 \times 0.0007015 = -0.00689$,

or -0.689 pp), which yields a 95% firm-clustered confidence interval of $[-0.0134, -0.0016]$ excluding zero, accounting for 20.26% ($-0.689/-3.400$) of the total negative association between liability intensity and ROA%.

4. Robustness, Component Disaggregation, Sample Selection, and Institutional Heterogeneity

To address mechanical accounting overlap between VAIC_{it} and ROA_{it}, sample truncation from the $\text{EBT} > 0$ screen, dynamic endogeneity, and institutional heterogeneity across state-owned versus private issuers, Table 8 summarizes nine identification and heterogeneity checks.[34]

Table 8. Robustness, Identification, and Heterogeneity Specifications (ROA% **Outcome)**

Specification / Subsample (N)	DD Slope (p-val)	DK Slope (p-val)	KA Slope (p-val)	Mediator Slope [DK→Med→ROA% CI]
1. Component Mediator: VACA_{it} (325)	0.461 (0.005)	0.340 (0.044)	0.892 (0.033)	4.812 ($p = 0.001$) [0.024, 0.165]
2. Component Mediator: VAHU_{it} (325)	0.482 (0.004)	0.355 (0.041)	0.931 (0.028)	0.068 ($p = 0.008$) [0.028, 0.198]
3. Component Mediator: STVA_{it} (325)	0.512 (0.002)	0.418 (0.018)	0.884 (0.036)	14.25 ($p = 0.042$) [-0.012, 0.089]
4. Modified IC: MVAIC_{it} (325)	0.471 (0.004)	0.348 (0.043)	0.918 (0.030)	0.064 ($p = 0.009$) [0.025, 0.184]
5. Lagged Chain: $\text{GCG}_{t-1} \rightarrow \text{VAIC}_t \rightarrow \text{ROA}_{t+1}$ (195)	0.435 (0.014)	0.328 (0.048)	0.840 (0.045)	0.058 ($p = 0.019$) [0.014, 0.162]
6. Two-Step System-GMM (260)	0.412 (0.021)	0.315 (0.049)	0.795 (0.046)	0.054 ($p = 0.024$) [AR(2) $p = 0.342$]
7. Expanded $\text{VA} > 0$ Sample (482)	0.448 (0.006)	0.331 (0.039)	0.865 (0.034)	0.052 ($p = 0.015$) [0.018, 0.156]
8a. Subsample: State-Owned SOEs (25)	0.390 (0.082)	0.612 (0.011)	1.140 (0.019)	0.089 ($p = 0.009$) [0.041, 0.312]
8b. Subsample: Private Issuers (300)	0.491 (0.003)	0.329 (0.046)	0.905 (0.032)	0.068 ($p = 0.008$) [0.024, 0.195]
9. Tightening Regime: 2022–2024 (195)	0.465 (0.009)	0.378 (0.032)	0.960 (0.025)	0.074 ($p = 0.007$) [Lev × Post22 $= -4.12$]

Source: Authors' robustness estimations using Stata 18 (2026).
Notes: Dependent variable is ROA% (percentage points); all models include Lev_{it}, Size_{it}, year fixed effects, and firm-clustered standard errors; last column reports the mediator's slope on ROA% and the 95% cluster-bootstrap confidence interval for the DK indirect effect (or Hansen/Arellano-Bond diagnostics in Row 6 and interaction slope in Row 9).

[34] Sriranga Vishnu and Vijay Kumar Gupta, "Intellectual Capital and Performance of Pharmaceutical Firms in India," *Journal of Intellectual Capital* 15, no. 1 (2014): 83–99, https://doi.org/10.1108/JIC-04-2013-0049; M. Babajide Wintoki, James S. Linck, and Jeffry M. Netter, "Endogeneity and the Dynamics of Internal Corporate Governance," *Journal of Financial Economics* 105, no. 3 (2012): 581–606, https://doi.org/10.1016/j.jfineco.2012.03.005; Richard Blundell and Stephen Bond, "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models," *Journal of Econometrics* 87, no. 1 (1998): 115–143, https://doi.org/10.1016/S0304-4076(98)00009-8; Rr. Sri Saraswati, Winwin Yadiati, Harry Suharman, and Roebiandini Soemantri, "Corporate Governance, Intellectual Capital, and Organizational Culture: Their Influence on Lean Manufacturing and Firm Value," *Cogent Business & Management* 11, no. 1 (2024): 2382335, https://doi.org/10.1080/23311975.2024.2382335.

The sensitivity results in Table 8 establish four key empirical regularities across alternative estimators and subsamples:

a. Disaggregated VAIC Components and Modified MVAIC (Rows 1–4): Estimating each component separately confirms that positive mediation for DD_{it} and DK_{it} is driven jointly by Capital Employed Efficiency (VACA_{it}: $B = 4.812$ pp, $p = 0.001$) and Human Capital Efficiency (VAHU_{it}: $B = 0.068$ pp, $p = 0.008$), whereas Structural Capital Efficiency ($\mathrm{STVA}_{it} = 1 - 1/\mathrm{VAHU}_{it}$) exhibits a non-significant indirect bootstrap interval ($[-0.012, +0.089]$) once isolated from VAHU_{it}. Replacing VAIC_{it} with Vishnu and Gupta's Modified MVAIC_{it} (incorporating R&D and relational marketing costs, Row 4) preserves both the direct governance slopes and partial mediation.

b. Temporal Lagged Identification and Dynamic System-GMM (Rows 5–6): To break contemporaneous accounting overlap between VA_{it} and ROA_{it} and mitigate reverse causality (profitable firms expanding board headcounts), Row 5 lags governance to $t - 1$, VAIC to t, and ROA% to $t + 1$ ($N = 195$). The lagged $\mathrm{VAIC}_t \rightarrow \mathrm{ROA\%}_{t+1}$ slope remains positive and statistically significant ($B = 0.058$ pp, $p = 0.019$), and two-step System-GMM estimation (Row 6, instrumenting board variables with $t - 2$ lags; Arellano-Bond AR(2)$p = 0.342$, Hansen $Jp = 0.418$) confirms positive parameter stability across all three organs and VAIC_{it}.

c. Sample Selection Sensitivity Retaining Loss-Making Firms with $\mathrm{VA}_{it} > 0$ (Row 7): Relaxing the $\mathrm{EBT}_{it} > 0$ filter to retain all consecutively listed Rupiah-reporting firm-years with positive Value Added ($\mathrm{VA}_{it} > 0, \mathrm{HC}_{it} > 0$, expanding the sample to 482 firm-years across 104 firms, including firms with negative net income) with 1% winsorization yields a positive and significant $\mathrm{VAIC}_{it} \rightarrow \mathrm{ROA\%}_{it}$ slope of 0.052 pp ($p = 0.015$) and preserves partial mediation for DD_{it} and DK_{it}. By contrast, including raw unweighted observations where $\mathrm{VA}_{it} < 0$ (not tabulated) flips the unadjusted STVA_{it} ratio and attenuates the VAIC_{it} slope toward zero ($B = -0.011$ pp, $p = 0.284$), empirically confirming the boundary condition of Pulic's denominator.

d. State-Owned Enterprise (SOE) Heterogeneity and Monetary Tightening Regime (Rows 8a–9): Splitting the sample between state-owned manufacturing enterprises ($N = 25$ firm-years) and private issuers ($N = 300$)

reveals that supervisory Board of Commissioners (DK_{it}: $B = 0.612$ pp, $p = 0.011$) and Audit Committee (KA_{it}: $B = 1.140$ pp, $p = 0.019$) slopes are substantially larger in SOEs, whereas executive Board of Directors (DD_{it}: $B = 0.491$ pp, $p = 0.003$) dominates in private manufacturers. Finally, isolating the 2022–2024 monetary tightening regime (Row 9) and interacting interest-bearing debt with a post-2022 indicator confirms that the negative association of financial leverage with VAIC_{it} and $\mathrm{ROA\%}_{it}$ intensifies significantly during high-interest-rate years (Lev × Post2022 $= -4.12$ pp, $p = 0.018$).

C. DISCUSSION

1. Theoretical Operationalization: Functional Demarcation of Decision Management, Supervisory Control, and Value-Added Efficiency in Two-Tier Boards

The multivariable panel and cluster-bootstrapped mediation findings in Section B adjudicate between two contending theoretical predictions in corporate governance economics: the agency-monitoring hypothesis pioneered by Jensen and Meckling and Fama and Jensen, and the board-coordination friction hypothesis advanced by Yermack and Adams, Hermalin, and Weisbach.[35] Rather than supporting the view that larger statutory boards suffer from free-rider paralysis in emerging markets, the positive and statistically significant direct slopes across all three governance structures in Model 2b—the Board of Directors ($\theta_1 = 0.479$ pp, $\epsilon_{\mathrm{ROA,\,DD}} = +0.2643, p = 0.008$), the Board of Commissioners ($\theta_2 = 0.352$ pp, $\epsilon_{\mathrm{ROA,\,DK}} = +0.1654, p = 0.047$), and the Audit Committee ($\theta_3 = 0.930$ pp, $\epsilon_{\mathrm{ROA,\,KA}} = +0.3038, p = 0.038$)—support Fama and Jensen's (1983) separation of decision management from decision control within Indonesia's mandatory two-tier corporate law architecture. However, when Agency Theory is integrated with Barney's (1991, 2001) Resource-Based View (RBV) and Freeman's (1984) Stakeholder Theory via Zhao, Lynch, and Chen's (2010) mediation framework, our disaggregated

[35] Michael C. Jensen and William H. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics* 3, no. 4 (1976): 305–360, https://doi.org/10.1016/0304-405X(76)90026-X; Eugene F. Fama and Michael C. Jensen, "Separation of Ownership and Control," *The Journal of Law and Economics* 26, no. 2 (1983): 301–325, https://doi.org/10.1086/467037; David Yermack, "Higher Market Valuation of Companies with a Small Board of Directors," *Journal of Financial Economics* 40, no. 2 (1996): 185–211, https://doi.org/10.1016/0304-405X(95)00844-5; Renée B. Adams, Benjamin E. Hermalin, and Michael S. Weisbach, "The Role of Boards of Directors in Corporate Governance: A Conceptual Framework and Survey," *Journal of Economic Literature* 48, no. 1 (2010): 58–107, https://doi.org/10.1257/jel.48.1.58.

estimations demonstrate that internal governance mechanisms operate through two distinct institutional channels: a direct compliance-and-monitoring channel shared by all three organs, and a selective operational value-added efficiency channel (VAIC_{it}) activated by the executive and supervisory boards but bypassed by the Audit Committee.[36]

Dissecting the executive decision-management chain ($\mathrm{DD}_{it} \rightarrow \mathrm{VAIC}_{it} \rightarrow \mathrm{ROA}_{it}$) clarifies how executive board capacity shapes both asset utilization and workforce productivity. Under Article 92 of Law No. 40 of 2007 and Financial Services Authority Regulation (POJK) No. 33/POJK.04/2014, the Board of Directors (*Direksi*) exercises direct statutory authority over production scheduling, input procurement, working-capital allocation, and labor deployment. In capital-intensive manufacturing corporations, expanding the executive board distributes functional responsibility across specialized operational directors, curbing unilateral chief-executive rent-seeking and directly raising ROA by 47.9 basis points per director (H_1 supported). Concurrently, in the first-stage mediator equation (H_4 supported: $\beta_1 = 0.7190, \epsilon_{\mathrm{VAIC,\,DD}} = +0.1585, p = 0.048$), larger executive boards are positively associated with Intellectual Capital efficiency. In strict adherence to the mathematical structure of Pulic's index and the critiques of Ståhle, Ståhle, and Aho and Iazzolino and Laise, this positive β_1 coefficient must be interpreted as an operational productivity effect rather than a raw intangible expenditure effect. Because $\mathrm{VAHU}_{it} = \mathrm{VA}_{it}/\mathrm{HC}_{it}$ measures corporate value added ($\mathrm{OUT}_{it} - \mathrm{IN}_{it}$) generated per Rupiah of PSAK 24 employee benefit expense (HC_{it}), an increase in HC_{it} alone would mathematically depress VAHU_{it} unless accompanied by a more than proportional expansion in operating value added. As verified by the component-level disaggregation in Table 8 (Rows 1–2), executive directors elevate VAIC_{it} by optimizing the deployment of physical/financial capital (VACA_{it}) and raising labor value-added productivity (VAHU_{it}), which subsequently transmits 9.52% ($\beta_1\lambda = 0.050$ pp, 95% cluster BootCI [0.0001,0.0011]) of the executive board's total association with ROA (H_8

[36] Jay Barney, "Firm Resources and Sustained Competitive Advantage," *Journal of Management* 17, no. 1 (1991): 99–120, https://doi.org/10.1177/014920639101700108; Jay Barney, Mike Wright, and David J. Ketchen Jr., "The Resource-Based View of the Firm: Ten Years After 1991," *Journal of Management* 27, no. 6 (2001): 625–641, https://doi.org/10.1177/014920630102700601; R. Edward Freeman, *Strategic Management: A Stakeholder Approach* (Boston: Pitman Publishing, 1984), 31–48; Xinshu Zhao, John G. Lynch Jr., and Qimei Chen, "Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis," *Journal of Consumer Research* 37, no. 2 (2010): 197–206, https://doi.org/10.1086/651257.

supported as complementary partial mediation).[37]

Dissecting the supervisory decision-control chain ($\mathrm{DK}_{it} \rightarrow \mathrm{VAIC}_{it} \rightarrow \mathrm{ROA}_{it}$) explains why the non-executive Board of Commissioners (*Dewan Komisaris*) serves as a robust catalyst for intangible efficiency (H_5 supported: $\beta_2 = 1.5790, \epsilon_{\mathrm{VAIC,\,DK}} = +0.2969, p = 0.001$), transmitting 23.95% ($\beta_2\lambda = 0.111$ pp, 95% cluster BootCI [0.0003,0.0021]) of its total effect on ROA through VAIC_{it} (H_9 supported) alongside its direct 35.2-basis-point monitoring effect (H_2 supported). Under Article 108 of Law No. 40 of 2007, commissioners do not execute daily transactions; instead, they ratify corporate strategic plans, evaluate executive performance, and provide institutional counsel. From a combined Agency and Stakeholder Theory perspective, supervisory boards constrain executive short-termism and enforce cost discipline over non-labor operating inputs (IN_{it}), widening the value-added margin ($\mathrm{VA}_{it} = \mathrm{OUT}_{it} - \mathrm{IN}_{it}$) relative to both employed capital (VACA_{it}) and workforce compensation (VAHU_{it}). At the same time, econometric rigor requires caution when ranking the relative magnitudes of supervisory versus executive boards: although the first-stage point estimate for DK_{it} (1.5790) is numerically larger than that of DD_{it} (0.7190), the linear Wald test reported in Section B ($F_{\mathrm{Wald}} = 2.18, p = 0.141$) indicates that equality of the two slopes cannot be rejected at the 5% significance threshold. Thus, executive and supervisory boards should be viewed as complementary rather than hierarchically ranked drivers of value-added efficiency within Indonesia's two-tier governance system.

By contrast, dissecting the audit compliance pathway ($\mathrm{KA}_{it} \rightarrow \mathrm{ROA}_{it}$ versus $\mathrm{KA}_{it} \nrightarrow \mathrm{VAIC}_{it}$) accounts for why the Audit Committee exhibits a substantial positive direct association with ROA (H_3 supported: $\theta_3 = 0.930$ pp, $p = 0.038$) while both its first-stage association with VAIC_{it} (H_6 not supported: $\beta_3 = -0.8590, p = 0.359$, 95% CI $[-2.700, +0.982]$) and its multivariable indirect path (H_{10} not supported: $\beta_3\lambda = -0.060$ pp, 95% cluster BootCI $[-0.0021, +0.0007]$) are statistically indistinguishable from zero. Two institutional and econometric factors explain this divergence without over-interpreting a null point estimate as a negative causal effect. First, legally and

[37] Ante Pulic, "VAIC™ – An Accounting Tool for IC Management," *International Journal of Technology Management* 20, nos. 5–8 (2000): 702–714, https://doi.org/10.1504/IJTM.2000.002891; Daniel Andriessen, *Making Sense of Intellectual Capital: Designing a Method for the Valuation of Intangibles* (Burlington, MA: Elsevier Butterworth-Heinemann, 2004), 92–108; Pirjo Ståhle, Sten Ståhle, and Samuli Aho, "Value Added Intellectual Coefficient (VAIC): A Critical Analysis," *Journal of Intellectual Capital* 12, no. 4 (2011): 531–551, https://doi.org/10.1108/14691931111181715; Gianpaolo Iazzolino and Domenico Laise, "Value Added Intellectual Coefficient (VAIC): A Methodological and Empirical Critique," *Journal of Intellectual Capital* 14, no. 4 (2013): 547–563, https://doi.org/10.1108/JIC-12-2012-0107.

structurally, under Article 121 of Law No. 40 of 2007 and POJK No. 55/POJK.04/2015, the Audit Committee is not an autonomous third tier of corporate management; rather, it is an auxiliary committee established by and accountable to the Board of Commissioners and chaired by an Independent Commissioner. When KA_{it} is estimated in a bivariate model that omits DK_{it} and DD_{it} (Table 7, Panel A), KA_{it} absorbs omitted supervisory board variance and appears positively associated with VAIC_{it} ($a_3 = 2.2491, p = 0.0081$). Once DK_{it} and DD_{it} are simultaneously controlled in Model 1, the independent partial variance of KA_{it}—which is heavily compressed around the statutory minimum of three members ($\mathrm{Mean} = 3.38, \mathrm{SD} = 0.72$)—carries no statistically significant explanatory power for operational value-added efficiency. Second, functionally, the statutory mandate of the Audit Committee under POJK No. 55/POJK.04/2015 is anchored in *ex-post* financial reporting verification, internal control auditing, and regulatory compliance. By deterring accounting misstatements, asset overvaluation, and related-party tunneling—such as the financial reporting violations sanctioned by OJK at PT Indo Pureco Pratama Tbk and PT Tianrong Chemical Industry Tbk—robust audit committees directly safeguard bottom-line net income (ROA_{it}) without altering factory-floor labor or capital value-added ratios (VAIC_{it}).[38]

Furthermore, our component, lagged, and auxiliary mediation checks operationalize how accounting structure and financial obligations interact with intangible efficiency. Because $\mathrm{STVA}_{it} = 1 - (1/\mathrm{VAHU}_{it})$ is a deterministic nonlinear function of VAHU_{it} and $\mathrm{VA}_{it} - \mathrm{HC}_{it}$ equals EBITDA, contemporaneous $\mathrm{VAIC}_{it} \rightarrow \mathrm{ROA}_{it}$ estimates ($\lambda = 0.0702$ pp, $\epsilon_{\mathrm{ROA,\,VAIC}} = +0.1755, p = 0.011$) reflect both operational capability efficiency and partial accounting overlap. However, the persistence of a statistically significant positive link in the temporally ordered chain ($\mathrm{GCG}_{t-1} \rightarrow \mathrm{VAIC}_t \rightarrow \mathrm{ROA}_{t+1}, B = 0.058$ pp, $p = 0.019$), two-step System-GMM ($B = 0.054$ pp, $p = 0.024$), and Modified

[38] Republic of Indonesia, *Undang-Undang Republik Indonesia Nomor 40 Tahun 2007 tentang Perseroan Terbatas* [Law of the Republic of Indonesia No. 40 of 2007 on Limited Liability Companies], State Gazette of the Republic of Indonesia Year 2007 No. 106, Supplement to the State Gazette No. 4756, arts. 92, 108, and 121; Otoritas Jasa Keuangan, *Peraturan Otoritas Jasa Keuangan Nomor 55/POJK.04/2015 tentang Pembentukan dan Pedoman Pelaksanaan Kerja Komite Audit* [OJK Regulation No. 55/POJK.04/2015 on the Establishment and Implementation Guidelines of the Audit Committee], State Gazette of the Republic of Indonesia Year 2015 No. 306, Supplement to the State Gazette No. 5780, arts. 4 and 7; Andrew Christian Sudjono and Amelia Setiawan, "Audit Committee's Roles & Effectiveness: Evidence from Indonesia," *Sriwijaya International Journal of Dynamic Economics and Business* 8, no. 2 (2024): 183–208, https://doi.org/10.29259/sijdeb.v8i2.183-208; Apri Darwanti and Desi Purwasih, "Pengaruh Intellectual Capital, Struktur Modal dan Komite Audit Terhadap Kinerja Keuangan," *Jurnal Akuntansi Barelang* 9, no. 1 (2024): 1–12, https://doi.org/10.33884/jab.v9i1.9124.

MVAIC_{it} incorporating R&D and marketing outlays ($B = 0.064$ pp, $p = 0.009$) in Table 8 confirms that past governance-driven gains in human and physical capital efficiency carry forward into subsequent corporate earnings.[39] Similarly, consistent with Myers' (1977) Debt Overhang Theory, the auxiliary mediation test in Table 7 Panel B confirms that 20.26% ($\gamma_1\lambda = -0.689$ pp, 95% cluster BootCI $[-0.0134, -0.0016]$) of the negative total association between total liability intensity (Lev_{it}) and ROA% (-3.400 pp in Model 2a) operates indirectly through reduced value-added efficiency ($\gamma_1 = -9.8240, p = 0.016$), an effect that intensifies significantly for interest-bearing debt during the 2022–2024 monetary tightening cycle (Table 8, Row 9).[40]

2. Scholarly Debate: Resolving Empirical Divergences Across Governance, Ownership, and VAIC Specifications

Situating our standardized parameter estimates (β) and sample-mean elasticities (ϵ) against prior empirical studies resolves three recurring controversies in the corporate governance and intellectual capital literature. Table 9 synthesizes how the present findings confirm, extend, or qualify eight prior empirical studies across comparable manufacturing and state-owned enterprise contexts.

Table 9. Comparative Synthesis of Empirical Studies on Governance, Intellectual Capital, and Performance

Study & Context	Sample & Estimator	Key Reported Finding	Standardized / Elasticity Metric	Position and Empirical Explanation in Present Study
Jalih et al. (2024) IDX Manuf.	178 firms (2015–2021) Path Analysis	GCG → IC → ROA Not Supported	Indirect $p >$ 0.05 (Ownership proxies)	**Extends:** Internal boards (DD 9.52%,DK 23.95%) mediate, whereas passive ownership proxies do not
Mondal & Sahu (2024) India BSE	76 Manuf. firms (2015–2021) Panel	Board Size → ROA & Tobin's Q Pos.	ROA slope > 0 ($p < 0.05$)	**Confirms & Extends:** Disaggregates unitary board effect into two-tier DD ($\beta = 0.218$) and DK ($\beta = 0.144$)
Sari et al. (2023) IDX Manuf.	88 Manuf. firms (2016–2021) Panel	DD → ROA Pos.; DK,KA →	DD $p < 0.05$; DK,KA $p > 0.05$	**Confirms** DD / **Qualifies** DK,KA**:** Controlling VAIC in 2020–2024 survivor panel yields DK $p =$

[39] Sriranga Vishnu and Vijay Kumar Gupta, "Intellectual Capital and Performance of Pharmaceutical Firms in India," *Journal of Intellectual Capital* 15, no. 1 (2014): 83–99, https://doi.org/10.1108/JIC-04-2013-0049; M. Babajide Wintoki, James S. Linck, and Jeffry M. Netter, "Endogeneity and the Dynamics of Internal Corporate Governance," *Journal of Financial Economics* 105, no. 3 (2012): 581–606, https://doi.org/10.1016/j.jfineco.2012.03.005.

[40] Stewart C. Myers, "Determinants of Corporate Borrowing," *Journal of Financial Economics* 5, no. 2 (1977): 147–175, https://doi.org/10.1016/0304-405X(77)90015-0; Hanis Galih Pramesti, Beti Nurbaiti, and Pratiwi Nila Sari, "Pengaruh Good Corporate Governance dan Leverage Terhadap Kinerja Keuangan Perusahaan (Studi Empiris Pada Perusahaan Manufaktur Sub Sektor Makanan dan Minuman yang Terdaftar di Bursa Efek Indonesia Periode Tahun 2019–2022)," *Indonesian Journal of Economics and Strategic Management* 2, no. 1 (2024): 7–22, https://journal.drafpublisher.com/ijesm/article/view/111.

		ROA Null		0.047,KA $p = 0.038$
Yuandri & Keristin (2025) IDX	45 Consumer firms (2020–2023) OLS	DD → ROA Neg.; IC → ROA Pos.	DD $t < -1.96$; IC $t > 1.96$	**Confirms** IC / **Refutes** DD **Sign:** Broader 65-firm multi-subsector panel with Size & Lev controls yields $\beta_{DD} = +0.218$
Allan et al. (2020) IDX Manuf.	144 Manuf. firms (2014–2018) OLS	IC → ROE Neg.; GCG → ROE Pos.	IC slope < 0 ($p < 0.05$)	**Qualifies via** VA > 0 **Filter:** Table 8 Row 7 shows VA > 0 preserves positive IC slope ($p = 0.015$), whereas VA < 0 inverts STVA
Habibi & Muid (2024) IDX LQ45	45 LQ45 firms (2019–2021) Panel	DD,KA → ROA & ROE Pos.	DD,KA $p < 0.05$; Ind. Com. Null	**Confirms:** Aligns with positive direct DD ($\epsilon = +0.264$) and KA ($\epsilon = +0.304$) elasticities in profitable issuers
Ramadhani & Agustin (2021) SOE	21 IDX SOEs (2015–2019) Panel	VAIC,DK → ROE Pos.	VAIC,DK $p < 0.05$	**Confirms & Extends:** Table 8 Row 8a confirms stronger DK slope (0.612 pp) in manufacturing SOEs vs private firms
Avilya & Ghozali (2022) IDX	87 Manuf. firms (2018–2020) PLS-SEM	IC → ROA Pos.; GCG → ROA Null	IC $p < 0.05$; GCG $p > 0.05$	**Extends:** Disaggregating board size headcounts (DD,DK,KA) from ownership/independence indices restores direct significance

Source: Authors' comparative synthesis of prior empirical studies and internal specification checks (2026).

First, confronting the mediation discrepancy with Jalih, Widyowati, and Rani (2024) and Avilya and Ghozali highlights the analytical importance of how corporate governance is operationalized and estimated. Jalih et al. examined 178 IDX manufacturing firms (2015–2021) and reported that Intellectual Capital did not significantly mediate the link between Good Corporate Governance and ROA. However, their model measured governance exclusively via external equity ownership shares (*managerial ownership* and *institutional ownership*). Passive external blockholders do not directly manage production floors or ratify operational budgets. By shifting the governance construct to internal statutory organs ($\mathrm{DD}_{it}, \mathrm{DK}_{it}, \mathrm{KA}_{it}$), our study demonstrates that executive and supervisory boards actively shape value-added efficiency. Equally important, our comparison between Panel A and Panel B of Table 7 shows that estimating mediation one organ at a time (without controlling for concurrent board organs, leverage, and size) artificially inflates the executive mediation share to 18.06% and generates a spurious positive indirect effect for the Audit Committee (12.31%). When all three organs and both controls are estimated jointly with firm-clustered bootstrap resamples (Table 7, Panel B), the executive mediation share is calibrated to 9.52% ($\beta_1\lambda = 0.050$ pp), the supervisory mediation share stands at 23.95% ($\beta_2\lambda = 0.111$ pp), and the Audit Committee indirect path becomes statistically non-significant (-0.060 pp, 95% CI [-0.210 pp, $+0.070$ pp]).[41]

[41] Jara Hardiyanti Jalih, Lestari Adhi Widyowati, and Inta Hartaningtyas Rani, "Mediasi Intellectual Capital: Good Corporate Governance dan Return on Assets pada Perusahaan Manufaktur," *Reviu Akuntansi dan Bisnis Indonesia* 8, no. 2 (2024): 136–155, https://doi.org/10.18196/rabin.v8i2.19145; Lesatanova

Second, confronting the sign reversal in Intellectual Capital reported by Allan, Sondakh, and Gamaliel—who found a negative association between VAIC and ROE across 144 IDX manufacturers (2014–2018)—against the positive findings of Soewarno and Tjahjadi, Ramadhani and Agustin, Avilya and Ghozali, Rengganis et al., Saraswati et al., and Yuandri and Keristin underscores the mathematical boundary conditions of Pulic's (2000) formula. In Pulic's specification, $\text{STVA}_{it} = (\text{VA}_{it} - \text{HC}_{it})/\text{VA}_{it}$. When a firm experiences an operating downturn where Value Added remains positive but falls below labor expenses ($0 < \text{VA}_{it} < \text{HC}_{it}$), Structural Capital ($\text{SC}_{it} = \text{VA}_{it} - \text{HC}_{it}$) turns negative, driving STVA_{it} into negative territory; conversely, if a firm suffers severe operating losses such that $\text{VA}_{it} < 0$, both the numerator ($\text{SC}_{it} < 0$) and denominator ($\text{VA}_{it} < 0$) are negative, producing an artificial positive spike in $\text{STVA}_{it} > 1.0$ for deeply loss-making firms. Rather than relying on conjecture, our sensitivity analysis in Table 8 (Row 7) tests this mechanism directly on the 2020–2024 IDX data: when we relax the baseline $\text{EBT}_{it} > 0$ screen and retain all 482 firm-years that satisfy Pulic's strict positivity condition ($\text{VA}_{it} > 0, \text{HC}_{it} > 0$, which includes net-loss firms whose value added still covers non-labor inputs), VAIC_{it} maintains a statistically significant positive slope on ROA% ($B = 0.052$ pp, $p = 0.015$), whereas including raw observations with $\text{VA}_{it} < 0$ distorts STVA_{it} and attenuates the VAIC_{it} slope to statistical insignificance ($B = -0.011$ pp, $p = 0.284$).[42]

Tricahya Avilya and Imam Ghozali, "Pengaruh Intellectual Capital, Good Corporate Governance dan Corporate Social Responsibility Terhadap Kinerja Keuangan Dengan Manajemen Laba Sebagai Variabel Mediasi," *Diponegoro Journal of Accounting* 11, no. 4 (2022): 1–15, https://ejournal3.undip.ac.id/index.php/accounting/article/view/36387.

[42] Fransisco Allan, Jullie J. Sondakh, and Hendrik Gamaliel, "Pengaruh Intellectual Capital, Corporate Social Responsibility dan Good Corporate Governance Terhadap Kinerja Perusahaan (Studi pada Perusahaan Manufaktur yang Terdaftar di Bursa Efek Indonesia)," *Jurnal Riset Akuntansi dan Auditing "Goodwill"* 11, no. 1 (2020): 44–58, https://doi.org/10.35800/jjs.v11i1.29034; Noorlailie Soewarno and Bambang Tjahjadi, "Measures That Matter: An Empirical Investigation of Intellectual Capital and Financial Performance of Banking Firms in Indonesia," *Journal of Intellectual Capital* 21, no. 6 (2020): 1085–1106, https://doi.org/10.1108/JIC-09-2019-0225; Aulia Ramadhani and Henri Agustin, "Pengaruh Intellectual Capital dan Corporate Governance Terhadap Kinerja Keuangan (Studi Empiris Pada Perusahaan BUMN yang Terdaftar di Bursa Efek Indonesia Tahun 2015–2019)," *Jurnal Eksplorasi Akuntansi* 3, no. 1 (2021): 67–81, https://doi.org/10.24036/jea.v3i1.336; Pipit Rengganis et al., "Intellectual Capital and Firm Performance: The Mediating Role of Governance," *NCAF: Proceeding of National Conference on Accounting & Finance* 5 (2023): 465–474, https://doi.org/10.20885/ncaf.vol5.art1; Rr. Sri Saraswati et al., "Corporate Governance, Intellectual Capital, and Organizational Culture: Their Influence on Lean Manufacturing and Firm Value," *Cogent Business & Management* 11, no. 1 (2024): 2382335, https://doi.org/10.1080/23311975.2024.2382335; Ria Yuandri and Usnia Wati Keristin, "Peran Intellectual Capital, Dewan Direksi dan Komisaris Independen Dalam Meningkatkan Kinerja Keuangan," *SOLUSI: Jurnal Ilmiah Bidang Ilmu Ekonomi* 23, no. 1 (2025): 110–125, https://doi.org/10.26623/slsi.v23i1.11260.

Third, regarding direct board-size effects across manufacturing subsamples, our positive direct estimates for DD_{it} ($\beta = 0.218$), DK_{it} ($\beta = 0.144$), and KA_{it} ($\beta = 0.134$) align with Mondal and Sahu in India, Liza and Daljono in Indonesian manufacturing, and Habibi and Muid in Indonesian LQ45 firms, while qualifying Sari, Ahmad, and Kurnianti and refuting the negative DD slope reported by Yuandri and Keristin. Sari et al. found DD positive and significant on ROA across 88 manufacturers (2016–2021) but reported null effects for DK and KA. As shown in our Table 6, the direct slopes of DK_{it} ($p = 0.040$ OLS; $p = 0.047$ clustered RE) and KA_{it} ($p = 0.027$ OLS; $p = 0.038$ clustered RE) are more modest in statistical significance than DD_{it} ($p = 0.003$ OLS; $p = 0.008$ clustered RE) and are particularly pronounced in state-owned enterprises and during the 2022–2024 post-pandemic window (Table 8, Rows 8a and 9). Meanwhile, whereas Yuandri and Keristin examined a single sub-sector (45 consumer non-cyclical firms during 2020–2023) without controlling for firm scale or leverage, our multi-subsector panel (spanning consumer non-cyclicals, basic materials/chemicals, and industrials in Table 3) controls for both $Size_{it}$ and Lev_{it}, isolating the positive managerial capacity effect of DD_{it} from scale-related overhead.[43]

3. Context Elevation and Global Impact: State-Owned Enterprise Governance, Industrial Upgrading, and Macroeconomic Tightening

Elevating these firm-level findings into the broader political economy of state and industrial development connects corporate governance directly to three macro-structural challenges in emerging markets: the governance of State-Owned Enterprises (SOEs), premature deindustrialization under the middle-income trap, and corporate vulnerability to global monetary tightening.

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[43] Subhas Mondal and Tarak Nath Sahu, "Is Corporate Governance Relevant to Firm Performance? Evidence from Indian Manufacturing Companies," *International Journal of Business Governance and Ethics* 18, no. 1 (2024): 1–24, https://doi.org/10.1504/IJBGE.2024.10060226; Ruth Theodora Liza and Daljono, "Pengaruh Good Corporate Governance Terhadap Kinerja Keuangan Perusahaan (Studi Empiris pada Perusahaan Manufaktur yang Terdaftar pada Bursa Efek Indonesia Periode 2016–2020)," *Diponegoro Journal of Accounting* 11, no. 4 (2022): 1–10, https://ejournal3.undip.ac.id/index.php/accounting/article/view/36366 [Official OJS permalink; journal does not assign Crossref DOIs]; Masandy Muhammad Rais Habibi and Dul Muid, "Pengaruh Good Corporate Governance Terhadap Kinerja Keuangan Perusahaan (Studi Empiris pada Perusahaan LQ45 yang Terdaftar di Bursa Efek Indonesia Tahun 2019–2021)," *Diponegoro Journal of Accounting* 13, no. 3 (2024): 1–15, https://ejournal3.undip.ac.id/index.php/accounting/article/view/46065 [Official OJS permalink; journal does not assign Crossref DOIs]; Rini Nurmala Sari, Gatot Nazir Ahmad, and Destria Kurnianti, "Pengaruh Karakteristik CEO dan Good Corporate Governance terhadap Kinerja Perusahaan pada Perusahaan Manufaktur di BEI," *Jurnal Bisnis, Manajemen, dan Keuangan* 4, no. 1 (2023): 294–314, https://doi.org/10.21009/jbmk.0401.21.

First, addressing the core scope of state economic research, our institutional subsample split between State-Owned Enterprises (SOEs) and Private Manufacturing Issuers (Table 8, Rows 8a and 8b) reveals a striking structural asymmetry in how two-tier governance operates across state versus private capital. In private manufacturing corporations ($N = 300$ firm-years), profitability is driven predominantly by the executive Board of Directors (DD: $B = 0.491$ pp, $p = 0.003$), reflecting entrepreneurial agility and operational control by private controlling shareholders. Conversely, in state-owned manufacturing enterprises and their listed subsidiaries ($N = 25$ firm-years, such as state cement and pharmaceutical issuers), the executive board slope is attenuated ($B = 0.390$ pp, $p = 0.082$), whereas the supervisory Board of Commissioners (DK: $B = 0.612$ pp, $p = 0.011$) and the Audit Committee (KA: $B = 1.140$ pp, $p = 0.019$) exert nearly double the marginal direct impact on ROA%, alongside a stronger DK → VAIC → ROA% mediation pathway (95% CI [0.041,0.312]). In Indonesian SOEs, dual agency problems arise because executive managers act as agents of state bureaucrats rather than dispersed private equity holders, creating heightened risks of political rent-seeking, delayed strategic execution (as seen in state energy infrastructure projects), and soft budget constraints. Under Ministry of State-Owned Enterprises (*Kementerian BUMN*) governance regulations, the Board of Commissioners and Audit Committee serve as the state's primary institutional check on executive discretion, explaining why supervisory and audit oversight carry substantially greater marginal weight in safeguarding SOE asset profitability and value-added efficiency.[44]

Second, from a development economics perspective, our elasticity estimates inform the structural debate on premature deindustrialization and the middle-income trap conceptualized by Rodrik and Eichengreen, Park, and Shin. According to World Bank and Statistics Indonesia (*Badan Pusat Statistik*, BPS) national accounts data, Indonesia's manufacturing value-added share of GDP declined structurally from a peak of 29.1% in 2001 to 19.8% in 2019 and hovered between 18.3% and 19.0% during 2020–2024, even as physical capital formation and IDX manufacturing listings expanded from 193 to 210 issuers.[45] Our panel regressions in Table 6 provide a microeconomic explanation for this

[44] Ramadhani and Agustin, "Pengaruh Intellectual Capital dan Corporate Governance Terhadap Kinerja Keuangan," 67–81, https://doi.org/10.24036/jea.v3i1.336; Nur Fadjrih Asyik et al., "Good Corporate Governance or Corporate Social Responsibility: Which Affects the Firm Value and Performance?," *Cogent Social Sciences* 10, no. 1 (2024): 2378540, https://doi.org/10.1080/23311886.2024.2378540.
[45] Dani Rodrik, "Premature Deindustrialization," *Journal of Economic Growth* 21, no. 1 (2016): 1–33, https://doi.org/10.1007/s10887-015-9122-3; Barry Eichengreen, Donghyun Park, and Kwanho Shin,

aggregate pattern: expanding physical asset scale (Size_{it}) exhibits no statistically significant direct association with ROA_{it} in either Model 2a ($B = -0.269$ pp, $p = 0.195$) or Model 2b ($B = -0.343$ pp, $p = 0.100$), and contributes to profitability only indirectly through its positive association with Intellectual Capital efficiency (Size → VAIC: $B = 1.0560, p = 0.031$, semi-elasticity +0.41% per 10% asset growth). Industrial corporations that accumulate physical plant and balance-sheet scale without strengthening executive and supervisory governance over human capital productivity (VAHU_{it}) and capital employed efficiency (VACA_{it}) fail to convert asset expansion into higher accounting returns.

Third, our regime-split and interaction estimates in Table 8 (Row 9) empirically link domestic corporate governance to the global financial cycle and monetary tightening (Rey 2015). Between August 2022 and April 2024, in response to global inflationary pressures and US Federal Reserve rate hikes, Bank Indonesia raised its benchmark policy rate (BI-Rate) by 275 basis points from 3.50% to 6.25%.[46] When we interact interest-bearing debt leverage with the 2022–2024 tightening regime indicator (Table 8, Row 9), the negative slope of financial leverage on ROA% deepens significantly (Lev × Post2022 = −4.12 pp, $p = 0.018$), while the marginal returns to supervisory board oversight (DK: $B = 0.378$ pp, $p = 0.032$) and audit compliance (KA: $B = 0.960$ pp, $p = 0.025$) strengthen. During monetary tightening regimes, rising interest expenses compress operating cash flows and erode value-added efficiency (Lev → VAIC: $B = -9.8240, p = 0.016$), making disciplined supervisory and audit governance essential to preserve corporate solvency and asset productivity.

Comparing these standardized governance and intangible elasticity metrics across emerging industrial jurisdictions highlights the institutional specificity of Indonesia's two-tier legal framework:

a. Two-Tier Civil Law (Indonesia) vs. Unitary Common Law Emerging Markets (India and Malaysia): In unitary board systems such as India and Malaysia, executive and non-executive directors sit on a single board where strategic resource allocation and monitoring are fused.[47] By disaggregating Indonesia's

"Growth Slowdowns Redux: New Evidence on the Middle-Income Trap," *Japan and the World Economy* 32 (2014): 65–84, https://doi.org/10.1016/j.japwor.2014.07.003.

[46] Hélène Rey, "Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence," *NBER Working Paper* No. 21162 (2015): 1–41, https://doi.org/10.3386/w21162.

[47] Norman Mohd Saleh, Mara Ridhuan Che Abdul Rahman, and Mohamat Sabri Hassan, "Ownership Structure and Intellectual Capital Performance in Malaysia," *Asian Academy of Management Journal of*

two-tier structure, our standardized betas demonstrate that while the executive *Direksi* carries a larger direct weight on short-term ROA ($\beta_1 = 0.218$ vs. $\beta_2 = 0.144$), the supervisory *Dewan Komisaris* accounts for a larger share of indirect value-added transmission (23.95% vs. 9.52%).

b. Boundary Conditions of Generalizability: To avoid over-generalizing from a single national cohort, three explicit boundary conditions govern these conclusions. First, our baseline parameter estimates generalize strictly to profitable or positive value-added ($\text{VA}_{it} > 0$) industrial corporations operating under two-tier Civil Law corporate statutes characterized by concentrated blockholder or state ownership. Second, because VAIC$^{\text{TM}}$ relies on accounting value added ($\text{OUT}_{it} - \text{IN}_{it}$) and treats employee wages as a denominator input ($\text{VAHU}_{it} = \text{VA}_{it}/\text{HC}_{it}$), these parameters do not generalize to pre-revenue R&D startups or distressed firms incurring negative value added ($\text{VA}_{it} \leq 0$). Third, within Indonesia, the balance between executive and supervisory governance differs across ownership regimes: executive board capacity is the primary direct driver in private manufacturing firms, whereas supervisory commissioners and audit committees are the primary drivers in state-owned manufacturing enterprises.

4. Theoretical Contributions, Mechanism-Driven Policy Implications, and Research Limitations

Theoretical, empirical, and policy contributions. Theoretically, this study extends the intersection of Agency Theory, Stakeholder Theory, and the Resource-Based View by establishing a disaggregated functional division of labor inside two-tier corporate boards: it demonstrates that while executive directors, supervisory commissioners, and audit committees all directly support asset profitability (ROA), only executive and supervisory boards operate through the intermediate channel of human and physical capital value-added efficiency ($\text{VAHU}_{it}, \text{VACA}_{it}$), whereas the Audit Committee operates strictly as a direct financial compliance mechanism. Empirically, this research contributes a rigorous methodological correction to the governance-mediation literature by demonstrating that single-predictor PROCESS models suffer from omitted-board inflation, recalibrating the

Accounting and Finance 5, no. 1 (2009): 1–29; Mondal and Sahu, "Is Corporate Governance Relevant to Firm Performance?," 1–24, https://doi.org/10.1504/IJBGE.2024.10060226; Vishnu and Gupta, "Intellectual Capital and Performance of Pharmaceutical Firms in India," 83–99, https://doi.org/10.1108/JIC-04-2013-0049.

true multivariable firm-clustered mediation shares to 9.52% for the Board of Directors and 23.95% for the Board of Commissioners, and verifying parameter stability across panel Random Effects, lagged chains, System-GMM, and expanded $\mathrm{VA}_{it} > 0$ samples. For public policy and state economic governance, the study provides differentiated empirical benchmarks for private issuers versus State-Owned Enterprises (SOEs).

Mechanism-driven policy and managerial implications**.** Each prescriptive implication flows directly from a verified econometric mechanism in Tables 6–8:

a. For Corporate Boards and CFOs (Aligning Labor Productivity and Liability Structure): Because our component-level estimates (Table 8, Rows 1–3) prove that the positive $\mathrm{VAIC}_{it} \rightarrow \mathrm{ROA\%}_{it}$ slope (0.0702 pp per unit; +77.0 bps per SD) is driven by Human Capital Efficiency ($\mathrm{VAHU}_{it} = \mathrm{VA}_{it}/\mathrm{HC}_{it}$) and Capital Employed Efficiency ($\mathrm{VACA}_{it} = \mathrm{VA}_{it}/\mathrm{CE}_{it}$) rather than raw wage inflation, executive boards (DD) and supervisory commissioners (DK) should link workforce compensation and skill-training programs directly to measurable value-added output metrics (VA_{it} per employee). Furthermore, because liability intensity reduces ROA% by 20.26% indirectly through VAIC_{it} compression ($\gamma_1\lambda = -0.689$ pp) and amplifies earnings erosion during high-interest-rate regimes ($\mathrm{Lev} \times \mathrm{Post2022} = -4.12$ pp), manufacturing CFOs should limit short-term interest-bearing debt exposure during monetary tightening cycles to preserve working capital for productive capital-employed and human-capital utilization.

b. For Capital Market and SOE Regulators (OJK, IDX, and Ministry of SOEs): First, given the Audit Committee's strong direct association with ROA% (+93.0 bps per member in the full sample and +114.0 bps in SOEs) alongside its structural overlap with the Board of Commissioners under POJK No. 55/POJK.04/2015, OJK should strictly enforce prompt replacement of mid-year audit committee vacancies (eliminating the 3.7% of firm-years where KA_{it} temporarily drops to 2 members) and mandate accounting and industrial risk certification for committee members. Second, in light of the superior marginal impact of the Board of Commissioners in manufacturing SOEs (0.612 pp vs. 0.329 pp in private firms, Table 8 Rows 8a–8b), the Ministry of State-Owned Enterprises (*Kementerian BUMN*) should strengthen meritocratic, non-political appointment standards for SOE commissioners and integrate explicit value-

added efficiency targets (VACA,VAHU) into annual SOE key performance contracts. Third, OJK and the Indonesian Institute of Chartered Accountants (IAI) should standardize itemized disclosure of PSAK 24 employee training, R&D, and digital systems outlays in annual report notes under POJK No. 29/POJK.04/2016 so investors can evaluate direct intangible investments alongside VAIC^{TM} productivity ratios.

Limitations and future research agenda**.** Linked directly to the boundary conditions and methodological critiques addressed above, three specific avenues remain for future research:

a. Accounting-Based Efficiency Ratios versus Direct Intangible Investment Flows: While this study supplemented Pulic's VAIC^{TM} with disassembled components (VACA,VAHU,STVA) and Modified MVAIC, VAIC-family metrics remain anchored in income-statement value added. Future industrial studies should compile hand-collected panel data on capitalized and expensed R&D, patent citations, ERP software capex, and hours of technical workforce training to test how two-tier boards govern direct innovation inputs.
b. Board Headcount versus Demographic and Network Capital: Operationalizing DD_{it}, DK_{it}, and KA_{it} via statutory member headcounts captures board capacity and functional division of labor, but does not measure internal board processes. Future research should incorporate commissioner independence ratios, director engineering/financial tenure, political connections in SOEs, and committee meeting frequency to isolate qualitative governance channels.
c. Sample Attrition and Unexplained Structural Variance ($1 - \text{Adj. } R^2 \approx 82.3\%$): Although our expanded $\mathrm{VA}_{it} > 0$ sensitivity check ($N = 482$ firm-years) and two-step System-GMM estimations confirm that our main findings are not artifacts of the baseline $\mathrm{EBT}_{it} > 0$ screen or contemporaneous reverse causality, over 80% of the variance in manufacturing ROA_{it} reflects external input-cost shocks, exchange-rate pass-through, and market competition. Future research should estimate Heckman two-stage sample-selection models across the full universe of profitable and distressed IDX issuers while incorporating industry-level import penetration and carbon-pricing moderators.

D. CONCLUSIONS

Addressing the central problem of how internal two-tier governance structures relate to industrial profitability in Indonesia, multivariable panel estimations across 65 listed manufacturing corporations from 2020 to 2024 demonstrate that the Board of Directors, the Board of Commissioners, and the Audit Committee are each positively and significantly associated with Return on Assets. However, the capacity of internal governance structures to foster operational value-added efficiency diverges across organs: while executive directors and supervisory commissioners significantly enhance human and physical capital efficiency, the Audit Committee exhibits no statistically significant association with intellectual capital once concurrent board structures, firm scale, and liability intensity are controlled. Consequently, firm-clustered bootstrap mediation tests confirm that intellectual capital efficiency functions as a selective partial mediator for the executive and supervisory boards—with executive governance leading in private manufacturers and supervisory governance leading in state-owned enterprises—whereas the Audit Committee supports financial performance strictly through direct financial reporting and internal control oversight. These findings establish a functional division of labor between agency monitoring and resource efficiency in two-tier boards, indicating that capital market and state-enterprise regulators should reinforce meritocratic supervisory appointments, prevent audit committee vacancies, and standardize corporate value-added disclosures.

REQUIRED STATEMENTS

CRediT authorship contribution statement. K.E.P.: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Writing – original draft. I.G.K.A.U.: Conceptualization, Methodology, Supervision, Validation, Writing – review & editing. A.F.: Methodology, Formal analysis, Supervision, Validation, Writing – review & editing.

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Data availability. The financial datasets and corporate governance records supporting

this article are publicly available from the official electronic disclosure repository of the Indonesia Stock Exchange (IDX) at https://www.idx.co.id. The processed balanced panel dataset ($N = 325$) and statistical outputs generated during the current study are available from the corresponding author (Kristina Evana Pakpahan, pakpahan.tina15@gmail.com) on reasonable request.

Ethics statement. This study analyzed firm-level secondary financial and governance data available in the public domain through audited corporate annual reports published on the Indonesia Stock Exchange. Therefore, institutional ethical approval and informed consent were not required.

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