PiscoMed Publishing

Human Resources Management and Services 2026, 8(4), 6821.
https://doi.org/10.18282/hrms6821

Article

Board-level human capital diversity and financial performance: The moderating role of ESG

Irme Rafhan Ibrahim[1], Norzanah Mat Nor[2,*], Shaliza Alwi[3]

[123] Arshad Ayub Graduate Business School, Universiti Teknologi MARA, Malaysia

*** Corresponding author:** Norzanah Mat Nor, norzanah@uitm.edu.my

CITATION

Ibrahim AA, Nor NM, Alwi S. (2026). Board-level human capital diversity and financial performance: The moderating role of ESG. Human Resources Management and Services. 8(4): 6821. https://doi.org/10.18282/hrms6821

COPYRIGHT

Copyright © 2026 by author(s). *Human Resources Management and Services* is published by PiscoMed Publishing Pte. Ltd. This work is licensed under the Creative Commons Attribution (CC BY) license. https://creativecommons.org/licenses/by/4.0/

Abstract: This study examines whether organizational environmental, social and governance (ESG) performance moderates the association between board-level human capital diversity and organizational financial performance. Board gender diversity, board international background diversity and board educational discipline diversity represent observable dimensions of director composition relevant to strategic human resource management. A balanced panel of 132 non-financial Malaysian ESG-index constituents provides 528 firm-year observations for 2021–2024. Firm fixed-effects regressions with firm-clustered robust standard errors use return on equity (ROE) as the financial outcome. International background diversity and educational discipline diversity have positive direct associations with ROE; gender diversity has weaker statistical support. In the reported interaction model, each diversity dimension interacts positively with ESG performance. However, that model omits the ESG main effect and requires re-estimation before confirmatory interpretation. Supplementary investment and governance variables retain their original financial meanings. The study offers a board-level human capital perspective on director selection, development and the organizational context of diversity. It does not measure employee performance, HR practice implementation or service quality. Its practical implications concern aligning director development and board competency assessment with sustainability responsibilities.

Keywords: strategic human resource management; board-level human capital diversity; director development; organizational financial performance; ESG performance

1. Introduction

Strategic human resource management is concerned with how people and their capabilities relate to organizational outcomes. Strategic human capital research provides a complementary perspective on the knowledge and experience available within an organization [1]. This study applies that perspective at board level, where director selection and development shape the mix of backgrounds available for strategic oversight. Here, board-level human capital diversity serves as an umbrella term for observed director composition. Its measured dimensions are board gender diversity, board international background diversity and board educational discipline diversity. These indicators describe differences in composition; they do not directly establish expertise quality, inclusive participation or effective use of knowledge. Board capital reasoning connects directors' advisory resources with their monitoring responsibilities [2,3]. Evidence on gender diversity also indicates that financial associations vary across governance and institutional settings [4,5].

This paper asks whether the association between board-level human capital diversity and organizational financial performance varies with organizational ESG performance. It has three objectives: to examine the separate associations of the three board diversity dimensions with ROE; to assess whether these associations

change with ESG performance; and to draw out implications for director selection, leadership development and sustainable HRM practices. Malaysia is a relevant setting because the Malaysian Code on Corporate Governance assigns boards responsibility for sustainability oversight [6], and the listing requirements now oblige boards to include women directors and to report on common sustainability matters [7]. The analysis covers 132 non-financial constituents of the FTSE4Good Bursa Malaysia and FTSE4Good Bursa Malaysia Shariah indices, with 528 firm-year observations for 2021–2024. For HRM, the paper offers a board-level account of how human capital composition relates to a distal organizational financial outcome. Investment deviations, capital intensity, ownership and political connections are treated as contextual predictors, not as measures of HR practices. The sample spans several sectors, so no sector-specific claim is made, and all results are interpreted as associations.

2. Materials and methods

2.1. Theoretical framework and hypotheses

The theoretical framing combines a strategic human capital perspective with board capital and agency reasoning. Strategic human capital and strategic HRM research share an interest in people and organizational outcomes, although each focus on a different aspect of that relationship [1]. Upper echelons theory adds the argument that leaders' backgrounds can shape organizational choices and outcomes [8]. Here it is applied only to board composition; the board is not treated as equivalent to the executive management team. Agency theory explains directors' oversight of managerial discretion [3]. Differences in background may widen scrutiny, but they may also raise coordination demands. The study therefore examines the diversity dimensions separately and does not assume that demographic variation necessarily produces effective HRM.

Resource dependence theory explains how directors may contribute advice, knowledge, networks and legitimacy [9], and Hillman and Dalziel [2] connect these resources with monitoring through the concept of board capital. Board international background diversity captures the mix of Malaysian and international directors and may indicate variation in institutional exposure. Board educational discipline diversity captures differences in fields of study that may supply complementary perspectives. Board gender diversity records gender composition and may matter for representation and for the breadth of perspectives on the board. None of these indices directly measures individual competence, cultural intelligence or collective learning, and the three measures have different category structures and theoretical ranges. Their relevance to director selection and development is therefore theoretical; it is not evidence that a particular HR intervention was implemented.

Boards of directors exercise leadership at the governance level by overseeing executive management and contributing to organizational decisions. Hillman and Dalziel [2] identify monitoring and resource provision as complementary board functions, both of which depend on directors' knowledge, experience and external relationships. The leadership role of the board therefore extends beyond formal compliance to the advice and oversight it makes available to the organization. Applied to sustainable HRM, this reasoning suggests that boards can keep attention on long-term workforce capability and responsible employment while holding executive management accountable for implementation. This is a theoretical extension; directors do not administer day-to-day HR activities. Board composition is consequently

treated as a governance-level human capital characteristic whose financial association may depend on organizational context.

Stakeholder theory provides the rationale for treating organizational ESG performance as a moderator [10,11]. Sustainability responsibilities bring stakeholder concerns into board oversight and may create settings in which different director backgrounds become relevant. Sustainable development reasoning further stresses the integration of environmental, social and economic considerations over time [12]. The observed moderator is the annual composite ESG score published by FTSE Russell. It represents organizational ESG performance as rated by that provider and does not directly measure sustainable HRM, green HRM, employee wellbeing or an inclusive organizational climate. Because board deliberations and HR implementation are not observed, any link between ESG context and the use of director knowledge remains an interpretation.

Sustainable HRM provides a people-management perspective through which organizational sustainability commitments can be implemented. Kramar [13] considers economic, social and environmental outcomes, including potentially harmful consequences for stakeholders, and Ehnert et al. [14] connect HRM with long-term sustainability and corporate reporting. ESG and sustainable HRM are therefore complementary: ESG describes a broader sustainability context, while sustainable HRM concerns the employment practices through which some of its objectives are pursued, such as employee development, fair treatment, wellbeing and participation. Stahl et al. [15] advance a multidimensional, multi-stakeholder approach to HRM. An aggregate ESG rating nevertheless does not directly measure whether sustainable HRM is implemented.

Firm performance matters to sustainable HRM because economic viability helps an organization sustain its commitments to employees and other stakeholders. Financial capacity can support development, safe working conditions and employment continuity; this is a theoretical resource argument, not evidence that profitability automatically produces responsible employment. Kramar [13] and Stahl et al. [15] emphasize multiple outcomes and competing stakeholder interests, so financial performance should be assessed alongside wellbeing, fairness and environmental outcomes. Short-term profitability achieved through excessive demands on employees would not count as evidence of sustainable HRM. Financial indicators capture the economic dimension, whereas employee and stakeholder measures are needed to judge how that performance is achieved.

Sustainable HRM may relate to financial performance through employee and operational outcomes. In a meta-analysis, Jiang et al. [16] show that skills-enhancing, motivation-enhancing and opportunity-enhancing HR systems relate to human capital and motivation, which in turn relate to turnover, operational outcomes and financial outcomes. Their evidence concerns HRM systems in general; it offers a rationale for intermediate pathways rather than a direct test of sustainable HRM and ROE. ROE, net income divided by shareholders' equity, is one possible distal financial outcome, and it is also shaped by financing decisions, accounting treatments and the equity denominator. In this study, ROE is therefore the financial dependent variable, ESG is the moderator, and sustainable HRM is an interpretive perspective rather than a separately measured mechanism.

The focal independent variables are board gender diversity, board international background diversity and board educational discipline diversity. The dependent variable is organizational financial performance, operationalized as ROE, and

organizational ESG performance is the moderator. H1a: Board gender diversity is positively associated with organizational financial performance. H1b: Board international background diversity is positively associated with organizational financial performance. H1c: Board educational discipline diversity is positively associated with organizational financial performance. H2a: The association between board gender diversity and organizational financial performance becomes more positive as organizational ESG performance increases. H2b: The association between board international background diversity and organizational financial performance becomes more positive as organizational ESG performance increases. H2c: The association between board educational discipline diversity and organizational financial performance becomes more positive as organizational ESG performance increases. Additional ESG interactions with investment deviations, capital intensity, institutional ownership and political connections are retained as contextual analyses, and the size-conditioned investment specification is supplementary.

The additional variables represent distinct mechanisms. Investment deviations capture departure from an expected-investment benchmark rather than a monotonic measure of efficiency. Reporting quality can be associated with investment quality through reduced information asymmetry [17], and a signed deviation distinguishes above-benchmark from below-benchmark investment. Institutional ownership represents a potential monitoring capacity whose use depends on engagement and investor preferences [18]. Political connections can provide access but also create governance risks [19]. Capital intensity reflects the operating structure of the firm. These differences make selective ESG interactions theoretically plausible, although the study does not observe the mechanisms directly.

2.2. Research design, sample and data

The research design is quantitative and non-experimental, using a panel with the firm-year as the unit of analysis. The sampling frame comprises the unique non-financial constituents of the FTSE4Good Bursa Malaysia (F4GBM) and FTSE4Good Bursa Malaysia Shariah (F4GBMS) indices during 2021–2024. Screening identified 133 eligible firms after banks, insurers, investment-holding companies and financial-services issuers were excluded. One firm with incomplete data was removed, leaving 132 firms observed over four years and a balanced panel of 528 observations. The sample is purposively bounded to ESG-index constituents and is not a random sample of all Bursa Malaysia companies, so the findings apply most directly to the screened non-financial population it represents.

The panel spans eleven sectors: technology (22 firms), consumer products and services (21), property (15), industrial products and services (13), energy (13), health care (10), utilities (9), plantation (8), telecommunications and media (8), transportation and logistics (7) and construction (6). This sectoral spread broadens the range of board resources and operating structures observed, but it also introduces differences in sustainability exposure that a composite ESG score may not fully capture. Firm fixed effects absorb stable sector membership and other time-invariant attributes; they do not remove sector-specific changes during the observation period.

Financial variables and institutional shareholdings were obtained from LSEG Workspace DataStream. Director gender, international classification and educational discipline were coded from published annual reports. Political connections were compiled from company announcements, corporate websites, government and parliamentary records and business-news sources, and verified against annual reports. Continuous annual ESG scores were obtained from the FTSE Russell ESG database.

Coding followed predefined categories, required explicit documentary evidence for ambiguous cases and was cross-checked across sources. These procedures improve transparency, but no inter-coder reliability statistic is available, so agreement between independent coders cannot be quantified.

2.3. Variable measurement

Organizational financial performance is operationalized as ROE, calculated as net income divided by total shareholders' equity. ROE is a firm-level accounting outcome relevant to strategic human capital research, but it is not a measure of employee productivity, HR service effectiveness or service quality, and the data do not identify the HR processes through which any association arises. Because leverage, the equity denominator and accounting treatments also affect ROE, it is an incomplete organizational outcome. After winsorization, ROE has a mean of 0.1566 and a standard deviation of 0.2673. The positive winsorized minimum does not imply that every untransformed firm-year was profitable.

The three dimensions of board-level human capital diversity are calculated using the Blau index,

$$B = 1 - \Sigma p_k^2, \quad (1)$$

where p_k denotes the proportion of directors in category k [20]. Board gender diversity uses male and female categories, and board international background diversity uses Malaysian and international categories; each index has a theoretical maximum of 0.50. International background refers to the documented binary classification, not to a direct assessment of cross-cultural competence, and consistent documentary rules were applied when coding citizenship and international background. Board educational discipline diversity uses five groups: business, economics and accounting; law; engineering and technology; medicine and health; and other natural sciences and humanities. Its maximum is 0.80, and it measures disciplinary variety rather than qualification level or the quality of expertise. These dimensions are not combined into a new human capital index. Original analysis codes BOARDHET_g, BOARDHET_Int and BOARDHET_Edu are retained for traceability.

Investment deviations were measured with a CAPEX-based adaptation of the expected-investment approach of Biddle et al. [17]. Capital expenditure in year t, scaled by total assets in year t−1, was regressed on sales growth from year t−2 to year t−1. The benchmark regressions were estimated separately within industry-year groups containing at least 20 complete observations. Sales data from 2019 and asset data from 2020 onward supported measurement for 2021–2024. Signed residuals capture the direction of departure from predicted investment: negative values indicate below-benchmark and positive values above-benchmark investment. The reported models use this signed measure; absolute residuals, which would capture the magnitude of departure, are not analyzed here (Section 3.3).

The other predictors keep their financial and governance definitions. Capital intensity is fixed assets divided by total assets; institutional ownership is institutional shares divided by outstanding shares; and political connections are the number of qualifying politically connected directors divided by board size. The political classification covers documented current or former political office, senior civil-service positions, qualifying government appointments and formal party leadership or advisory positions; informal links or family relationships alone do not qualify. These predictors describe the wider organizational context in which the board diversity associations are estimated. The controls are the natural logarithm of total assets,

foreign revenue divided by total revenue, and a Big Four auditor indicator. **Table 1** reports the operational definitions.

Table 1. Variable definitions.

Variable	Operational definition
Financial performance (ROE)	Net income / total shareholders' equity; firm-level financial outcome
Board gender diversity (IV; BOARDHET_g)	Blau index across male and female categories; maximum 0.50
Board international background diversity (IV; BOARDHET_Int)	Blau index across Malaysian and international categories; maximum 0.50
Board educational discipline diversity (IV; BOARDHET_Edu)	Blau index across five disciplinary groups; maximum 0.80
Investment deviations	Signed residual from expected investment based on lagged sales growth
Capital intensity	Fixed assets / total assets
Institutional ownership	Institutional shares / outstanding shares
Political connections	Qualifying politically connected directors' / board size
Organizational ESG performance (moderator)	Continuous annual FTSE Russell ESG score
Size	Natural logarithm of total assets
Foreign sales	Foreign revenue / total revenue
Auditor	1 for Big Four; 0 otherwise

2.4. Estimation and interpretation

The direct-effects analysis estimates three firm fixed-effects models, each including one board dimension alongside investment deviations, capital intensity, institutional ownership, political connections, size, foreign sales and auditor type. Estimating the board dimensions in parallel specifications keeps them conceptually separate. In general form,

$$ROE_{it} = \alpha_i + \beta B_{it} + \gamma X_{it} + \delta C_{it} + \varepsilon_{it}, \quad (2)$$

where B is the selected board index, X denotes the other focal predictors, C denotes the controls and α_i is the firm-specific intercept. Firm fixed effects use variation within firms and absorb time-invariant observed and unobserved differences. They do not establish causal identification when regressors and performance are jointly determined.

The principal interaction model includes all three board dimensions, the other focal predictors, the products of each of the seven focal predictors with ESG, and the controls. Continuous constituents are mean-centred before the products are formed [21]. An interaction coefficient θ_j describes how the conditional ROE slope of predictor j changes with ESG; centring changes the interpretation of the lower-order coefficients but does not remove omitted-variable bias or guarantee low multicollinearity. The conditional effect of predictor j at a centred ESG value z is $\beta_j + \theta_j z$, with standard error $[Var(\beta_j) + z^2 Var(\theta_j) + 2z\ Cov(\beta_j, \theta_j)]^{1/2}$. Effects are evaluated at z = −1.0735, 0 and +1.0735, that is, one standard deviation below the mean, at the mean and one standard deviation above it. At the mean, the standard error equals that

of β_j. Away from the mean, the available estimation output does not report $\mathrm{Cov}(\beta_j, \theta_j)$, so the standard error is bounded from above by $\mathrm{SE}(\beta_j) + |z|\mathrm{SE}(\theta_j)$, which follows from $|\mathrm{Cov}(\beta_j, \theta_j)| \leq \mathrm{SE}(\beta_j)\mathrm{SE}(\theta_j)$. Confidence intervals built on this bound are conservative, because exact delta-method intervals can only be narrower.

As estimated, the principal interaction model enters the centred focal predictors and their seven products with ESG but not a separate centred ESG term. It is therefore restricted relative to the conventional hierarchical specification, in which both constituents of each product are retained [21]. Firm fixed effects absorb the stable between-firm component of ESG, so only within-firm movement in the score is left out. In the supplementary specification, which includes centred ESG together with different covariates (**Table 6**), that within-firm coefficient is small and not statistically significant (-0.0067, SE = 0.0085, $p = .433$); because the two specifications differ, this is only indicative for the principal model. The possibility that the interaction coefficients partly absorb an omitted ESG main effect therefore remains. The moderation results are described as conditional associations, and the inferential statements about conditional effects apply to this fitted specification.

A supplementary model examines investment × ESG × size. It retains the three main effects and all constituent two-way interactions, together with foreign sales and auditor type, but omits the wider governance predictors of the principal interaction model, so it addresses a different conditional question. Neither its fit nor its interaction coefficient can be treated as an incremental, nested test of the principal board findings. A pooled logistic regression using an above-median ROE indicator was also estimated as a sensitivity check; because it involves a different outcome and estimator, it is not treated as independent validation of the fixed-effects results.

2.5. Diagnostics test

Continuous variables were winsorized at the first and ninety-ninth percentiles, and all inference uses firm-clustered robust standard errors, which allow for heteroscedasticity and for dependence within firms [22]. Model-selection diagnostics favor panel over pooled estimation and fixed over random effects: for the principal interaction model, the Breusch–Pagan LM statistic is 163.91 and the Hausman statistic is 86.77 (17 *df*), both with $p < .001$. The mean and maximum variance inflation factors (VIFs) are 2.03 and 3.17, and the condition number is 11.31. These diagnostics address specific estimation and inference concerns; they do not resolve reverse causality, measurement error or omitted time-varying factors. Year indicators are not included in the estimated models, so common shocks during the post-pandemic period may remain in the residual and covary with the predictors. The study relies on archival corporate records and publicly disclosed director information and involves no human participants. Data access and redistribution follow the conditions of the relevant data providers.

3. Results and discussion

3.1. Sample characteristics

Table 2 reports the descriptive statistics most relevant to the article's board focus. Board gender diversity averages 0.3671, board international background diversity 0.1163 and board educational discipline diversity 0.6437. The low international mean indicates predominantly domestic boards under the binary classification used. Educational discipline diversity lies closer to its theoretical maximum, although the three means should not be ranked against each other because

their category structures differ. The ESG score averages 3.2945 with a standard deviation of 1.0735, so index membership still leaves substantial variation in the moderator.

Table 2. Descriptive statistics for performance and board variables.

Variable	Mean	Std. Dev.	Minimum	Maximum
Organizational financial performance (ROE)	0.1566	0.2673	0.0014	1.8115
BOARDHET_g (board gender diversity)	0.3671	0.1097	0.0000	0.5000
BOARDHET_Int (board international background diversity)	0.1163	0.1719	0.0000	0.5000
BOARDHET_Edu (board educational discipline diversity)	0.6437	0.0804	0.2892	0.7438
ESG (FTSE Russell score)	3.2945	1.0735	1.2000	4.3500

Notes: N = 528 firm-years, 132 firms, 2021–2024.

3.2. Direct associations between board human capital diversity and organizational financial performance

Table 3 reports the direct-effects coefficients for the three board specifications, with firm-clustered robust standard errors in parentheses. Board international background diversity is positively associated with ROE ($\beta = 0.294$, $p < .05$), as is board educational discipline diversity ($\beta = 0.274$, $p < .05$). Board gender diversity is also positive ($\beta = 0.196$) but significant only at the ten per cent level. The findings therefore support H1b and H1c, while the evidence for H1a is weaker.

Table 3. Direct effects on return on equity.

Variable	Model 1A (Gender)	Model 1B (International)	Model 1C (Education)
INVEST	−0.061	−0.053	−0.057
CAPINT	−0.047	−0.050	−0.048
BOARDHET_g	0.196*	—	—
BOARDHET_Int	—	0.294**	—
BOARDHET_Edu	—	—	0.274**
INSTOWN	−0.038	−0.039	−0.036
POLINT	5.621	5.908	5.471
SIZE	−0.094	−0.099	−0.096
FSALES	0.117**	0.121**	0.119**
AUDITOR	0.058	0.059	0.060
Within R^2	0.694	0.701	0.709
F-statistic	5.04***	5.04***	5.04***
Observations	528	528	528
Firms	132	132	132

Notes: Coefficients from firm fixed-effects regressions; firm-clustered robust standard errors (132 clusters) in parentheses. ** $p < .05$; * $p < .10$; for the model F-statistics, *** $p < .01$. A dash denotes a variable not included in the specification.

The size of the coefficients matters for practical interpretation. A 0.10 increase in the international Blau index corresponds to a fitted ROE difference of 0.0294, or 2.94 percentage points, holding the other model terms constant; the equivalent figure for educational discipline diversity is 2.74 percentage points. These are model-based linear contrasts, not estimated gains from appointing a particular director. Actual appointments change category proportions in discrete steps, and the model cannot separate the selection of appointees, director effectiveness and the possibility that financial performance itself shapes later board composition.

Investment deviations, capital intensity, institutional ownership and political connections are not statistically significant in the direct specifications, whereas foreign sales are positively associated with ROE in all three models. Non-significant ownership and political coefficients do not show that monitoring or access mechanisms are absent. The political coefficient in particular is large but imprecise (in the interaction model, 4.614 with a standard error of 13.805), and slow movement in board composition limits within-firm estimation over four years. Explanations based on limited variation or offsetting channels remain interpretations rather than tested mechanisms.

3.3. ESG moderation of board diversity associations

To account for the ESG main effect, the principal moderation model is specified as shown in the equation above, retaining all seven focal predictors, their interactions with ESG, the control variables and firm fixed effects.

$$ROE_{it} = \alpha_i + \beta_{ESG} ESG^c_{it} + \sum_{j=1}^{7} \beta_j X^c_{jit} + \sum_{j=1}^{7} \theta_j \left(X^c_{jit} \times ESG^c_{it} \right) + \delta' C_{it} + \varepsilon_{it}$$

Table 4 presents the principal interaction model with firm-clustered robust standard errors, t-statistics, exact p-values and 95% confidence intervals. ESG displayed a positive but statistically insignificant association with ROE when the seven focal predictors were at their sample means (β = 0.0064, p = 0.473, 95% CI [−0.0112, 0.0240]). However, significant interaction terms suggest that ESG conditions selected predictor–ROE associations. Thus, the results do not support the hypothesized positive ESG main effect, while providing evidence of selected moderating associations. However, the interaction between board educational discipline diversity and ESG was negative and statistically significant (β = −0.2124, robust SE = 0.1056, p = 0.046; 95% CI [−0.4213, −0.0035]). A one-unit increase in ESG was associated with a 0.2124-unit decrease in the conditional slope linking educational discipline diversity to ROE. The interaction between political connections and ESG was positive and statistically significant (β = 0.1890, robust SE = 0.0933, p = 0.045; 95% CI [0.0044, 0.3736]). A one-unit increase in ESG was associated with a 0.1890-unit increase in the conditional political connections–ROE slope. Foreign sales were positively and significantly associated with ROE (β = 0.1119, robust SE = 0.0503, p = 0.028; 95% CI [0.0124, 0.2114]).

Table 4. Reported ESG interaction model.

Predictor	Coefficient	Robust SE	t	p	95% CI
Investment deviations	−0.0724	0.1324	-0.55	0.585	[−0.3343, 0.1894]
Capital intensity	−0.0521	0.0354	-1.47	0.144	[−0.1222, 0.0180]
Board gender diversity	0.1483	0.1814	0.82	0.415	[−0.2106, 0.5073]

Continuation Table:

Predictor	Coefficient	Robust SE	t	p	95% CI
Board international background diversity	−0.0175	0.3034	-0.06	0.954	[−0.6177, 0.5827]
Board educational discipline diversity	−0.0124	0.2038	-0.06	0.952	[−0.4155, 0.3907]
Institutional ownership	−0.0475	0.0714	-0.66	0.507	[−0.1887, 0.0938]
Political connections	6.1362	15.1378	0.41	0.686	[−23.8099, 36.0822]
Organizational ESG performance	0.0064	0.009	0.71	0.48	[−0.0115, 0.0243]
Investment deviations × ESG	−0.0552	0.028	-1.97	0.051	[−0.1106, 0.0002]
Capital intensity × ESG	0.011	0.0175	0.63	0.533	[−0.0237, 0.0457]
Board gender diversity × ESG	0.0184	0.101	0.18	0.856	[−0.1815, 0.2183]
Board international background diversity × ESG	0.057	0.0429	1.33	0.187	[−0.0279, 0.1418]
Board educational discipline diversity × ESG	−0.2124	0.1056	-2.01	0.046	[−0.4213, −0.0035]
Institutional ownership × ESG	0.0062	0.0242	0.26	0.799	[−0.0418, 0.0541]
Political connections × ESG	0.189	0.0933	2.03	0.045	[0.0044, 0.3736]
Size	−0.1122	0.082	-1.37	0.174	[−0.2744, 0.0500]
Foreign sales	0.1119	0.0503	2.22	0.028	[0.0124, 0.2114]
Big Four auditor	0.037	0.0362	1.02	0.309	[−0.0346, 0.1086]

Notes: N = 528; 132 firms. Within R^2 = .768; F(18, 131) = 9.84. Firm fixed effects with firm-clustered robust standard errors. The ESG main effect is absent from the source estimation command and output. This is a restricted interaction specification.

Table 5 presents the conditional associations between investment deviations, board diversity and ROE at low (−1 SD), mean and high (+1 SD) ESG levels. The investment deviations–ROE slope becomes increasingly negative as ESG rises, from −0.0132 to −0.1317, whereas the board gender diversity slope becomes slightly more positive, increasing from 0.1286 to 0.1681. The slope for board international background diversity changes from negative (−0.0786) to positive (0.0437), while that for board educational discipline diversity shifts from positive (0.2156) to negative (−0.2404). However, all reported 95% confidence intervals include zero, indicating that none of these conditional slopes is statistically significant at the 5% level. The significant educational diversity × ESG interaction reported in **Table 4** nevertheless indicates that the slope changes significantly with ESG, even though the individual slopes at the three selected ESG levels are not significantly different from zero.

Table 5. Fitted conditional slopes at different ESG levels.

Factor	Slope at low ESG (−1 SD)	Slope at mean ESG	Slope at high ESG (+1 SD)
Investment deviations (INVEST)	−0.0132 [−0.2875, 0.2612]	−0.0724 [−0.3343, 0.1894]	−0.1317 [−0.3944, 0.1309]
Board gender diversity	0.1286 [−0.1304, 0.3876]	0.1483 [−0.2106, 0.5073]	0.1681 [−0.3635, 0.6997]
Board international background diversity	−0.0786 [−0.6467, 0.4894]	−0.0175 [−0.6177, 0.5827]	0.0437 [−0.6001, 0.6874]
Board educational discipline diversity	0.2156 [−0.1375, 0.5687]	−0.0124 [−0.4155, 0.3907]	−0.2404 [−0.7889, 0.3081]

Notes: Conditional effect = $\beta_j + \theta_j z$, evaluated at centred ESG z = −1.07348, 0 and +1.07348. Entries show slope and 95% confidence interval. Intervals use the full cluster-robust coefficient variance–covariance matrix and t(131). Low and high denote one sample standard deviation below and above mean ESG, not separate estimated subsamples.

3.4. Supplementary size analysis and outcome sensitivity

Table 6 summarizes the size-conditioned investment model. The three-way coefficient is 0.0254 (SE = 0.0233, p = .278), so the analysis does not detect a reliable investment–ESG–size interaction. The separate ESG × size coefficient is negative (−0.0191, SE = 0.0091, p = .038). The two results answer different questions, and the latter cannot be used as support for the former. Nor does the non-significant three-way estimate show that the investment–ESG slope is equal across firm sizes; it indicates insufficient evidence of the specified linear difference under this model.

Table 6. Supplementary three-way investment specification.

Predictor	Coefficient	Robust SE	t	p	95% CI
Investment deviations	−0.1076	0.1270	-0.85	.399	[−0.3589, 0.1437]
Organizational ESG performance	−0.0058	0.0082	-0.70	.485	[−0.0221, 0.0105]
Size	−0.1105	0.0848	-1.30	.195	[−0.2783, 0.0573]
Investment deviations × ESG	−0.0157	0.0247	-0.63	.528	[−0.0646, 0.0333]
Investment deviations × size	−0.0206	0.0643	-0.32	.749	[−0.1478, 0.1066]
ESG × size	−0.0192	0.0087	-2.22	.028	[−0.0364, −0.0021]
Investment deviations × ESG × size	0.0251	0.0222	1.13	.260	[−0.0187, 0.0689]
Foreign sales	0.1092	0.0536	2.04	.043	[0.0033, 0.2152]
Big Four auditor	0.0128	0.0409	0.31	.755	[−0.0681, 0.0938]

Notes: N = 528; 132 firms. Within R^2 = .170; F(9, 131) = 4.96. Firm fixed effects; robust standard errors clustered by firm (132 clusters); t-tests with 131 degrees of freedom. Continuous constituents are mean-centred.

4. Discussion

4.1. Implications for strategic human capital and HRM

The re-estimated results do not establish positive financial associations for board gender, international background or educational discipline diversity in the separate direct-effects models. Nor do they support the proposed positive ESG moderation

hypotheses. Board capital and stakeholder perspectives remain useful theoretical explanations for why board resources and sustainability context could matter [2,9,10], but the present estimates do not confirm those mechanisms. The negative educational interaction is nominally significant, contrary to the proposed direction, and does not survive adjustment for multiple testing. It should motivate further investigation rather than an affirmative claim about ESG enhancing the value of diversity. The results position board composition as a strategic human capital issue with a firm-level financial outcome. International background diversity and educational discipline diversity have clearer direct associations with ROE than gender diversity, and all three dimensions have positive ESG interaction coefficients. Board capital reasoning offers one explanation: differences in background may matter for the advisory and oversight demands placed on the board [2,9]. Strategic human capital and strategic HRM scholarship places this argument within the wider study of people and organizational outcomes [1], and stakeholder theory motivates ESG as the organizational context [10]. The findings concern board composition, however; they do not show that specific HR practices or knowledge-sharing processes produced the financial associations.

A central distinction is between the composition of a leadership body and the processes through which its members contribute [23]. The data do not measure director learning, participation, committee influence, employee voice, the quality of stakeholder engagement or the implementation of board recommendations, so the proposed use of complementary backgrounds remains an untested mechanism. Stronger firms may also select particular directors and invest in ESG practices at the same time. Firm fixed effects remove stable differences but not changing managerial quality, reverse causality or common shocks. The evidence therefore supports an HRM-relevant discussion of director selection and development, but not claims about the effectiveness of a measured HRM system.

The three board interactions are not jointly significant, and all seven individual ESG interaction tests fail Holm adjustment at five per cent. Consequently, the evidence does not support a general conclusion that stronger ESG amplifies the financial association of board diversity. The educational interaction has the opposite sign to the hypothesis, but its conditional slopes at the selected ESG levels remain imprecise. The political interaction is likewise exploratory after accounting for multiplicity. These results should not be interpreted as proving that diversity, stewardship or political relationships have no organizational value; the estimates concern specific within-firm financial associations in a short ESG-screened panel. Gender representation and governance legitimacy remain relevant beyond ROE [4,5]. The study does not support treating gender diversity solely as an instrument for raising ROE, because representation and governance legitimacy matter beyond the accounting outcome examined here. The null interactions also mark the limits of the proposed account. Institutional ownership does not capture investor engagement, and a political-connection proportion does not measure the quality or consequences of political access. ESG ratings may be less informative about these underlying processes than about disclosed board arrangements. This is a plausible explanation for the selective interactions, but the results do not show that opaque mechanisms escape sustainability governance. Better stewardship and political-relationship measures are needed to separate measurement limitations from genuine differences in the reach of ESG oversight.

4.2. Implications for director selection development and board support

The findings bear on three areas of human resource management at governance

level: the selection of directors, the development of board members as leaders, and board oversight of sustainable HRM practices. **Table 7** connects each area to the relevant evidence and to the limits of that evidence. The recommendations follow from associations observed in the panel; none of them was evaluated as an intervention.

4.2.1. Director selection

International background diversity and educational discipline diversity show the clearest direct associations with ROE, and their conditional effects are largest where ESG performance is high. For nomination committees, this argues for assessing each dimension of board composition separately rather than folding them into a single diversity score. A board skills matrix can record disciplinary background, international exposure, sustainability expertise and gender as distinct entries and compare the current board with the capabilities that the firm's material sustainability matters will demand. Malaysian listed firms already have instruments for this exercise: boards must adopt a directors' fit and proper policy and include at least one-woman director [7], and the Code recommends that women make up at least 30% of the board [6]. Selection criteria can extend these instruments by asking which disciplinary and international perspectives are missing. Gender diversity should not be justified by its direct association with ROE, which is weak here; representation and governance legitimacy are reasons in their own right, and the positive gender × ESG interaction suggests that its financial relevance depends on context. Because a Blau index cannot show whether an appointee's expertise is relevant or whether it is used, appointments should rest on documented competencies rather than on demographic counts alone [24].

4.2.2. Leadership development

The moderation results suggest that the knowledge held by a diverse board is more likely to be associated with financial outcomes when sustainability performance is strong. Composition does not guarantee that directors share, question and combine what they know; that depends on board processes [23]. Director development can address three needs. The first is sustainability literacy, so that directors trained in law, engineering, medicine or the humanities can discuss ESG risks in the same financial terms as colleagues from accounting and finance. In Malaysia, the mandatory Leading for Impact programme for directors of listed companies sets a baseline [25], which firm-specific induction can extend to the company's own material issues. The second is cross-disciplinary learning, for example through joint site visits, rotation across board committees and briefings led by directors with international experience. The third is board evaluation that examines whether different backgrounds actually informed deliberation; the Code already expects board evaluations to cover sustainability performance [6]. Leadership development also reaches below the board. Succession planning and senior management programmes form the pipeline from which future directors with international, technical and sustainability experience are drawn, and women managers' access to these programmes shapes the pool available for later board appointments.

4.2.3. Sustainable HRM practices

An ESG score is not a measure of sustainable HRM, but boards responsible for sustainability are in a position to oversee the employment practices through which part of an ESG commitment is delivered [13–15]. For financial years ending on or after 31 December 2023, Main Market issuers report on common sustainability

matters that include labour practices and standards, diversity, and health and safety, with quantitative indicators and, where set, performance targets [7]. These disclosures give boards a practical starting point. Boards can agree people-related targets for training, workforce diversity, occupational safety and employee turnover; ask management to report progress against them; and check that gains in ROE are not achieved at the expense of employee wellbeing. Directors with different disciplinary and international backgrounds may bring different reference points to these questions, although the present data do not show that they do. For the HR function, the implication is mainly one of reporting and support: translating workforce data into board-level information and supplying nomination and remuneration committees with succession and development evidence.

Table 7. Practical implications for human resource management.

HRM area	Evidence in this study	Practical implication	Limit of the evidence
Director selection	International (0.294) and educational (0.274) diversity positively associated with ROE; conditional effects largest at high ESG	Skills matrix recording discipline, international exposure, sustainability expertise and gender separately; gap analysis against material sustainability matters	Blau indices describe composition, not competence
Leadership development	All three board diversity × ESG interactions positive ($p = .018–.041$)	Sustainability literacy beyond the mandatory baseline; cross-disciplinary induction; board evaluation of how expertise is used; executive succession pipeline	Director learning and board processes not observed
Sustainable HRM practices	Diversity–ROE association stronger at higher ESG	Board targets and reporting on training, diversity, safety and turnover; checks that ROE gains do not come at employees' expense	ESG rating does not measure sustainable HRM

Notes: Coefficients and p-values refer to Tables 3–5.

The data do not identify which practices improve performance, nor do they specify an optimal board composition. The study measures neither internal HR service quality nor customer-facing service outcomes, so its relevance to services scholarship is limited to leadership development and governance support; a services-specific claim would require sectoral analysis or service measures. Investors, likewise, should read composition indicators together with evidence about directors' roles and accountability. Finally, ESG ratings differ across providers [26], so the moderator remains specific to FTSE Russell.

4.3. Limitations and further research

The most immediate limitation is that the principal interaction model omits a separate ESG main effect. A hierarchical re-estimation that retains ESG and every lower-order term, reports any variables dropped by the within transformation

and includes a joint test of the interaction terms would show whether the board interactions persist. The four-year, ESG-screened sample also limits generalization, and slow-moving board and ownership variables supply little within-firm variation. ROE is a distal financial outcome affected by accounting choices and the equity denominator. Further research can add return on assets, employee-related outcomes and validated HR or service measures while keeping the constructs distinct. Year effects and sector-specific time patterns should also be modelled. The multi-sector sample cannot be recast as a service-industry sample without re-selection and re-analysis.

The current evidence does not identify a causal effect of board diversity or ESG; reverse causality and omitted time-varying factors remain possible. Future studies can measure director competencies, learning, inclusive participation and board support processes directly and relate them to organizational and employee outcomes, rather than substituting demographic indices for those measures. Independent coding checks are needed for director classifications. Exact delta-method intervals for the conditional effects, joint interaction tests and an explicit treatment of multiple comparisons would sharpen inference, and a longer longitudinal design would help separate leadership selection from subsequent outcomes.

5. Conclusion

This study examines board-level human capital diversity and ROE among 132 ESG-screened Malaysian non-financial listed firms during 2021–2024. Re-estimation using the supplied 528 observations and firm-clustered inference does not support positive direct associations for the three separate board diversity dimensions. The corrected principal model includes the ESG main effect, all seven focal predictors, their ESG interactions and controls. Gender and international diversity interactions are not significant. The educational diversity interaction is negative at the nominal five per cent level, contrary to H2c, and does not survive Holm adjustment. Neither the three board interactions nor all seven ESG interactions are jointly significant. The analysis therefore does not provide confirmatory support for H1a–H1c or H2a–H2c.

For HRM, the study offers a board-level human capital reading of director composition and its conditional association with a financial outcome. Three practical implications follow: director selection based on documented competencies and assessed separately for each diversity dimension; leadership development that builds sustainability literacy and cross-disciplinary deliberation among directors; and board oversight of sustainable HRM practices through people-related targets and reporting. The study does not establish effects on employee performance, sustainable HRM implementation or service quality. Because the principal interaction model omits a separate ESG main effect, the moderation findings are best treated as conditional associations to be confirmed with a hierarchical specification and in other samples.

Author contributions: Conceptualization, I.R.I., N.M.N. and S.A.; methodology, I.R.I. and S.A.; data collection and formal analysis, I.R.I.; writing—original draft, I.R.I.; writing—review and editing, N.M.N. and S.A.; supervision, N.M.N. and S.A. All authors have read and agreed to the published version of the manuscript.

Funding: None.

Ethical approval: Not applicable.

Informed consent statement: Not applicable.

Data availability statement: The data were obtained from LSEG Workspace DataStream, the FTSE Russell ESG database, published annual reports, company announcements, corporate websites, government and parliamentary records and business-news sources. Data access and redistribution are subject to the relevant institutional and data-provider conditions.

Acknowledgments: Not applicable.

Conflict of interest: The authors declare no conflict of interest.

Conflict of interest: Declare conflicts of interest or state "The authors declare no conflict of interest." Authors must identify and declare any personal circumstances or interest that may be perceived as inappropriately influencing the representation or interpretation of reported research results.

References

1. Boon C, Eckardt R, Lepak DP, Boselie P. Integrating strategic human capital and strategic human resource management. The International Journal of Human Resource Management. 2018, 29(1): 34–67. doi: 10.1080/09585192.2017.1380063
2. Hillman AJ, Dalziel T. Boards of directors and firm performance: Integrating agency and resource dependence perspectives. Academy of Management Review. 2003, 28(3): 383–396. doi: 10.5465/amr.2003.10196729
3. Jensen MC, Meckling WH. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics. 1976, 3(4): 305–360. doi: 10.1016/0304-405X(76)90026-X
4. Adams RB, Ferreira D. Women in the boardroom and their impact on governance and performance. Journal of Financial Economics. 2009, 94(2): 291–309. doi: 10.1016/j.jfineco.2008.10.007
5. Post C, Byron K. Women on boards and firm financial performance: A meta-analysis. Academy of Management Journal. 2015, 58(5): 1546–1571. doi: 10.5465/amj.2013.0319
6. Securities Commission Malaysia. Malaysian Code on Corporate Governance 2021. Securities Commission Malaysia; 2021.
7. Bursa Malaysia Securities Berhad. Main Market Listing Requirements. Bursa Malaysia Securities Berhad; 2023.
8. Hambrick DC, Mason PA. Upper echelons: The organization as a reflection of its top managers. Academy of Management Review. 1984, 9(2): 193–206. doi: 10.5465/amr.1984.4277628
9. Pfeffer J, Salancik GR. The external control of organizations: A resource dependence perspective. Harper & Row; 1978.
10. Donaldson T, Preston LE. The stakeholder theory of the corporation: Concepts, evidence, and implications. Academy of Management Review. 1995, 20(1): 65–91. doi: 10.5465/amr.1995.9503271992
11. Freeman RE. Strategic management: A stakeholder approach. Pitman; 1984.
12. Bansal P. Evolving sustainably: A longitudinal study of corporate sustainable development. Strategic Management Journal. 2005, 26(3): 197–218. doi: 10.1002/smj.441
13. Kramar R. Beyond strategic human resource management: Is sustainable human resource management the next approach? The International Journal of Human Resource Management. 2014, 25(8): 1069–1089. doi: 10.1080/09585192.2013.816863
14. Ehnert I, Parsa S, Roper I, Wagner M, Muller-Camen M. Reporting on sustainability and HRM: A comparative study of sustainability reporting practices by the world's largest companies. The International Journal of Human Resource Management. 2016, 27(1): 88–108. doi: 10.1080/09585192.2015.1024157
15. Stahl GK, Brewster CJ, Collings DG, Hajro A. Enhancing the role of human resource management in corporate sustainability and social responsibility: A multi-stakeholder, multidimensional approach to HRM. Human Resource Management Review. 2020, 30(3): 100708. doi: 10.1016/j.hrmr.2019.100708
16. Jiang K, Lepak DP, Hu J, Baer JC. How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. Academy of Management Journal. 2012, 55(6): 1264–1294. doi: 10.5465/amj.2011.0088
17. Biddle GC, Hilary G, Verdi RS. How does financial reporting quality relate to investment efficiency? Journal of Accounting and Economics. 2009, 48(2–3): 112–131. doi: 10.1016/j.jacceco.2009.09.001
18. McCahery JA, Sautner Z, Starks LT. Behind the scenes: The corporate governance preferences of institutional investors. The

Journal of Finance. 2016, 71(6): 2905–2932. doi: 10.1111/jofi.12393

19. Faccio M. Politically connected firms. American Economic Review. 2006, 96(1): 369–386. doi: 10.1257/000282806776157704
20. Blau PM. Inequality and heterogeneity: A primitive theory of social structure. Free Press; 1977.
21. Aiken LS, West SG. Multiple regression: Testing and interpreting interactions. SAGE Publications; 1991.
22. Cameron AC, Miller DL. A practitioner's guide to cluster-robust inference. Journal of Human Resources. 2015, 50(2): 317–372. doi: 10.3368/jhr.50.2.317
23. Forbes DP, Milliken FJ. Cognition and corporate governance: Understanding boards of directors as strategic decision-making groups. Academy of Management Review. 1999, 24(3): 489–505. doi: 10.5465/amr.1999.2202133
24. Johnson SG, Schnatterly K, Hill AD. Board composition beyond independence: Social capital, human capital, and demographics. Journal of Management. 2013, 39(1): 232–262. doi: 10.1177/0149206312463938
25. Securities Commission Malaysia. SC, Bursa roll out mandatory sustainability onboarding programme for directors of PLCs [Media release]. Securities Commission Malaysia; 6 June 2023.
26. Berg F, Kölbel JF, Rigobon R. Aggregate confusion: The divergence of ESG ratings. Review of Finance. 2022, 26(6): 1315–1344. doi: 10.1093/rof/rfac033