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Firm Size and Corporate Sustainability: A comparative study of Indonesia's Vegetable Seed Industry

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A B S T R A C T

Firm size is commonly associated with differences in organizational resources, yet its implications for sustainability implementation remain context dependent. This study compares social, economic, and environmental sustainability between SMEs and large firms in Indonesia's vegetable seed industry. Survey data were collected from 262 organizational respondents and analyzed in R using ordinal confirmatory factor analysis, measurement invariance testing, and latent mean comparison. The three-dimensional measurement model demonstrated satisfactory reliability and validity, while scalar invariance supported meaningful comparisons across firm-size groups. Large firms reported slightly higher social and economic sustainability, but the differences were not statistically significant. Environmental sustainability was nearly identical across the groups. Welch and permutation tests confirmed the robustness of these findings. The results refine Contingency Theory by showing that greater organizational scale does not necessarily produce stronger sustainability implementation. Different configurations of resources, flexibility, managerial proximity, and stakeholder relationships may enable firms of different sizes to achieve comparable outcomes. Sustainability policies should therefore address firm-specific capabilities rather than assume that SMEs consistently underperform large firms.

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INTRODUCTION

Greater organizational resources should facilitate sustainability, yet firm size does not consistently predict social, economic, and environmental outcomes. Large firms can finance specialized personnel, digital infrastructure, formal monitoring, and environmental management systems (Montresor & Vezzani, 2023). SMEs may compensate for resource constraints through flexibility, shorter decision chains, and closer stakeholder relationships (Sen *et al*., 2023). Contingency theory explains this tension by proposing that organizational outcomes depend on alignment between internal characteristics and contextual demands rather than a universally superior organizational form (Donaldson, 2001). Firm size represents a relevant contingency because it shapes resource availability, formalization, managerial specialization, and decision-making flexibility.

Recent empirical evidence reflects this theoretical tension. Larger manufacturing firms have demonstrated stronger performance across several sustainability dimensions, partly because their organizational resources support more formal and systematic sustainability practices (Jum'a *et al*., 2024a). SMEs have also generated meaningful environmental and social value through adaptive structures, locally embedded operations, and direct stakeholder relationships (Moursellas *et al*., 2023). These contrasting findings suggest that organizational scale may influence corporate sustainability differently across its social, economic, and environmental dimensions. Resource advantages may strengthen certain sustainability outcomes without guaranteeing superior performance across all dimensions.

The vegetable seed industry provides a theoretically relevant setting for examining this contingency (Li *et al*., 2024). Sustainability in this industry is embedded in relationships connecting plant breeding, contract production, quality assurance, distribution, and farming communities (Kliem & Sievers-Glotzbach, 2022). Decisions made by seed companies affect varietal availability, production resilience, farmer livelihoods, resource use, and environmental impacts. Vegetable seed companies also operate through heterogeneous business models and differ substantially in technological capabilities, market reach, and farmer engagement (ter Steeg & Louwaars, 2024). Indonesia presents a valuable empirical context because commercial seed production requires coordination among companies, growers, distributors, research institutions, and government agencies (Qadir *et al*., 2024).

Firm-size differences in this setting remain insufficiently understood. Existing corporate sustainability studies commonly examine SMEs separately, treat firm size merely as a control variable, or combine sustainability dimensions into a single score (Garrido-Ruso et al., 2024; Hernández et al., 2024). Seed-system research has focused predominantly on seed accessibility, technological innovation, varietal adoption, production, and distribution (Westengen *et al*., 2023). Direct evidence comparing sustainability dimensions across firm sizes remains limited. This study applies contingency theory to compare social, economic, and environmental sustainability between SMEs and large Indonesian

vegetable seed firms, clarifying whether sustainability support should be differentiated by firm size or directed toward shared industry priorities.

LITERATURE REVIEW

Contingency Theory

Contingency theory rejects the assumption that one organizational structure produces superior outcomes universally. Effectiveness depends on alignment between organizational characteristics and operating conditions. Burns & Stalker (1961) distinguished formalized, hierarchical mechanistic structures from flexible, decentralized organic structures, while Lawrence & Lorsch (1967) emphasized adapting differentiation and integration to environmental demands. Donaldson (2001) subsequently identified size, technology, strategy, and uncertainty as contingencies shaping organizational performance. Firm size influences resource availability, specialization, formalization, authority, and coordination. Large firms typically employ specialized functions, standardized procedures, formal monitoring, and greater capital investment, whereas SMEs rely on simpler structures, direct communication, and flexible decision-making. Neither arrangement is inherently superior. In the vegetable seed industry, firms must balance commercial viability, farmer relationships, resource efficiency, waste management, and environmental responsibility. Large firms may use formal systems and specialized resources, while SMEs may rely on adaptive coordination and direct farmer engagement, producing different outcomes across sustainability dimensions.

Firm Size and Corporate Sustainability

Corporate sustainability integrates economic viability with responsible social and environmental outcomes, recognizing firms' dependence on stakeholders and natural systems (Ghobakhloo *et al*., 2021; Jum'a *et al*., 2024). In the vegetable seed industry, it encompasses business continuity, partner-farmer welfare, responsible resource use, waste management, and environmental impact mitigation.

Firm size creates different conditions for implementing these responsibilities. Large firms possess greater financial capacity, specialized personnel, digital infrastructure, reporting systems, and certification access. Jum'a *et al*. (2024) found that larger manufacturing firms performed better on several sustainability measures and that size shaped the sustainability effects of supply-chain practices. Resource availability, however, does not guarantee superior outcomes. SMEs may compensate through flexibility, local knowledge, informal coordination, and stakeholder proximity. Their practices reflect costs, managerial commitment, stakeholder expectations, and local conditions (Moursellas *et al*., 2023). Firm size also shapes how stakeholder pressure drives circular-economy adoption (Ahmadov *et al*., 2025), suggesting different sustainability configurations rather than a uniform large-firm advantage.

Firm Size and Social Sustainability

Social sustainability concerns corporate effects on stakeholder welfare, equitable relationships, social inclusion, human-capital protection, and community well-being (Oduro, 2025). It is closely connected to partner farmers because companies depend on growers to meet specified quality and quantity requirements. Farmer welfare, production support, and mutually beneficial cooperation therefore represent central outcomes. Large firms may use greater financial and technical capacity to provide formal training, quality assistance, incentives, and structured partnership programmes. Their visibility may also create stronger expectations for documented social responsibility. Firm size has been shown to condition relationships involving social sustainability performance (Jum'a *et al*., 2024). However, SME's may achieve comparable outcomes through frequent communication, relational trust, local proximity, and rapid responses to farmer needs. Social sustainability can consequently emerge through formal systems in large firms or relationship-based mechanisms in SMEs, without establishing that either size category consistently produces superior farmer-oriented outcomes. The corresponding hypothesis states:

H1: Social sustainability differs significantly between SMEs and large firms in Indonesia's vegetable seed industry.

Firm Size and Economic Sustainability

Economic sustainability reflects a firm's ability to maintain financial viability, manage resources, respond to markets, and preserve business continuity. It involves achieving profit targets, maintaining operating revenue, and supplying products aligned with farmers' needs. Financial capacity is also necessary to sustain social and environmental commitments. Large firms may benefit from economies of scale, diversified products, wider markets, professional management, and stronger investment capacity. Firm size can consequently shape the relationship between sustainable supply-chain practices and economic sustainability (Jum'a *et al*., 2024). Credible sustainability commitments and ESG signals may also improve SME financial performance, although institutional conditions influence these outcomes (Momtaz, 2025). SMEs can compensate through lower administrative complexity, specialized markets, rapid decisions, and close knowledge of local demand. Limited reserves and market power nevertheless increase their exposure to disruption and uncertainty. Large-firm resource advantages and SME adaptability therefore prevent a definitive expectation that either group consistently achieves superior economic sustainability. The economic hypothesis is formulated as follows:

H2: Economic sustainability differs significantly between SMEs and large firms in Indonesia's vegetable seed industry.

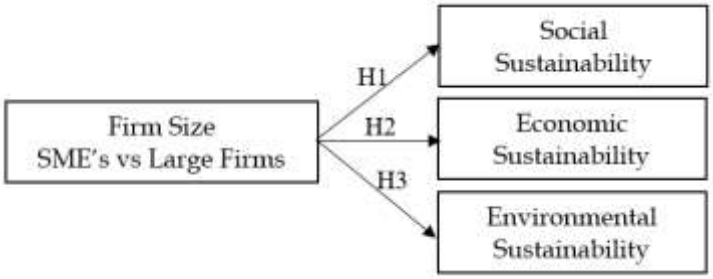
Firm Size and Environmental Sustainability

Environmental performance consequently requires both production-level impact mitigation and organizational systems that support responsible resource use. Large firms can invest in cleaner technologies, waste-management infrastructure, environmental monitoring, and specialized compliance functions. Formalized systems may improve the consistency, documentation, and scalability of environmental practices. SMEs frequently face financial, technological, and knowledge barriers that restrict these investments (Moursellas

et al., 2023). The aggregate environmental impact of SMEs remains substantial because of their collective presence across production systems. Smaller firms may implement resource-saving and waste-reduction practices through operational simplicity, cost awareness, and direct managerial oversight. Environmental initiatives may be integrated into daily routines without extensive formal systems. Oduro's (2025) meta-analytic evidence shows that environmental sustainability can enhance SME competitiveness, although the magnitude of the relationship varies across economic and institutional contexts. Firm size may therefore influence environmental sustainability without producing a universally predictable direction. The environmental hypothesis states:
H3: Environmental sustainability differs significantly between SMEs and large firms in Indonesia's vegetable seed industry.

Conceptual Framework

The conceptual framework positions firm size as an organizational contingency that distinguishes SMEs from large firms. Corporate sustainability is represented by social, economic, and environmental sustainability. The framework proposes that differences in organizational scale may be reflected in overall corporate sustainability and each of its three dimensions. Respondent gender, age, education, organizational position, and length of service may be included as control variables to assess the robustness of the firm-size comparison.



METHODOLOGY

Research Design

This study adopted a quantitative, cross-sectional, and comparative design to examine whether corporate sustainability implementation differed between SMEs and large firms in Indonesia's vegetable seed industry. The firm constituted the unit of analysis, while individual respondents served as knowledgeable organizational informants. Purposive sampling was employed because the assessment required respondents with sufficient knowledge of company operations and sustainability practices.

A total of 262 respondents representing Indonesian vegetable seed companies participated in the survey. Eligible respondents held managerial, supervisory, or strategic operational positions and were responsible for supervising at least five employees. These criteria ensured that respondents possessed adequate organizational authority and familiarity with the practices being evaluated. Data were collected using a structured questionnaire covering firm characteristics and corporate sustainability implementation.

Firm size was treated as a categorical grouping variable. The operational classification adopted during data collection categorized companies with authorized capital between IDR 500 million and IDR 10 billion and paid-up capital between IDR 250 million and IDR 2.5 billion as SMEs. Companies with authorized capital exceeding IDR 10 billion and paid-up capital exceeding IDR 2.5 billion were classified as large firms. These thresholds represented the operational capital criteria applied in this study and were informed by capital classifications applicable to Indonesian companies (Acclime Indonesia, 2026).

Variables and Measurement

The study incorporated firm size as the grouping variable and corporate sustainability as the focal multidimensional construct. Firm size was directly observed and coded as either an SME or a large firm. Corporate sustainability was operationalized through three correlated but distinct dimensions: social, economic, and environmental sustainability. This multidimensional specification enabled firm-size differences to be examined separately across sustainability domains. Nine indicators were used to measure the three sustainability dimensions, with each dimension represented by three indicators. Responses were recorded on a four-point Likert scale, with higher scores indicating stronger sustainability implementation.

Table 1. Variable Measurement

Variable	Code	Measurement focus
Firm size	firm_size	SME or large firm based on the study's capital criteria
Social sustainability	y1_1	Occupational health and employee safety
	y1_2	Employee welfare and development
	y1_3	Responsibility toward surrounding communities
Economic sustainability	y2_1	Long-term economic performance and business continuity
	y2_2	Efficient use of organizational resources
	y2_3	Creation of sustainable economic value
Environmental sustainability	y3_1	Reduction of operational environmental impacts
	y3_2	Responsible use of materials, energy, and natural resources
	y3_3	Management of waste and emissions

The three sustainability dimensions were modeled as separate latent variables rather than immediately combined into a single composite construct. This specification corresponded with the hypotheses proposing separate firm-size differences in social, economic, and environmental sustainability. Potential common method bias was addressed through procedural and statistical assessment. The questionnaire employed concise and neutral statements, separated firm characteristics from sustainability indicators, and informed respondents that their responses would be reported in aggregate form. Statistical assessment examined the proportion of variance represented by the first factor derived from the polychoric correlation matrix and compared a one-factor confirmatory model with the theoretically specified three-factor model. The first-factor diagnostic was treated only as a preliminary indication and was not used independently to establish the presence or absence of common method bias.

Data Analysis

Data were analyzed in R using dplyr, psych, lavaan, and semTools. Screening covered completeness, response ranges, response patterns, and potential duplicates, followed by descriptive statistics. Confirmatory factor analysis treated the nine indicators as ordered categorical variables and employed the WLSMV estimator. Model fit was assessed using CFI, TLI, RMSEA, and SRMR. The proposed three-factor model was compared with a one-factor alternative. Measurement quality was evaluated through standardized loadings, ordinal alpha, composite reliability, AVE, the Fornell–Larcker criterion, and HTMT.

Multigroup CFA assessed measurement invariance before latent mean comparison. Empty and sparse categories required combining the two lowest response categories, producing low, moderate, and high categories consistently across indicators and groups. Original four-point scores were retained for descriptive and robustness analyses. Using Wu–Estabrook identification with theta parameterization, configural, threshold-loading, and scalar invariance were assessed through changes in CFI, RMSEA, SRMR, and robust chi-square tests. After scalar invariance, SMEs served as the reference group. Latent differences were evaluated using Wald statistics and 95% confidence intervals, supplemented by Welch tests, Hedges' g, and 9,999-replication permutation tests.

RESULTS AND DISCUSSION

Measurement Quality and Cross-Group Equivalence

The sample comprised 262 organizational informants, including 154 respondents representing SMEs and 108 representing large firms. The respondents predominantly held operational, quality-control, research and development, executive, and marketing positions, supporting their suitability as knowledgeable informants. The mean scores of the nine indicators ranged from 3.19 to 3.44, indicating relatively strong sustainability implementation across the sampled companies. Negative skewness across the indicators reflected the concentration of responses in the upper categories of the four-point scale.

The preliminary common-method diagnostic showed that the first factor accounted for 57.4% of the total variance. This result indicated the presence of a general sustainability component but could not independently establish common method bias. The confirmatory analysis provided a clearer distinction. The theoretically specified three-factor model demonstrated a substantially better fit (CFI = .965, TLI = .947, RMSEA = .119, and SRMR = .070) than the one-factor model (CFI = .914, TLI = .885, RMSEA = .175, and SRMR = .107). Although the RMSEA remained above the conventional threshold, the improvement in comparative and residual-based indices supported the three-dimensional specification. The result was therefore evaluated jointly with factor loadings, reliability, validity, and cross-group equivalence rather than relying on a single fit index.

Table 1. Measurement quality of the sustainability constructs

Construct and indicator	Mean	SD	Loading	Ordinal α	CR	AVE
Social sustainability				**.847**	**.851**	**.658**
Occupational health and employee safety (y1_1)	3.34	0.755	.685			
Employee welfare and development (y1_2)	3.44	0.739	.854			
Responsibility toward surrounding communities (y1_3)	3.31	0.813	.881			
Economic sustainability				**.849**	**.874**	**.698**
Long-term economic performance and continuity (y2_1)	3.27	0.746	.848			
Efficient use of organizational resources (y2_2)	3.29	0.752	.781			
Creation of sustainable economic value (y2_3)	3.33	0.768	.874			
Environmental sustainability				**.843**	**.851**	**.657**
Reduction of operational environmental impacts (y3_1)	3.19	0.853	.861			
Responsible use of materials, energy, and resources (y3_2)	3.28	0.824	.754			
Management of waste and emissions (y3_3)	3.25	0.946	.813			

Refer to table 1, all the standardized loadings were positive and statistically significant at $p < .001$, ranging from .685 to .881. Ordinal alpha and composite reliability exceeded .80, while the average variance extracted ranged from .657 to .698. Convergent validity was therefore established. The square roots of AVE for social (.811), economic (.835), and environmental sustainability (.811) exceeded their corresponding inter-construct correlations. HTMT values ranged from .662 to .794, supporting the empirical distinction among the three sustainability dimensions.

Table 2. Measurement invariance across firm-size groups

Model	χ^2	df	CFI	TLI	RMSEA	SRMR	ΔCFI	ΔRMSEA
Configural	122.08	48	.966	.949	.109	.080	—	—
Threshold-loading	131.00	54	.964	.953	.105	.081	−.001	−.004
Scalar	131.00	60	.967	.960	.096	.081	.003	−.009

Measurement invariance was evaluated before comparing firm-size groups. Sparse and empty lower response categories required the two lowest categories to be combined consistently across groups for the ordinal multigroup analysis. The configural model produced CFI = .966, TLI = .949, RMSEA = .109, and SRMR = .080. Threshold-loading constraints produced negligible changes in model fit (ΔCFI = −.001 and ΔRMSEA = −.004), while the scaled difference test was nonsignificant, $\Delta\chi^2$ (6) = 11.00, p = .087. Scalar constraints improved rather than reduced the comparative fit indices (ΔCFI = .003 and ΔRMSEA = −.009),

accompanied by a nonsignificant difference test, $\Delta\chi^2$ (6) = 3.00, p = .810. Scalar invariance was therefore supported, permitting latent mean comparisons.

Firm-Size Differences in Corporate Sustainability

Large firms reported slightly higher observed scores than SMEs for social sustainability (3.42 versus 3.32), economic sustainability (3.38 versus 3.23), and environmental sustainability (3.26 versus 3.23). None of these differences reached the 5% significance threshold in the latent mean analysis. H1 was not supported because the difference in social sustainability was non-significant (ΔM = .258, p = .125, 95% CI [−.071, .587]). H2 was also not supported, although economic sustainability produced the largest difference (ΔM = .292, p = .070, 95% CI [−.024, .608]). H3 was not supported because environmental sustainability was nearly identical across groups (ΔM = .017, p = .902, 95% CI [−.248, .281]).

Table 3. Firm-size differences in sustainability implementation

Hypothesis	Dimension	SME mean	Large mean	Latent difference	Latent p	Welch p	Permutation p	Hedges' g	Decision
H1	Social	3.32	3.42	.258	.125	.209	.207	.158	Not supported
H2	Economic	3.23	3.38	.292	.070	.053	.056	.239	Not supported
H3	Environmental	3.23	3.26	.017	.902	.726	.721	.043	Not supported

Note. SMEs were the reference group. Positive latent differences indicate higher estimates among large firms. Permutation tests used 9,999 replications.

The social sustainability result indicates that greater organizational scale did not translate into distinguishable implementation of employee safety, employee development, and community responsibility. This finding differs from (Caha *et al*., 2024), who found significant firm-size differences across CSR pillars, with larger companies generally implementing more social activities. The contrast suggests that sectoral concentration matters. Vegetable seed companies operate within closely connected production and distribution networks in which employee safety, technical competence, and community relationships may constitute operational necessities across firm sizes rather than discretionary programs available only to large firms. Sustainability practices in agri-food SMEs can also remain embedded in operations despite limited formalization or external communication, indicating that lower visibility should not be interpreted as weaker implementation (Galli *et al*., 2024).

Economic sustainability showed the clearest, although still statistically inconclusive, firm-size difference. Large firms may benefit from broader financial reserves, specialized personnel, and formal resource-allocation systems, explaining the positive direction of the estimate. (Khattak *et al*., 2023) similarly found that firm size strengthened the contribution of financial resources to SME sustainability performance. The small effect in the present study (g = .239) indicates that these resource advantages were not sufficient to produce a decisive performance gap. Financial management, CSR, and human-resource practices can jointly shape SME sustainability, implying that firm-specific managerial configurations may be more consequential than size alone (Belas *et al*., 2024).

Environmental sustainability displayed the strongest convergence, with an observed difference of only .032 and a negligible effect size (g = .043). This result is notable because SMEs frequently encounter financial, educational, regulatory, and technical barriers to environmental implementation (Durrani *et al*., 2024). The absence of a gap suggests that these constraints did not necessarily prevent vegetable seed SMEs from adopting resource-use, impact-reduction, and waste-management practices comparable to those of large firms. Agricultural SMEs can advance environmental sustainability through open innovation, collaborative relationships, and circular practices without depending exclusively on firm-owned resources (Worakittikul *et al*., 2025). Such mechanisms provide a plausible explanation for comparable environmental implementation, although they were not directly tested in this study.

The combined findings refine rather than reject Contingency Theory. Firm size represents a structural condition that changes the resources and coordination mechanisms available to an organization, but it does not prescribe a universally superior sustainability outcome. Large firms may rely on capital, specialization, and formal systems, whereas SMEs may rely on managerial proximity, operational flexibility, and stakeholder relationships. Different organizational configurations may consequently generate similar sustainability implementation. The nonsignificant results therefore indicate that sustainability in the vegetable seed industry is contingent on how firms configure their available resources and relationships, rather than being determined by organizational scale alone.

The practical implication is that sustainability support should not be designed solely around the assumption that SMEs consistently lag behind large firms. SME programs should strengthen financing, measurement capability, technical training, and collaborative access to environmental innovation. Large firms should focus on integrating sustainability targets across organizational units and supply-chain partners. Industry associations and policymakers can facilitate shared training, waste-management infrastructure, sustainability metrics, and knowledge platforms accessible to both groups. Such differentiated support recognizes distinct organizational conditions while maintaining common sustainability expectations.

CONCLUSION

This study compared social, economic, and environmental sustainability implementation between SMEs and large firms in Indonesia's vegetable seed industry. Measurement invariance supported valid comparisons across the 262 firms. No statistically significant firm-size differences were identified. Large firms showed slightly higher social and economic sustainability, whereas environmental sustainability was nearly identical across groups. These findings refine Contingency Theory by indicating that organizational scale alone does not determine sustainability implementation; different resource and organizational configurations may produce comparable outcomes. Policies should therefore strengthen SME financing, technical capabilities, and collaborative infrastructure while encouraging large firms to improve sustainability integration and supply-chain accountability. The cross-sectional, single-industry design and reliance on informant assessments limit generalizability and causal interpretation. Future studies should use longitudinal designs and objective indicators to examine how managerial capability, stakeholder integration, regulatory pressure, and access to finance shape sustainability across firm sizes.

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