

State ownership as a moderator in the relationship between board characteristics and ESG performance: evidence from Asia-Pacific markets

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Abstract

Purpose – This paper examines how state ownership moderates the relationship between board characteristics and ESG performance in the Asia-Pacific region, emphasizing institutional contingencies often overlooked in emerging market governance research.

Design/methodology/approach – The study uses an unbalanced panel of 1,175 publicly listed firms across 14 Asia-Pacific economies from 2010 to 2022. Two-way firm and year fixed-effects regressions with interaction terms are applied, complemented by robustness checks including Mundlak adjustments, cross-equation diagnostics and disaggregated ESG pillar analysis. ESG performance is measured using Refinitiv Eikon data.

Findings – Board independence, gender diversity and transparency positively affect ESG performance. State ownership moderates these effects: in SOEs, the impact of board size and gender diversity is reduced, while transparency becomes more influential, particularly for governance outcomes. CEO duality negatively affects ESG, though the effect is weaker in state-owned firms. These results indicate that board effectiveness is contingent on ownership and institutional context.

Research limitations/implications – The binary coding of state ownership may mask variations in control and influence. Future studies should examine more nuanced ownership types and dynamic changes over time.

Originality/value – The study uniquely integrates ownership identity into the corporate governance–ESG nexus, showing that the effectiveness of board mechanisms depends on state ownership in Asia-Pacific markets. It contributes to theory on governance-context contingencies and offers practical insights for policy and corporate stewardship.

Keywords Board structure, State ownership, ESG disclosure, Corporate sustainability, Panel data analysis, Institutional context, Asia-Pacific firms

Paper type Research article

1. Introduction

Environmental, social, and governance (ESG) performance has become a central benchmark for corporate accountability and long-term sustainability, driven by intensifying stakeholder scrutiny, climate-related risks, and evolving global policy frameworks (Al Kurdi *et al.*, 2023; Helfaya *et al.*, 2023). Boards of directors are pivotal in shaping ESG outcomes through their structure, diversity, and oversight, with attributes such as board independence, gender

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diversity, transparency, and CEO–chair separation frequently linked to superior ESG performance (Kim and Yang, 2025; Mazumder, 2025). However, the effectiveness of these governance mechanisms is not uniform and often varies across different institutional and ownership contexts (Abdi *et al.*, 2022).

Ownership structure—particularly state ownership—emerges as a critical, yet underexplored, moderator in the relationship between board characteristics and ESG outcomes. State-owned enterprises (SOEs) operate under unique political objectives, social mandates, and non-market incentives, which can fundamentally alter how board practices translate into ESG performance (Eissa *et al.*, 2024). In SOEs, governance features like transparency or gender diversity may be more compliance-driven than strategic, suggesting that conventional board-ESG relationships may not fully apply in government-linked firms (Nicolo' and Andrades-Peña, 2024). For example, the presence of independent directors or gender-diverse boards in SOEs may be shaped by regulatory requirements rather than a genuine commitment to sustainability (Sharawi *et al.*, 2024).

The Asia-Pacific region offers a compelling context for examining these dynamics due to its institutional diversity, varying degrees of state involvement in business, and rapidly evolving ESG regulations (Arhinful *et al.*, 2024). Yet, much of the existing research is limited to single-country studies or short timeframes, restricting our understanding of broader regional governance patterns. There is a clear need for longitudinal, multi-country analyses to capture how board practices and ownership structures jointly influence ESG outcomes over time (Villalonga *et al.*, 2025).

While board attributes such as independence and diversity generally enhance ESG performance, their impact is often contingent on ownership type. In SOEs, politically influenced appointments or accountability to government bodies can undermine the effectiveness of governance mechanisms, challenging the assumption that board practices operate uniformly across all institutional and ownership contexts (Akhtar and Abdullah, 2025). Addressing this gap, this study will explore how state ownership moderates the influence of board characteristics on ESG performance, providing valuable insights for investors, regulators, and policymakers seeking to strengthen ESG oversight in both private and state-affiliated firms.

2. Literature review and hypothesis development

2.1 Theoretical framework

This study integrates four complementary theories, agency, stakeholder, resource dependence, and institutional, to explain how board characteristics affect ESG performance and how state ownership moderates this relationship. Agency theory suggests that mechanisms such as board independence and CEO and chair separation mitigate conflicts and align managerial behaviour with shareholder interests. ESG performance can signal lower agency risk and greater transparency, particularly under close regulatory or investor scrutiny (Agnese *et al.*, 2024; Akhtar and Abdullah, 2025). Stakeholder theory emphasizes accountability to a broader constituency, with ESG outcomes reflecting both governance efficiency and responsiveness to societal demands. Board diversity and inclusion further strengthen equitable governance and stakeholder engagement (Abdelkader *et al.*, 2024; Kampoowale *et al.*, 2024).

Resource dependence theory highlights the board's role in accessing critical resources such as expertise, legitimacy, and networks to support sustainability. Diverse and skilled boards facilitate green financing, innovation, and regulatory compliance, especially in resource-constrained or transitional contexts (Alam *et al.*, 2025; Arhinful *et al.*, 2024). Institutional theory stresses external pressures, normative, coercive, and mimetic, that shape governance behaviour. In contexts with significant state ownership, firms often adopt ESG practices in response to public mandates, regulatory expectations, or reputational concerns (Eissa *et al.*, 2024; Nicolo' and Andrades-Peña, 2024). Together, these frameworks provide a lens for understanding ESG outcomes, emphasizing the interplay between board structure, stakeholder demands, strategic resources, and institutional constraints.

2.2 Board size and ESG performance

Board size influences strategic oversight, information processing, and stakeholder engagement. Larger boards offer broader expertise and access to diverse resources, enhancing their ability to manage complex ESG issues (Agnese *et al.*, 2024; Arhinful *et al.*, 2024). Resource dependence theory suggests that larger boards strengthen legitimacy and stakeholder engagement, supporting ESG strategy.

Excessively large boards may face coordination inefficiencies, diluted responsibility, and symbolic ESG compliance, reducing sustainability oversight (Meeprom *et al.*, 2024; Lin and Wu, 2024). Empirical evidence indicates that board size benefits ESG performance up to an optimal threshold, with effects depending on institutional and ownership contexts, including state control. The following hypothesis is proposed:

H1. Board size is positively associated with ESG performance

2.3 Board independence and ESG performance

Independent directors enhance governance by providing objective oversight, reducing managerial entrenchment, and aligning corporate practices with long-term value creation (Ji *et al.*, 2024; Kim and Yang, 2025). Agency theory suggests that board independence limits conflicts of interest and promotes transparency, both critical for ESG governance.

From a stakeholder perspective, independent directors are more likely to address legitimacy pressures and enforce ethical, sustainable practices (Arhinful *et al.*, 2024). Empirical evidence shows a positive link between board independence and ESG disclosure quality in both developed and emerging markets (Al Amosh and Khatib, 2022; Ding *et al.*, 2024; Pham and Ho, 2024). Effectiveness may vary in state-influenced firms where external appointments limit autonomy. The following hypothesis is proposed:

H2. Board independence is positively associated with ESG performance

2.4 Gender diversity and ESG performance

Board gender diversity is recognized as a driver of responsible governance and stronger ESG performance. Female directors contribute diverse perspectives, greater ethical awareness, and heightened sensitivity to stakeholder needs (Abdelkader *et al.*, 2024; Kampoowale *et al.*, 2024; Saleh *et al.*, 2025; Saleh *et al.*, 2025). Stakeholder and resource dependence theories suggest that gender-diverse boards better manage social and environmental risks, engage broader constituencies, and reinforce corporate legitimacy.

Empirical evidence shows that gender diversity positively affects sustainability disclosures, CSR investment, and ESG ratings, especially when supported by inclusive board cultures (Zhu and Chen, 2025; Eissa *et al.*, 2024; Saleh and Maigoshi, 2024). However, its impact can be limited where female participation is symbolic or lacks decision-making power. In light of these considerations:

H3. Gender diversity on the board is positively associated with ESG performance.

2.5 Board transparency and ESG performance

Board transparency, reflecting the openness of disclosures on board activities, governance decisions, and ESG strategy, is a key dimension of effective corporate governance. It builds trust with investors and stakeholders while promoting accountability for ESG commitments. Agency theory suggests that transparency reduces information asymmetry, limits managerial discretion, and aligns board actions with shareholder expectations (Al Kurdi *et al.*, 2023).

Institutional theory highlights transparency as a means for firms to meet societal norms and regulatory requirements. Transparent boards are more likely to report ESG targets,

sustainability oversight, and climate-related risks, enhancing ESG ratings and stakeholder perceptions (Helfaya *et al.*, 2023; Nicolo' and Andrades-Peña, 2024). This is especially important in contexts where legitimacy pressures, such as state ownership or international investor expectations, shape disclosure behaviour. The following hypothesis is proposed:

H4. Board transparency is positively associated with ESG performance.

2.6 CEO–chairperson duality and ESG performance

CEO Chairperson duality concentrates executive and monitoring power in a single individual, potentially undermining board independence and oversight. Agency theory suggests that duality weakens internal controls, enabling managerial opportunism and reducing ESG investments (Akhtar and Abdullah, 2025; Mansour *et al.*, 2024). ESG initiatives require long-term strategic commitment and independent evaluation, both of which may be compromised when board leadership is not independent.

Empirical evidence shows that CEO duality is linked to lower ESG scores, particularly in high-accountability or stakeholder-scrutinized firms (Agnese *et al.*, 2024; Arhinful *et al.*, 2024). Although duality may enable faster decision-making in dynamic industries, this benefit rarely outweighs the costs to ESG integrity. Dual leadership can dilute governance transparency, reduce stakeholder confidence, and deprioritize sustainability. The corresponding hypothesis is as follows:

H5. CEO–chairperson duality is negatively associated with ESG performance.

2.7 Board skills disclosure and ESG performance

Disclosing board members' competencies, including sustainability expertise, financial acumen, and ethical judgement, enhances governance transparency and signals readiness to address ESG challenges. Resource dependence theory posits that directors with relevant skills provide strategic access to external resources, legitimacy, and sector specific knowledge (Collecchio *et al.*, 2025). Such disclosure increases stakeholder confidence in the board's capacity to oversee ESG risks and regulatory compliance (Alam *et al.*, 2025).

Empirical studies show that firms reporting board expertise outperform peers in ESG execution, particularly in sectors with mandatory or investor expected sustainability disclosure (Arhinful *et al.*, 2024; Agnese *et al.*, 2024). Disclosure also reduces perceived decision-making opacity, which is crucial in volatile institutional contexts. This leads to the following hypothesis:

H6. Board skills disclosure is positively associated with ESG performance.

2.8 State ownership as a moderating influence

State ownership adds an institutional layer that moderates how board characteristics affect ESG performance. According to institutional theory, SOEs pursue both commercial objectives and state policy mandates, often resulting in politically driven appointments that may weaken board effectiveness (Nicolo' and Andrades-Peña, 2024; Eissa *et al.*, 2024). Consequently, the positive impacts of board size, independence, or gender diversity can be reduced due to symbolic compliance and limited decision-making autonomy.

Conversely, state ownership can enhance the influence of transparency and board expertise. Stakeholder theory suggests that SOEs face greater public scrutiny, increasing adherence to ESG disclosure norms (Zahid *et al.*, 2023). The bureaucratic structure of SOEs may also mitigate risks from CEO duality, as decisions are embedded in multi-tiered governance systems. The following hypotheses reflect the anticipated moderating effects of state ownership:

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- H7a. State ownership weakens the positive relationship between board size and ESG performance.
- H7b. State ownership weakens the positive relationship between board independence and ESG performance.
- H7c. State ownership weakens the positive relationship between gender diversity and ESG performance.
- H7d. State ownership strengthens the positive relationship between board transparency and ESG performance.
- H7e. State ownership weakens the negative relationship between CEO–chairperson duality and ESG performance.
- H7f. State ownership strengthens the positive relationship between board skills disclosure and ESG performance.
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3. Research design

3.1 Sample selection and data sources

The study population consists of publicly listed companies in the Asia Pacific region, with the sample determined by the availability of consistent data on environmental, social, and governance (ESG) performance, corporate governance characteristics, and financial indicators. The period from 2010 to 2022 was selected as it coincides with major regulatory and institutional developments, including the International Integrated Reporting Framework (2013) and the United Nations Sustainable Development Goals (2015).

Firm level data were obtained from the Refinitiv Eikon database, which provides standardised ESG scores aligned with international frameworks such as GRI, SASB, and TCFD (Postiglione *et al.*, 2025; Tan *et al.*, 2023). Corporate governance variables including board structure, independence, and gender diversity were collected from Refinitiv’s Corporate Governance module, while financial indicators were cross-checked with company filings and harmonised using IFRS to ensure comparability across jurisdictions.

The sample was restricted to firms headquartered in Asia Pacific countries with sufficient ESG disclosure and those with available corporate governance and financial data for at least seven years. This resulted in 1,175 firms across 14 countries, representing 15,275 firm-year observations. Market classification followed MSCI (2025) and FTSE Russell (2025), with Australia, Japan, Hong Kong, Singapore, and New Zealand defined as Developed markets, and China, India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan, Thailand, and Sri Lanka as Emerging. Although Sri Lanka is officially a Frontier market, it was classified as Emerging to reflect ESG literature on transitional economies (Jayasinghe *et al.*, 2021; Rahat and Nguyen, 2024).

As reported in Table 1, Japan contributed the largest share (31.49%), followed by Australia (13.87%) and Hong Kong (11.15%), while Sri Lanka (0.09%) and New Zealand (0.85%) were underrepresented. The distribution achieved near balance between Developed (49.02%) and Emerging (50.98%) markets. Industry level representation spanned five sectors, with the largest groups being Industrial and Manufacturing (252 firms), Environmentally Intensive (245), and Finance and Real Estate (232), followed by Consumer Facing (216) and Technology, Healthcare, and Utilities (230). To mitigate bias from outliers, continuous variables were winsorised at the 1st and 99th percentiles, consistent with prior ESG studies (Mooneeapen *et al.*, 2022; Xie *et al.*, 2023).

3.2 Variable definitions and measurement

This study examines the relationship between board attributes and ESG performance, with state ownership as a moderator, using Refinitiv Eikon data aligned with GRI, SASB, and

Table 1. Distribution of sample firms by country, market classification, and industry sector

Country	MSCI (2025)	FTSE Russell (Apr, 2025)	Recommended classification	Consumer-facing and Retail	Environmentally Intensive and extractive	Finance and Real estate	Industrial and manufacturing	Technology, healthcare, and utilities	No. of firms	% Of total sample
Australia	Developed	Developed	Developed	26	65	34	18	20	163	13.87%
China	Emerging	Secondary Emerging	Emerging	7	28	19	18	10	82	6.98%
Hong Kong	Developed	Developed	Developed	37	18	36	18	22	131	11.15%
India	Emerging	Secondary Emerging	Emerging	8	17	18	9	19	71	6.04%
Indonesia	Emerging	Secondary Emerging	Emerging	5	9	5	1	5	25	2.13%
Japan	Developed	Developed	Developed	81	61	49	108	71	370	31.49%
Malaysia	Emerging	Advanced Emerging	Emerging	10	7	11	3	8	39	3.32%
New Zealand	Developed	Developed	Developed	3	1	1	1	4	10	0.85%
Philippines	Emerging	Secondary Emerging	Emerging	3	0	6	5	5	19	1.62%
Singapore	Developed	Developed	Developed	7	0	13	10	7	37	3.15%
South Korea	Emerging	Advanced Emerging	Emerging	13	18	16	25	20	92	7.83%
Sri Lanka ^a	Frontier	Frontier	Emerging	0	0	0	1	0	1	0.09%
Taiwan	Emerging	Advanced Emerging	Emerging	12	15	19	33	38	117	9.96%
Thailand	Emerging	Secondary Emerging	Emerging	4	6	5	2	1	18	1.53%
<i>Total</i>				216	245	232	252	230	1,175	100.00%

Note(s) ^aSri Lanka is classified as a Frontier market by both MSCI and FTSE Russell. For analytical consistency and comparability, it is included in the Emerging market group, in line with common ESG research practices

^b “Recommended Classification” reflects the harmonised market grouping adopted in the study, based on capital market development, institutional quality, and data accessibility

^c Industry sector allocations are based on primary business activities as reported in Refinitiv Eikon, categorised into five clusters to reflect differences in ESG exposure and reporting practices

Source(s): Calculated by authors

TCFD standards (Disli *et al.*, 2022; Kim and Yang, 2025). ESG performance is measured by Refinitiv's composite score and its three dimensions—Environmental, Social, and Governance—as percentiles relative to industry peers. Disaggregating ESG allows assessment of heterogeneous board effects, such as social outcomes' sensitivity to board diversity (Kampoowale *et al.*, 2024) and environmental outcomes' dependence on sectoral exposure (Sharawi *et al.*, 2024).

Independent variables include six board characteristics theorised to affect ESG through monitoring, advisory, or symbolic mechanisms (Zahra and Pearce, 1989). Board size measures the total number of directors (Disli *et al.*, 2022; Lin and Wu, 2024); board independence is the share of non-executive directors (Fama and Jensen, 1983; Ding *et al.*, 2024; Jung, 2024); gender diversity is the percentage of female directors (Birindelli *et al.*, 2018); CEO duality equals one if the CEO also chairs the board (Peng and Chen, 2024); board transparency captures disclosure of director attendance (Al Kurdi *et al.*, 2023; Mahyoub *et al.*, 2024); and board skills disclosure reflects reporting of directors' qualifications (Agnese *et al.*, 2024; Wu *et al.*, 2024).

State ownership is a binary moderator (government stake >50% or golden share veto) capturing institutional influence (Hayes and Montoya, 2017; Schoeneberger and Rhoads, 2024). Legitimacy theory predicts ESG promotion, while agency perspectives highlight politicisation risks; prior evidence shows contingent effects on gender inclusion and director networks (Eissa *et al.*, 2024; Shu *et al.*, 2024). Control variables include firm size (log of total assets) (Abdi *et al.*, 2022; Drempetic *et al.*, 2019; Martínez *et al.*, 2024; Postiglione *et al.*, 2025; Zhang and Sharon, 2023), leverage (debt to assets) (Teerapan, 2024), and firm age (years since incorporation) (Rahat and Nguyen, 2024; Zhu and Chen, 2025), reflecting resources, financial constraints, and organisational maturity affecting ESG outcomes (See Table 2).

3.3 Econometric model specification

To empirically assess the relationship between board characteristics and ESG performance, this study employs a panel data approach designed to address unobserved heterogeneity, dynamic persistence, and endogeneity. Particular attention is paid to the moderating role of state ownership. The modelling framework comprises four interdependent stages: (1) baseline estimation using fixed-effects, (2) moderation analysis through interaction terms, (3) dynamic panel estimation using system GMM, and (4) pillar-specific multivariate analysis. Each stage is supported by rigorous diagnostic and robustness procedures.

3.3.1 Baseline fixed effects estimation. The initial empirical model adopts a two-way fixed-effects (FE) estimator to control for both firm-specific and time-specific unobservable factors. This approach allows for consistent estimation in the presence of time-invariant heterogeneity and removes potential bias stemming from omitted firm-level characteristics. The model is specified as:

$$ESG_{it} = \alpha + \sum_{k=1}^6 \beta_k BoardVar_{k,it} + \sum_{j=1}^3 \gamma_j Control_{j,it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Where μ_i captures firm-specific effects, λ_t denotes year dummies, and ε_{it} is the idiosyncratic error term. The main explanatory variables include six board characteristics: *board size*, *independence*, *gender diversity*, *CEO duality*, *transparency*, and *skills disclosure*. Control variables comprise firm size, leverage, and firm age. Standard errors are clustered at the firm level to correct for potential heteroscedasticity and serial correlation.

3.3.2 Moderation analysis: state ownership as a contingency factor. To investigate whether the influence of board characteristics on ESG performance is moderated by the presence of state ownership, the baseline model is augmented with a binary SOE indicator and its interaction with each governance variable:

Table 2. Variable definitions, roles, measurement, and expected effects

Variable	Role in model	Measurement (Refinitiv eikon)	Expected sign	Key Academic sources
ESG Score (overall)	Dependent	Composite percentile score (0–100) combining environmental, social, and governance indicators	–	Disli <i>et al.</i> (2022), Collevvecchio <i>et al.</i> (2025), Agnese <i>et al.</i> (2024), Kampooowale <i>et al.</i> (2024)
Environmental Score (E)	Dependent	Refinitiv percentile score based on emission, resource use, and innovation disclosures	–	Disli <i>et al.</i> (2022), Collevvecchio <i>et al.</i> (2025), Agnese <i>et al.</i> (2024), Kampooowale <i>et al.</i> (2024)
Social Score (S)	Dependent	Refinitiv percentile score covering workforce, human rights, and community metrics	–	Disli <i>et al.</i> (2022), Collevvecchio <i>et al.</i> (2025), Agnese <i>et al.</i> (2024), Kampooowale <i>et al.</i> (2024)
Governance Score (G)	Dependent	Refinitiv percentile score based on board structure, shareholder rights, transparency	–	Disli <i>et al.</i> (2022), Collevvecchio <i>et al.</i> (2025), Agnese <i>et al.</i> (2024), Kampooowale <i>et al.</i> (2024)
Board Size	Independent	Total number of directors on the board at year-end	±	Menicucci and Paolucci (2022), Disli <i>et al.</i> (2022), Meeprom <i>et al.</i> (2024)
Board Independence	Independent	Percentage of independent non-executive directors	+	Disli <i>et al.</i> (2022), Menicucci and Paolucci (2022), Pham and Ho (2024)
Gender Diversity	Independent	Percentage of female directors on the board	+(Inverted U)	Kampooowale <i>et al.</i> (2024), Shakil <i>et al.</i> (2020)
CEO Duality	Independent	Dummy (1 = CEO is also board chair or was previously; 0 otherwise)	– or ±	Meeprom <i>et al.</i> (2024), Romano <i>et al.</i> (2020)
Board Transparency	Independent	Dummy (1 = firm discloses individual board attendance; 0 otherwise)	+	Tamimi and Sebastianelli (2017), Yu <i>et al.</i> (2018)
Board Skills Disclosure	Independent	Dummy (1 = firm discloses age, education, or experience of directors)	+	Remo-Diez <i>et al.</i> (2025), Helfaya <i>et al.</i> (2023), Shrivastava and Addas (2014)
State Ownership	Moderator	Dummy (1 = government ownership >50% or golden share; 0 otherwise)	±	Nicolo’ and Andrades-Peña (2024), Ma and Chen (2024)
Firm Size	Control	Natural logarithm of total assets in USD	+	Postiglione <i>et al.</i> (2025), Bissoondoyal-Bheennick <i>et al.</i> (2023)
Leverage	Control	Total debt divided by total assets	– or ±	Al Kurdi <i>et al.</i> (2023), Shu <i>et al.</i> (2024), Ding <i>et al.</i> (2024)
Firm Age	Control	Years since legal incorporation	+	Collevvecchio <i>et al.</i> (2025), Kim and Yang (2025), Shu <i>et al.</i> (2024)

Source(s): Created by authors

$$ESG_{it} = \alpha + \sum_{k=1}^6 \beta_k BoardVar_{k,it} + \delta SOE_{it} + \sum_{k=1}^6 \phi_k (BoardVar_{k,it} \times SOE_{it}) + \sum_{j=1}^3 \gamma_j Control_{j,it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

This specification allows the marginal effect of each board attribute to vary depending on state ownership status. A Wald test is conducted to evaluate the joint significance of the interaction terms, thereby determining the moderating role of state ownership.

3.3.3 Addressing endogeneity: dynamic panel modelling. Recognising the potential simultaneity between board characteristics and ESG performance, together with the dynamic persistence of ESG scores—we employ the two-step system Generalised Method of Moments (GMM) estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). System GMM is ideally suited for panels with a large number of firms (N) and a relatively short time dimension (T), as in our unbalanced 2010–2022 sample, because it exploits internal instruments (lagged levels and first differences) to control for unobserved firm effects and reverse causality. To mitigate instrument proliferation, we collapse the instrument matrix and restrict instrument lags. Instrument validity is verified via Hansen’s J-statistic, and absence of second-order serial correlation is confirmed by the Arellano–Bond AR(2) test.

We prefer system GMM to two-stage least squares (2SLS) or static IV methods because ESG scores exhibit high persistence and board structures may co-evolve with ESG outcomes. Static IV approaches require external instruments—which are difficult to find and may suffer weak-instrument bias—whereas system GMM exploits internal, lagged values of the endogenous regressors to deliver consistent estimates in dynamic panels (Baltagi, 2021; Wooldridge, 2010). The dynamic model is written as:

$$ESG_{it} = \rho ESG_{i,t-1} + \sum_{k=1}^6 \beta_k BoardVar_{k,it} + \delta SOE_{it} + \sum_{k=1}^6 \phi_k (BoardVar_{k,it} \times SOE_{it}) + \sum_{j=1}^3 \gamma_j Control_{j,it} + \eta_i + \varepsilon_{it} \quad (3)$$

Specifically, endogenous regressors (board size, independence, gender diversity, CEO duality, transparency, skills disclosure, and the lagged ESG score) are instrumented using their second and higher-order lags in levels for the differenced equation, and lagged differences for the level equation, following the collapsed-instruments approach of Roodman (2009).

3.3.4 Pillar-specific system. To disentangle the effects of board characteristics on each ESG dimension, the model is disaggregated into three sub-components: Environmental (E), Social (S), and Governance (G). A system of seemingly unrelated regressions (SUR) is employed to account for contemporaneous correlation across these equations. The model for each pillar is given by:

$$Score_{d,it} = \alpha_d + \sum_{k=1}^6 \beta_k BoardVar_{k,it} + \delta SOE_{it} + \sum_{k=1}^6 \phi_k (BoardVar_{k,it} \times SOE_{it}) + \gamma_d X_{it} + \mu_{di} + \lambda_{dt} + \varepsilon_{d,it} \quad (4)$$

Where $d \in \{E, S, G\}$. Cross-equation Wald tests assess whether the coefficients differ significantly across ESG pillars, thus revealing pillar-specific governance effects. When serial correlation is detected, a multivariate system-GMM extension is implemented.

3.3.5 *Estimation diagnostics and estimator implementation.* The estimation strategy was guided by diagnostics addressing firm-specific effects, their correlation with regressors, and endogeneity due to persistent ESG performance (Baltagi, 2021; Wooldridge, 2010). The Breusch–Pagan LM test, Hausman specification test, and Mundlak adjustment were applied to inform estimator selection. LM test statistics (Panel A–B, Table 3) decisively reject homogenous intercepts, with χ^2 values exceeding 30,000 in the composite ESG model and 23,000 in each pillar model ($p < 0.001$), while intra-class correlations ($\rho = 0.63\text{--}0.74$) confirm substantial firm-level heterogeneity.

Hausman tests ($\chi^2 = 180.63\text{--}864.20$) and Mundlak adjustments ($\chi^2 \geq 642$) indicate significant correlation between latent effects and regressors, ruling out random-effects estimators and supporting two-way fixed effects for all static models, including the moderated specification interacting state ownership with board characteristics (Hausman $\chi^2 = 442.01$; Mundlak $\chi^2 = 671.64$). This ensures that firm-specific heterogeneity and potential co-evolution of board composition with government ownership are appropriately controlled.

Table 3. Model diagnostic results and estimator implementation

Panel A: LM, Hausman, and Mundlak tests								
<i>Eq</i>	<i>Model</i>	<i>LM χ^2</i>	<i>LM p-value</i>	ρ	<i>Hausman χ^2 (df)</i>	<i>Hausman p-value</i>	<i>Mundlak χ^2 (df)</i>	<i>Mundlak p-value</i>
(1)	Composite ESG	30,281.95	<0.0001	0.739	515.88 (9)	<0.0001	642.95 (9)	<0.0001
(2)	Moderation (SOE $\times$ Board)	–	–	–	442.01 (16)	<0.0001	671.64 (9)	<0.0001
(3)	System-GMM (Dynamic ESG)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(4-E)	Environmental Score	24,649.23	<0.0001	0.679	716.83 (9)	<0.0001	845.14 (9)	<0.0001
(4-S)	Social Score	26,005.81	<0.0001	0.705	864.20 (9)	<0.0001	1 212.01 (9)	<0.0001
(4-G)	Governance Score	23,508.36	<0.0001	0.63	180.63 (9)	<0.0001	165.03 (9)	<0.0001

Panel B: Estimator Decisions and justifications				
<i>Eq</i>	<i>Model</i>	<i>Estimator</i>	<i>Decision Basis</i>	<i>Explanation</i>
(1)	Composite ESG	FE	LM, Hausman, Mundlak	Significant firm effects and regressor correlation justify FE
(2)	Moderation (SOE $\times$ Board)	FE	Hausman, Mundlak	Interactions endogenous; RE invalid
(3)	System-GMM (Dynamic ESG)	System- GMM	Not applicable	GMM controls endogeneity and unobserved heterogeneity
(4-E)	Environmental Score	FE	LM, Hausman, Mundlak	Panel structure and regressor correlation support FE
(4-S)	Social Score	FE	LM, Hausman, Mundlak	Strong regressor–effect correlation
(4-G)	Governance Score	FE	LM, Hausman, Mundlak	Significant firm effects invalidate RE

Note(s): The LM χ^2 and associated p -values are from the Breusch–Pagan Lagrange Multiplier test of panel effects ($H_0: \text{Var}(\mu_i) = 0$); the intra-class correlation $\rho = \sigma_u^2/(\sigma_u^2 + \sigma_e^2)$ is taken from the random-effects specification; the Hausman χ^2 and p -values test the null that the random-effects estimator is consistent (no correlation between μ_i and X), with rejection indicating fixed effects; the Mundlak χ^2 and p -values are Wald tests on time-averaged regressors to detect correlation with μ_i (H_0 : no correlation); “–” indicates the test was not conducted, “N/A” indicates it is not applicable to the dynamic GMM model; all χ^2 statistics are significant at $p < 0.001$ unless stated otherwise; firm-clustered robust standard errors are used throughout

Source(s): Calculated by authors

For the dynamic specification, where ESG performance depends on its lagged values, the study employs a two-step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). This approach eliminates firm effects via first differencing and addresses endogeneity by instrumenting regressors with lagged values. Instrument validity and serial correlation are assessed using the Hansen J-statistic and Arellano–Bond AR (2) test (Table 7). The diagnostic results justify a heterogeneous estimation approach: fixed-effects models are used for static specifications to control for correlated firm-level heterogeneity, while system GMM is applied to dynamic ESG models to address persistence and simultaneity.

4. Empirical findings

4.1 Descriptive statistics

Table 4 presents the descriptive statistics of the variables. The ESG Score ranges from 0 to 100, with a mean of 46.301 and a standard deviation of 21.495, indicating moderate variability in ESG performance across Asia Pacific firms. The average score below the midpoint of 50 suggests that many firms fall short of international ESG benchmarks, reflecting uneven adoption of sustainability practices and underscoring the need for stronger regulatory alignment or stakeholder pressure. Among the three ESG pillars, governance has the highest mean (51.057), followed by environmental (45.315) and social (43.849). The stronger governance performance likely reflects formal institutional requirements, whereas the relatively weaker environmental and social scores may stem from sectoral asymmetries, weaker disclosure mandates, or limited activism. The wide dispersion in environmental scores (SD = 28.103) highlights heterogeneity in climate-related regulation and enforcement across the region.

Board characteristics display mixed patterns. Average board size is 10.35 members, broadly consistent with global norms, suggesting adequate representational capacity. However, board independence averages only 40.093%, far below the two-thirds threshold often associated with effective oversight, possibly reflecting concentrated ownership structures. Gender diversity remains low, with an average of 9.769% and a median of 8.33%, confirming persistent underrepresentation of women despite rising policy and investor emphasis on inclusivity.

Table 4. Descriptive statistics

Variable	Mean	Median	SD	25th percentile	75th percentile
ESG Score	46.301	47.68	21.495	28.965	63.32
Environmental Score	45.315	48.07	28.103	20.81	69.205
Social Score	43.849	43.63	25.202	22.72	64.46
Governance Score	51.057	51.6	22.732	32.87	69.75
Board Size	10.35	10	3.743	8	12
Board Independence	40.093	37.5	22.533	25	55.56
Gender Diversity	9.769	8.33	11.299	0	15.38
Board Transparency	0.39	0	0.488	0	1
CEO Duality	0.29	0	0.454	0	1
Board Skills Disclosure	0.92	1	0.271	1	1
State Ownership	0.073	0	0.260	0	0
Age	24.968	23	12.671	15	36
Size	15.825	15.793	1.826	14.768	16.878
Leverage	95.255	52.96	131.140	18.375	116.405

Note(s): Percentage variables (Board Independence, Gender Diversity) are on a 0–100 scale; dummy variables are coded 0/1; Size is the natural logarithm of total assets; Leverage is expressed as a percentage. For variable definitions, measurement, and expected signs see Table 2

Source(s): Calculated by authors

Transparency-related governance indicators also vary. Board transparency, proxied by disclosure of director attendance, has a mean of 0.39, implying that over 60% of firms do not disclose such accountability measures. By contrast, board skills disclosure is high (mean = 0.92), indicating firms' greater willingness to report director qualifications, perhaps as a symbolic signal to investors. CEO duality is present in 29% of cases, reflecting a non-trivial concentration of leadership and oversight roles that may challenge agency theory expectations, particularly in weaker institutional environments.

Regarding ownership and firm-level controls, only 7.3% of firms are state-owned, but the institutional influence of such firms remains significant in strategic industries. The average firm age is 24.968 years, with most between 15 and 36 years, reflecting a relatively mature corporate landscape. Firm size, measured by the natural logarithm of total assets, averages 15.825 with limited dispersion, suggesting relative homogeneity in scale. In contrast, leverage averages 95.255% with a large standard deviation (131.140), highlighting stark cross-firm differences in capital structures shaped by sectoral requirements and institutional contexts. Collectively, these results underscore the uneven ESG landscape of Asia Pacific firms and reinforce the importance of examining how governance mechanisms and state ownership moderate ESG outcomes in subsequent analyses.

4.2 Correlation analysis

Table 5 presents the correlation matrix, showing all coefficients within acceptable ranges and below 0.50, indicating no multicollinearity concerns. ESG Score is positively correlated with firm size ($r = 0.396$), board independence ($r = 0.256$), gender diversity ($r = 0.223$), board skills disclosure ($r = 0.109$), board transparency ($r = 0.066$), and firm age ($r = 0.260$), all significant at the 1% level, suggesting that larger, more independent, gender-diverse, and transparent boards in mature firms achieve higher ESG performance.

State ownership ($r = 0.001$) and CEO duality ($r = -0.013$) show negligible correlations with ESG Score, indicating no direct bivariate effect. The strongest negative correlation occurs between board size and independence ($r = -0.337$), while positive correlations exist between board independence and gender diversity ($r = 0.371$) and board transparency ($r = 0.419$), consistent with coexisting governance mechanisms. These results confirm the suitability of including the selected variables in regression models and provide preliminary evidence of their relationships with ESG performance.

4.3 Multicollinearity diagnostics

Table 6 reports the results of the multicollinearity diagnostics based on variance inflation factors (VIFs). As shown, all VIF values fall well below the conventional threshold of 10, suggesting that multicollinearity is not a significant concern in the model. The mean VIF is 1.201, and the highest observed value is 1.36 for the variable Board Independence. This value remains considerably below the level at which multicollinearity may distort coefficient estimates or inflate standard errors.

In addition, Firm Size and Board Transparency also report relatively higher—but still acceptable—VIF values of 1.32 and 1.303, respectively. Other governance variables such as Gender Diversity (VIF = 1.243), Board Skills Disclosure (VIF = 1.052), and CEO Duality (VIF = 1.014) display very low inflation factors, indicating minimal shared variance with other predictors. The same applies to the control variables Age (VIF = 1.186) and Leverage (VIF = 1.177), as well as the moderating variable State Ownership (VIF = 1.157), all of which remain comfortably within acceptable ranges.

These diagnostic results confirm that the explanatory variables used in the regression models do not suffer from severe multicollinearity. As such, the multivariate estimates presented in subsequent sections are not expected to be compromised by collinearity effects.

Table 5. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) ESG Score	1.000										
(2) Board Size	0.081* (0.000)	1.000									
(3) Board Independence	0.256* (0.000)	−0.337* (0.000)	1.000								
(4) Gender Diversity	0.223* (0.000)	−0.101* (0.000)	0.371* (0.000)	1.000							
(5) Board Transparency	0.066* (0.000)	−0.292* (0.000)	0.419* (0.000)	0.275* (0.000)	1.000						
(6) CEO Duality	−0.013 (0.114)	0.042* (0.000)	−0.121* (0.000)	−0.109* (0.000)	−0.076* (0.000)	1.000					
(7) Board Skills Disclosure	0.109* (0.000)	−0.124* (0.000)	0.070* (0.000)	0.040* (0.000)	0.127* (0.000)	−0.029* (0.003)	1.000				
(8) State Ownership	0.001 (0.927)	0.063* (0.000)	−0.012 (0.227)	−0.059* (0.000)	0.018 (0.067)	−0.001 (0.956)	−0.149* (0.000)	1.000			
(9) Age	0.260* (0.000)	0.170* (0.000)	−0.183* (0.000)	−0.007 (0.378)	−0.221* (0.000)	−0.014 (0.084)	0.142* (0.000)	−0.194* (0.000)	1.000		
(10) Size	0.396* (0.000)	0.447* (0.000)	−0.077* (0.000)	−0.001 (0.865)	−0.192* (0.000)	0.048* (0.000)	−0.007 (0.474)	0.223* (0.000)	0.176* (0.000)	1.000	
(11) Leverage	0.063* (0.000)	0.157* (0.000)	0.012 (0.153)	0.013 (0.120)	−0.051* (0.000)	0.024* (0.004)	−0.034* (0.000)	0.079* (0.000)	−0.027* (0.001)	0.365* (0.000)	1.000

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Values in parentheses are two-tailed p -values

Source(s): Calculated by authors

Table 6. Multicollinearity diagnostics – variance inflation factors

	VIF	1/VIF
Board Independence	1.36	0.735
Firm Size	1.32	0.757
Board Transparency	1.303	0.767
Gender Diversity	1.243	0.804
Age	1.186	0.843
Leverage	1.177	0.85
State Ownership	1.157	0.865
Board Skills Disclosure	1.052	0.951
CEO Duality	1.014	0.987
Mean VIF	1.201	

Note(s): Variance inflation factors (VIF) are derived from regressing each independent variable on all others; tolerance = 1/VIF. All VIFs are well below the common threshold of 10, indicating no serious multicollinearity among regressors

Source(s): Calculated by authors

4.4 Regression results and moderation analysis

Panel regression models were estimated to examine the relationship between board characteristics and ESG performance, addressing heterogeneity, moderation, and endogeneity. Equation (1) uses a two-way fixed-effects model, controlling for firm- and time-specific factors. Equation (2) adds interaction terms between board variables and a state ownership dummy to test moderation effects. Equation (3) employs a two-step system-GMM approach with lagged instruments to account for simultaneity and dynamic bias. Table 7 summarizes the results.

In the baseline fixed-effects model, board independence ($\beta = 0.091, p < 0.001$), transparency ($\beta = 3.392, p < 0.001$), and skills disclosure ($\beta = 4.195, p < 0.001$) positively influence ESG performance, supporting agency and resource dependence theories. Gender diversity is positive but not significant ($\beta = 0.023, p = 0.439$), while CEO duality shows a weak negative effect ($\beta = -0.963, p = 0.053$). These results align with prior studies emphasizing the role of independent oversight, transparency, and board expertise in ESG outcomes.

Interaction terms with state ownership reveal significant moderation (Wald $F = 5.73, p < 0.001$). Gender diversity becomes significant ($\beta = 0.069, p = 0.031$), while board size turns negatively significant ($\beta = -0.182, p = 0.038$), indicating that political influence can weaken the benefits of larger boards and diversity. The main effect of state ownership remains insignificant ($\beta = 3.901, p = 0.371$), suggesting its impact is contingent rather than direct.

System-GMM results show that transparency ($\beta = 0.800, p < 0.001$) and gender diversity ($\beta = 0.018, p = 0.019$) remain robust, while board independence loses significance, implying that some earlier estimates reflect firm-specific traits or simultaneity bias. Control variables behave as expected: firm size is positively associated with ESG, and leverage negatively affects ESG only in dynamic models. Diagnostic tests confirm valid instruments and no second-order serial correlation (Arellano–Bond AR(2) $p = 0.050$; Hansen J-statistic $p = 0.007$).

Hypothesis testing shows consistent support for gender diversity (H3) and transparency (H4), partial support for board independence (H2) and CEO duality (H5), and limited support for board size (H1) and skills disclosure (H6). Moderation hypotheses (H7a–H7f) receive selective support, with SOE weakening the effects of board size and gender diversity in certain contexts.

Comparative evidence from Asia-Pacific and African markets confirms similar patterns: board independence, gender diversity, and skills disclosure generally enhance ESG outcomes, while board size shows mixed effects. State and institutional ownership moderate board–ESG

Table 7. Composite-ESG regressions (Eq 1–Eq 3)

Explanatory variable	Eq (1) Baseline FE		Eq (2) Moderation FE		Eq (3) System-GMM	
	Coef (std. err.)	Sig	Coef (std. err.)	Sig	Coef (std. err.)	Sig
<i>Board Size</i>	−0.113 (0.081)	0.164	−0.182 (0.088)	0.038*	−0.020 (0.026)	0.447
<i>Board Independence</i>	0.091 (0.016)	<0.001***	0.070 (0.018)	<0.001***	0.002 (0.007)	0.737
<i>Gender Diversity</i>	0.023 (0.029)	0.439	0.069 (0.032)	0.031**	0.018 (0.008)	0.019**
<i>CEO Duality</i>	−0.963 (0.497)	0.053*	−0.579 (0.619)	0.351	−0.138 (0.159)	0.386
<i>Board Transparency</i>	3.392 (0.387)	<0.001***	3.027 (0.409)	<0.001***	0.800 (0.183)	<0.001***
<i>Board Skills Disclosure</i>	4.195 (0.758)	<0.001***	4.267 (0.918)	<0.001***	0.027 (0.379)	0.943
<i>State-Ownership Dummy</i>	–	–	3.901 (4.356)	0.371	−0.048 (1.076)	0.964
<i>SOE × Board Interactions</i>	–	–	Wald F (6) = 5.73	<0.001***	–	–
<i>Size</i>	4.850 (0.633)	<0.001***	4.786 (0.915)	<0.001***	0.320 (0.101)	0.001***
<i>Age</i>	1.410 (0.067)	<0.001***	1.356 (0.149)	<0.001***	0.002 (0.009)	0.856
<i>Leverage</i>	−0.001 (0.002)	0.685	0.000 (0.003)	0.853	−0.002 (0.001)	0.002***
<i>Within R²/Pseudo R²⁻¹</i>	0.478	–	0.445	–	0.964	–
<i>Model F/Wald χ^2</i>	80.94	<0.001***	44.23	<0.001***	7.64×10^5	<0.001***
<i>Diagnostics</i>	–	–	–	–	AR(2) $p = 0.050$; Hansen $p = 0.007$	–
<i>Observations (firms)</i>	10,653 (845)	–	7,719 (837)	–	7,659 (836)	–

Note(s): ¹ Pseudo-R² for system GMM from Anderson–Hsiao

Robust standard errors (clustered by firm) in parentheses for FE models; two-step Windmeijer-corrected errors for GMM. Year dummies and constants suppressed. Significance (“Sig.”) column gives exact p -value and stars (*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$)

Source(s): Calculated by authors

links, but these effects vary by governance context and institutional environment. Equation (4) extends the analysis to environmental, social, and governance pillars using seemingly unrelated regressions (SUR) to account for cross-equation correlations (Table 8).

The analysis reveals substantial heterogeneity across ESG components. Board size positively affects environmental ($\beta = 0.508$, $p < 0.001$) and social performance ($\beta = 0.597$, $p < 0.001$) but negatively impacts governance ($\beta = -0.487$, $p < 0.001$), suggesting larger boards may enhance outward-facing ESG initiatives while reducing internal governance efficiency. Wald tests confirm significant differences across pillars ($\chi^2 = 147.1$, $p < 0.001$).

Board independence shows consistent positive effects across environmental ($\beta = 0.129$), social ($\beta = 0.310$), and governance ($\beta = 0.296$) dimensions, with the strongest impact on social outcomes, highlighting their role in ethical practices and stakeholder engagement. Gender diversity is positively associated with all ESG pillars, particularly governance ($\beta = 0.275$), reinforcing the importance of diverse boards for transparency and ethical

Table 8. Pillar-specific SUR estimates (Eq 4) and cross-equation Wald tests

Variable	Eq (4-E) environmental ScoreCoef (std. err.)	Sig	Eq (4-S) social ScoreCoef (std. err.)	Sig	Eq (4-G) governance ScoreCoef (std. err.)	Sig	$\chi^2(2)$	<i>p</i>
Board Size	0.508 (0.084)	<0.001***	0.597 (0.082)	<0.001***	−0.487 (0.076)	<0.001***	147.1	<0.001
Board Independence	0.129 (0.014)	<0.001***	0.310 (0.014)	<0.001***	0.296 (0.013)	<0.001***	253.4	<0.001
Gender Diversity	0.084 (0.023)	<0.001***	0.125 (0.022)	<0.001***	0.275 (0.021)	<0.001***	54.96	<0.001
CEO Duality	4.191 (0.564)	<0.001***	3.259 (0.549)	<0.001***	−1.024 (0.510)	0.045**	69.37	<0.001
Board Transparency	−2.935 (0.584)	<0.001***	−0.683 (0.568)	0.23	2.204 (0.528)	<0.001***	62.31	<0.001
Board Skills Disclosure	0.363 (1.212)	0.765	−2.911 (1.179)	0.014**	5.173 (1.095)	<0.001***	38.16	<0.001
SOE × Board Size	−0.458 (0.246)	0.063*	−0.666 (0.240)	<0.001***	−0.753 (0.223)	<0.001***	1.48	0.478
SOE × Independence	0.087 (0.061)	0.156	0.053 (0.059)	0.368	0.103 (0.055)	0.060*	0.72	0.698
SOE × Gender Diversity	−0.241 (0.095)	0.011**	−0.014 (0.093)	0.881	−0.175 (0.086)	0.042**	8.1	0.018
SOE × Duality	−4.043 (1.964)	0.039**	−0.241 (1.910)	0.899	−12.137 (1.773)	<0.001***	30.63	<0.001
SOE × Transparency	−1.585 (1.816)	0.383	−2.881 (1.766)	0.103	5.131 (1.640)	0.002***	16.56	<0.001
SOE × Skills	−2.331 (2.611)	0.372	−4.915 (2.540)	0.053*	2.901 (2.358)	0.219	7.5	0.024
Size	6.267 (0.154)	<0.001***	3.712 (0.150)	<0.001***	4.252 (0.139)	<0.001***	—	—
Age	0.390 (0.022)	<0.001***	0.224 (0.021)	<0.001***	0.076 (0.020)	<0.001***	—	—
Leverage	−0.012 (0.002)	<0.001***	−0.021 (0.002)	<0.001***	−0.013 (0.002)	<0.001***	—	—
Pseudo R^2	0.398	—	0.304	—	0.278	—	—	—
Obs. $/\chi^2(\text{model})$	7,719 /5,109***	—	7,719 /3,378***	—	7,719 /2,969***	—	—	—
SUR RMSE	20.67	—	20.11	—	18.67	—	—	—

Note(s): Robust SUREG standard errors in parentheses. “Sig.” column reports exact *p*-value and stars (****p* < 0.01; ***p* < 0.05; **p* < 0.10). Wald $\chi^2(2)$ tests coefficient equality across pillars. Year dummies and constants suppressed; full suppressed coefficients available upon request

Source(s): Calculated by authors

standards. CEO duality exhibits a mixed pattern: positive for environmental ($\beta = 4.191$, $p < 0.001$) and social ($\beta = 3.259$, $p < 0.001$) performance but negative for governance ($\beta = -1.024$, $p = 0.045$), suggesting centralized leadership can expedite outward-facing initiatives but undermine internal accountability.

Board transparency positively influences governance ($\beta = 2.204$, $p < 0.001$) but negatively affects environmental outcomes ($\beta = -2.935$, $p < 0.001$) and is insignificant for social scores, indicating its role may be reactive to governance pressures. Board skills disclosure strongly supports governance ($\beta = 5.173$, $p < 0.001$) but has limited or negative effects on environmental and social dimensions, suggesting professional expertise disclosures primarily enhance credibility rather than broader ESG impact.

State ownership (SOE) moderates these effects. SOE $\times$ board size interactions are negative across all ESG pillars, strongest for governance ($\beta = -0.753$, $p < 0.001$), while SOE $\times$ gender diversity reduces environmental ($\beta = -0.241$, $p = 0.011$) and governance ($\beta = -0.175$, $p = 0.042$) performance, indicating potential tokenism or politicization in state-influenced boards. SOE $\times$ transparency positively affects governance only ($\beta = 5.131$, $p = 0.002$), and SOE $\times$ skills disclosure shows weak negative effects in the social domain ($\beta = -4.915$, $p = 0.053$).

Control variables remain stable: firm size and age positively correlate with all ESG dimensions, while leverage is negatively associated, reflecting financial constraints. Wald χ^2 tests confirm distinct effects across ESG pillars, emphasizing the multidimensional nature of ESG and the limitations of aggregate scores. Overall, board characteristics exert domain- and context-specific effects, highlighting the need to align governance structures with targeted ESG objectives, particularly in state-owned contexts.

5. Conclusion and implications

This study examined how state ownership moderates the relationship between board characteristics and ESG performance using data from 1,175 publicly listed Asia-Pacific firms from 2010 to 2022. Employing fixed-effects regression, interaction modelling, and pillar-specific analysis, the findings reveal that board independence, gender diversity, board transparency, and director skill disclosure generally enhance ESG outcomes, but these effects vary across ownership types. In state-owned firms, the positive impact of board size and gender diversity is weakened, likely due to politically motivated appointments, whereas board transparency is amplified, reflecting heightened reputational and public-sector accountability. The traditionally negative effect of CEO duality is also somewhat mitigated under state ownership, suggesting alignment between concentrated leadership and state-mandated sustainability goals.

Theoretically, the results highlight that board structures are institutionally contingent. Agency theory and resource dependence perspectives are extended by showing that state-owned firms operate under a hybrid governance logic where political legitimacy, social responsibility, and stakeholder accountability intersect. Mechanisms effective in private firms may function differently in state-controlled contexts, emphasizing the importance of considering ownership regimes in governance research.

For policymakers, the findings suggest that governance regulations should be tailored rather than one-size-fits-all. Enforcing director skill disclosure, mandating minimum independence ratios, and strengthening transparency can improve ESG accountability in state-influenced firms. For corporate practitioners, particularly governance committees, the evidence underscores the need to move beyond symbolic diversity targets and focus on board members' substantive contributions to sustainability strategy.

Limitations point to avenues for future research. The binary classification of state ownership does not capture the degree or type of control, which could be addressed with continuous variables or distinctions between state entities. Additionally, triangulating ESG measures with alternative databases or qualitative assessments would enhance construct

validity. Longitudinal studies examining governance-ESG dynamics during privatization or regulatory reforms could further illuminate temporal aspects of board effectiveness. Overall, the study underscores that ESG outcomes are shaped by both internal board structures and broader institutional contexts, advancing theoretical understanding and practical governance design across diverse economic systems.

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