

Bridging Sustainable Supply Chain Management and Operational Performance: Indirect Associations through Supply Chain Integration from a Dynamic Capabilities Perspective

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Abstract

Sustainable supply chain management (SSCM) is increasingly expected to improve operational outcomes, yet the organisational mechanism through which sustainability practices are converted into cost and logistics benefits remains insufficiently specified. Drawing on the dynamic capabilities perspective, this study examines supply chain integration (SCI) as a capability-based conversion mechanism linking environmental management practices (EMP), social practices (SP) and economic practices (EP) with operational performance (OP). Cross-sectional survey data from 475 organisational informants in food-products, apparel and furniture manufacturing were analysed using confirmatory factor analysis and latent structural equation modelling in R. The five-factor measurement model exhibited excellent fit under robust maximum likelihood, $\chi^2(109) = 117.700$, $p = 0.268$, CFI = 0.997, TLI = 0.997, RMSEA = 0.014 and SRMR = 0.024. EMP, SP and EP were positively associated with SCI, while SCI was positively associated with OP. EMP and SP retained positive direct associations with OP, whereas the direct EP-OP association was not statistically supported. All three indirect associations through SCI were positive and their 5000-resample percentile-bootstrap confidence intervals excluded zero. The findings show that sustainability practices are not operationally equivalent and that integration is a consequential conversion mechanism, particularly for economic practices whose operational relevance was expressed principally through SCI. Because the design is cross-sectional and the retained records do not establish temporal ordering, the indirect estimates are interpreted as model-con-

sistent associations rather than causal mediation effects.

Keywords

Sustainable Supply Chain Management, Supply Chain Integration, Operational Performance, Dynamic Capabilities, Structural Equation Modelling, Manufacturing

1. Introduction

Sustainable supply chain management has moved from a peripheral compliance concern to a strategic operations problem. Manufacturing firms are expected to reduce ecological harm, protect employees and communities, and maintain economic viability while simultaneously improving cost, quality, delivery and responsiveness. These demands are interconnected because environmental, social and economic practices are enacted through procurement, production, inventory, transportation and inter-organisational relationships rather than through isolated corporate programmes. Reviews therefore describe SSCM as the coordinated management of material, information and relational flows in ways that jointly pursue environmental, social and economic objectives while recognising persistent implementation and governance challenges (Ansari & Kant, 2017; Carter & Washispack, 2018; Dubey et al., 2017; Gómez-Luciano et al., 2018; Koberg & Longoni, 2019; Matthews et al., 2016; Negri et al., 2021; Panigrahi et al., 2021).

The performance rationale for SSCM is compelling but not automatic. Environmental management systems, eco-design and resource-efficiency initiatives may reduce waste and input intensity; social practices may stabilise labour relations, strengthen stakeholder legitimacy and protect continuity; and lean, inventory and transport practices may reduce operating costs. Empirical research often identifies positive relationships between sustainability-oriented supply-chain practices and performance, yet the magnitude and even direction of those relationships vary across dimensions and contexts, partly because implementation barriers and complementary organisational capabilities differ across firms (Ahmad et al., 2022; Cantele et al., 2023; Hong et al., 2018; Moktadir et al., 2018; Yu et al., 2023). This variability suggests that the possession of sustainability routines is not equivalent to their effective operational deployment.

A critical unresolved issue concerns conversion. Sustainability initiatives frequently require firms to coordinate information and actions across purchasing, production, logistics, suppliers and customers. Without such coordination, environmental requirements may remain disconnected from production planning, social commitments may not be reflected in sourcing and delivery decisions, and economic practices may be implemented locally without supply-chain-wide synchronisation. Supply chain integration is therefore a plausible mechanism through

which sustainability-related routines become lower production costs and more efficient inbound and outbound logistics. Meta-analytic and empirical evidence consistently associates integration with operational performance, including recent evidence from Ghanaian supply-chain settings, although the strength of the relationship depends on how integration is configured and on the capabilities surrounding it (Ahatsi & Olanrewaju, 2026; Ataseven & Nair, 2017; Kumar et al., 2020; Qi et al., 2017; Raj et al., 2025; Yu et al., 2017).

The dynamic capabilities view provides a theoretically disciplined explanation for this conversion problem. Dynamic capabilities refer to organisational capacities to sense changes, seize opportunities and reconfigure resources and routines as environments evolve. In supply chains, integration can acquire capability-like properties when it enables firms to combine external and internal knowledge, align production plans with customer requirements, coordinate supplier responses and reconfigure operating arrangements. Prior studies have linked sustainability practices to supply-chain dynamic capabilities and have shown that integration, collaboration, digital capability, agility and resilience can transmit the performance value of strategic resources (Bag et al., 2021; Chowdhury et al., 2019; Elnadi et al., 2026; Hong et al., 2018; Qader et al., 2025; Schoemaker et al., 2018; Teece, 2018). Nevertheless, many studies either aggregate sustainability into a single construct or focus on environmental practices, thereby obscuring whether environmental, social and economic practices rely on integration to the same extent.

This study addresses that limitation by examining three SSCM dimensions simultaneously and positioning SCI as a capability-based conversion mechanism. The empirical model distinguishes EMP, SP and EP; estimates their associations with SCI and OP; and tests their indirect associations with OP through SCI. The outcome is defined narrowly as production-cost reduction and inbound- and outbound-logistics efficiency, avoiding the common tendency to treat operational, financial and sustainability performance as interchangeable.

The study makes three contributions. First, it advances a mechanism-based account of SSCM by distinguishing sustainability-practice adoption from the integrative capability needed to convert those practices into operational outcomes. Second, it demonstrates that the environmental, social, and economic dimensions follow non-identical pathways: all three are associated with SCI, but only EMP and SP retain statistically supported direct associations with OP in the latent model. Third, it extends the operational relevance of dynamic capabilities by showing that SCI explains a substantial share of both its own variance and the variance in OP, while preserving construct distinctiveness through a rigorously validated five-factor measurement model. The remainder of the article develops the theoretical argument and hypotheses, explains the methodology, reports the measurement and structural results, and discusses their implications and limitations.

2. Theoretical Background and Hypothesis Development

2.1. Sustainable Supply Chain Management as a Multidimensional Practice Architecture

SSCM integrates environmental, social and economic objectives into the coordination of supply-chain processes. Its distinctiveness lies not simply in pursuing several outcomes but in recognising their interdependence across organisational boundaries. Systematic reviews show that the field has expanded substantially, yet research remains uneven: environmental themes receive disproportionate attention, social indicators are often underdeveloped, and empirical models frequently combine conceptually different practices into global indices (Koberg & Longoni, 2019; Negri et al., 2021; Panigrahi et al., 2021; Rejeb et al., 2020).

The present study treats EMP, SP and EP as correlated but distinct first-order constructs. EMP captures environmental management systems, responsiveness to customer environmental concerns and product or process design intended to reduce material and energy use. SP captures employee safety and remuneration alongside community education, employment and health-related practices. EP captures transportation economies, scientific inventory control and lean production. This disaggregation is theoretically important because the resources, stakeholders and coordination demands underlying the three dimensions differ. Empirically, the five-factor model fits significantly better than models that collapse the SSCM dimensions, confirming that treating them as interchangeable would sacrifice explanatory precision.

2.2. Environmental Management Practices and Supply Chain Integration

Environmental initiatives are inherently information-intensive. Environmental management systems require firms to translate objectives into process controls, supplier requirements and monitoring routines. Eco-design and reductions in material or energy intensity likewise depend on information moving between customers, designers, production units and suppliers. Green integration research demonstrates that internal, supplier and customer integration enable firms to coordinate environmental knowledge and align environmental requirements with operating decisions (Han & Huo, 2020; Khan et al., 2022; Karmaker et al., 2023).

From a dynamic capabilities perspective, EMP can strengthen SCI by creating a need and a platform for sensing external environmental requirements, seizing opportunities for resource efficiency and reconfiguring supply relationships. Conversely, environmental practices implemented without integration may remain localised and fail to influence planning or logistics. Therefore:

H1a: Environmental management practices are positively associated with supply chain integration.

2.3. Social Practices and Supply Chain Integration

Social sustainability extends supply-chain responsibility to employees, communi-

ties and other stakeholders. Practices concerning occupational safety, remuneration, education, employment and healthcare create obligations that cannot be fulfilled through a single function. Procurement choices affect working conditions, production scheduling affects safety, and community commitments may influence location, employment and distribution decisions. Supply chain social responsibility studies increasingly show that social practices are associated with sustainable performance when they are embedded in governance and coordination arrangements rather than treated as philanthropic appendages (Chowdhury & Quaddus, 2021; Yu et al., 2023).

SCI provides a mechanism for translating social commitments into coordinated routines. Information sharing and joint planning can align supplier behaviour, production targets and stakeholder expectations; integration can also reduce the risk that social requirements are lost as activities move across organisational boundaries. Although the social construct in this study spans employee- and community-oriented practices, confirmatory analysis supports a coherent reflective factor. Accordingly:

H1b: Social practices are positively associated with supply chain integration.

2.4. Economic Practices and Supply Chain Integration

Economic sustainability in the present model concerns operational routines that protect viability through transport efficiency, inventory control, lean production and waste minimisation. These practices appear operational by definition, yet their effective implementation often requires coordination beyond the focal plant. Lean production depends on reliable supplier deliveries; just-in-time inventory depends on timely information and synchronised replenishment; and transportation economies require consolidation across inbound and outbound flows. Operations and supply-chain strategies therefore influence performance partly through their fit with integration arrangements (Qi et al., 2017).

The dynamic capabilities logic predicts that EP strengthens SCI because firms seeking to eliminate waste and improve flow must connect internal schedules with external supply and demand information. Integration is not merely an outcome of economic practices but a means of continuously recombining them as operating conditions change. Thus:

H1c: Economic practices are positively associated with supply chain integration.

2.5. Supply Chain Integration and Operational Performance

SCI denotes the extent to which firms coordinate information, plans and activities with supply-chain partners. In the present instrument, it is reflected in communicating customers' future needs to suppliers, updating and sharing production plans, and responding rapidly to customer needs. Integration can reduce information delays, duplicated effort, excess inventory, scheduling conflict and logistics inefficiency. Meta-analytic evidence confirms a positive overall integration-perfor-

mance relationship, while recent work identifies integration as a central capability through which analytics, compatibility and other resources influence operations (Ataseven & Nair, 2017; Raj et al., 2025; Tarigan et al., 2019).

Integration should improve the specific OP dimensions measured here by enabling production plans to match demand, improving inbound material availability, reducing costly expediting, and supporting more reliable outbound fulfilment. It therefore represents the immediate capability through which sustainability-related routines are coordinated. Hence:

H2: Supply chain integration is positively associated with operational performance.

2.6. Direct Associations between SSCM Practices and Operational Performance

EMP may improve OP directly by reducing resource consumption, defects and waste, while environmental management systems may increase process discipline. SP may contribute through safer workplaces, employee stability and stronger stakeholder relationships that protect continuity. EP is directly aligned with cost, inventory and logistics outcomes. Prior studies report positive performance consequences for green supply-chain practices, social responsibility and lean or circular practices, although effects depend on configurations and complementary capabilities (Ahmad et al., 2022; Cantele et al., 2023; Siddiqi et al., 2025; Yu et al., 2023). Accordingly:

H3a: Environmental management practices are positively associated with operational performance.

H3b: Social practices are positively associated with operational performance.

H3c: Economic practices are positively associated with operational performance.

2.7. Indirect Associations through Supply Chain Integration

The central theoretical proposition is that sustainability practices provide routines and commitments, whereas SCI provides a capability-based pathway through which those routines are translated into coordinated operating action. The mechanism involves converting environmental, social and economic information into shared plans, aligned supplier behaviour and responsive logistics. Similar conversion arguments appear in studies where supply-chain dynamic capabilities, integration, collaboration or innovation transmit the performance value of sustainability and digital resources (Baig et al., 2026; Elnadi et al., 2026; Hong et al., 2018; Khan et al., 2022).

The indirect-association argument does not imply that all direct associations disappear. EMP and SP may be associated with OP through internal process discipline and workforce or stakeholder mechanisms, while EP may be especially dependent on integration because inventory, lean and transportation routines require synchronisation across organisational boundaries. The relevant proposi-

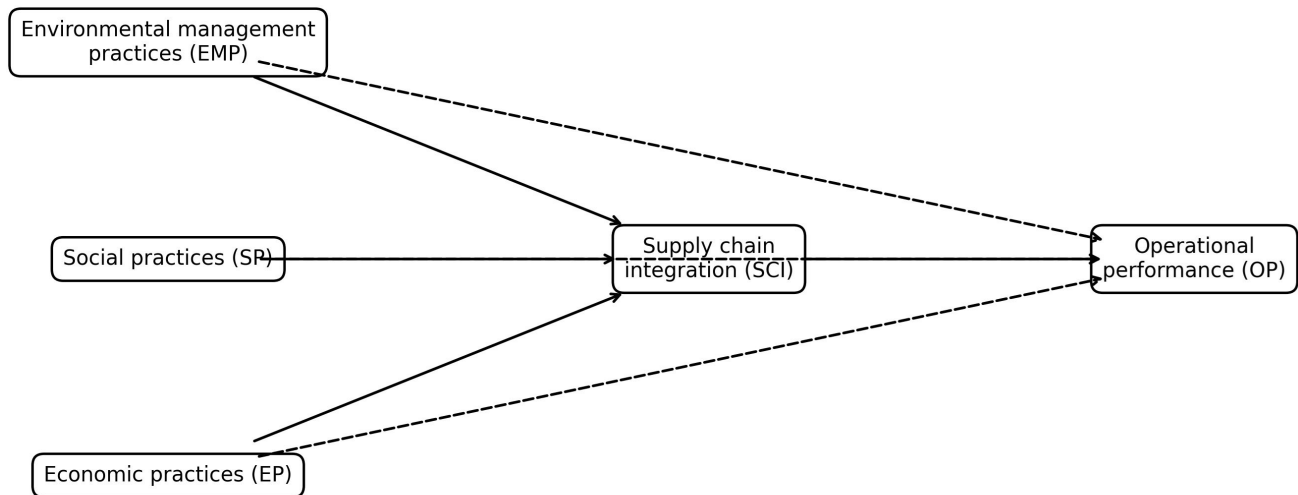
tions are therefore:

H4a: Environmental management practices have a positive indirect association with operational performance through supply chain integration.

H4b: Social practices have a positive indirect association with operational performance through supply chain integration.

H4c: Economic practices have a positive indirect association with operational performance through supply chain integration.

The hypothesised relationships are summarised in **Figure 1**.



Solid arrows denote the capability-conversion pathway; dashed arrows denote direct associations.

Figure 1. Conceptual model.

3. Materials and Methods

3.1. Research Design, Population, Sampling and Key-Informant Selection

The study employed a cross-sectional explanatory survey design at the organisational level, with the manufacturing firm as the unit of analysis. The target population comprised manufacturing firms operating in Ghana. The national sampling frame was derived from the 2018 Integrated Business Establishment Survey Phase II (IBES), which identified 4375 registered manufacturing establishments across 23 subsectors. For substantive alignment with the sustainability focus of the study, the operational sampling frame was restricted to three manufacturing subsectors with a strong national presence and material environmental and social sustainability implications: food products and beverages (943 firms), wearing apparel, dressing and dyeing of fur (996 firms), and furniture manufacturing (613 firms). The resulting eligible sampling frame comprised 2552 manufacturing firms.

A multistage probability-based sampling procedure was used. First, eligible firms were organised into geographical clusters representing the middle and southern belts of Ghana, where the selected manufacturing activities were princi-

pally concentrated. Second, the firms were stratified by the three focal manufacturing subsectors to ensure representation across the industry categories. Within each stratum, firms were arranged alphabetically and selected systematically using the relevant sampling interval and a random starting point. The final target sample comprised 475 manufacturing firms, selected from the 2552-firm operational sampling frame before questionnaire administration. The achieved analytical sample also comprised 475 firms: food products and beverages ($n = 167$, 35.2%), wearing apparel ($n = 158$, 33.3%), and furniture manufacturing ($n = 150$, 31.6%).

One knowledgeable senior-level professional was designated as the key informant for each selected firm so that the observational unit corresponded with the organisational unit of analysis. Eligible informants included chief executives and operating officers, directors, general, supply-chain and purchasing managers, and personnel with substantive responsibility for manufacturing engineering, quality, research and development, purchasing, production, sales and marketing, human resources, finance and accounting, logistics, distribution or warehousing. Informants were selected because their positions provided direct knowledge of the firm's supply-chain operations, sustainability practices and day-to-day organisational policies. The questionnaire also recorded respondents' years of experience in their professional field and within the focal organisation as an additional indicator of informant competence. Each participating firm contributed one usable questionnaire; accordingly, the final analytical sample comprised 475 distinct manufacturing firms represented by 475 key informants.

The data-quality audit confirmed that every retained record contained complete focal responses. No non-numeric or out-of-range focal values, duplicate serial numbers or missing focal observations were detected. Six exact straight-liners, 16 long-string flags, 33 low-variance response patterns and two multivariate outliers at $p < 0.001$ were identified. These diagnostic flags were retained in the primary analysis because they did not by themselves establish invalid responding; their influence was examined through sensitivity analyses.

3.2. Measures

The focal item pool was adapted principally from the SSCM scale-development work of Das (2017). The archived questionnaire itself labels the SCI and OP blocks as "Das, 2018", but does not provide a complete bibliographic entry; the traceable validated scale-development source is therefore reported as Das (2017). EMP was represented by three items concerning environmental-management systems, responsiveness to customers' environmental concerns and reductions in material or energy requirements. The third EMP item is labelled EMP4 in the archived questionnaire but was coded EMP3 in the analysis dataset; its wording was unchanged. SP used five retained items concerning workplace safety, adequate remuneration, community education, employment/business opportunities and healthcare. These items combine two domains that Das (2017) originally distinguished—socially inclusive practices for employees and socially inclusive practices for community.

The present study treated them as manifestations of a broader social-practices orientation; this aggregation is supported empirically by the one-factor CFA and reliability results but remains a construct-level limitation because the employee and community domains are conceptually heterogeneous. EP comprised three items—transport economies of scale, scientific/JIT inventory control and lean production—adapted from Das’s Operations Practices domain and reframed here as economic-efficiency practices. SCI comprised three indicators concerning communication of future customer needs, shared production-plan adjustment and customer responsiveness. OP comprised three indicators capturing change in production cost and inbound and outbound logistics efficiency.

EMP, SP and EP used a five-point implementation-extent scale from 1 = Not at all to 5 = To a Great Extent. SCI used a five-point agreement scale from 1 = Strongly Disagree to 5 = Strongly Agree. OP asked respondents to assess change over the previous three years on a five-point scale from 1 = Strongly Deteriorated to 5 = Strongly Improved. The archived study materials available for this revision do not document a separate pilot-test, expert-panel refinement, or translation/back-translation procedure; none is therefore claimed. The questionnaire is in English and no translated version was identified. Full item wording, source-domain mapping and response anchors are reproduced in Appendix A (see **Table A1**). Item means ranged from 3.808 to 4.059 and all items showed concentration at the upper response category; the ordinal scale and ceiling concentration motivated robust maximum likelihood as the primary estimator and WLSMV as an ordinal sensitivity estimator (**Table 1**).

Table 1. Construct provenance, adaptation and response anchors.

Construct	Indicators	Source/provenance	Present-study adaptation and response anchors
EMP	EMP1 - EMP3	Das (2017), Environmental Management Practices	Three selected items; archived questionnaire labels the third item EMP4, coded EMP3 in analysis. 1 = Not at all to 5 = To a Great Extent.
SP	SP2 - SP6	Das (2017), employee- and community-oriented social-practice domains	Employee and community items combined as broader SP; SP1 excluded before modelling because of wording overlap with SCI3. 1 = Not at all to 5 = To a Great Extent.
EP	EP1 - EP3	Das (2017), Operations Practices	Transport economies, inventory control and lean-production items reframed as economic-efficiency practices. 1 = Not at all to 5 = To a Great Extent.
SCI	SCI1 - SCI3	Das (2017) scale family; questionnaire labels block “Das, 2018”	Three selected integration items. 1 = Strongly Disagree to 5 = Strongly Agree.
OP	OP1 - OP3	Das (2017) performance scale family; questionnaire labels block “Das, 2018”	Three operations-performance indicators. 1 = Strongly Deteriorated to 5 = Strongly Improved over three years.

Note. SP1 was excluded during the pre-model measurement audit, before CFA and structural estimation, because its wording overlapped with SCI3. No further indicator deletion was undertaken after model estimation.

3.3. Analytical Procedure

The analysis was conducted in R using latent-variable structural equation modelling. Data screening preceded measurement and structural modelling. Reliability was assessed using Cronbach's alpha, McDonald's omega and composite reliability. Convergent validity was evaluated through standardised loadings and average variance extracted (AVE), while discriminant validity was assessed using heterotrait-monotrait ratios (HTMT), bootstrapped HTMT intervals, Fornell-Larcker comparisons and latent correlations.

The hypothesised five-factor measurement model was estimated using robust maximum likelihood (MLR) and compared with WLSMV. Alternative models combined the three SSCM dimensions, imposed a single common factor, or specified a higher-order SSCM factor. Global measurement-model fit was evaluated using chi-square, CFI, TLI, RMSEA and SRMR, with information criteria reported where appropriate. SP1 had been excluded before any CFA or structural-model estimation on the basis of questionnaire-content overlap with SCI3; this decision was not driven by model fit. Following that pre-model exclusion, no further indicators were deleted post hoc and no correlated residuals were introduced.

Common-method risk was evaluated using Harman's first-component result, a one-factor CFA and full-collinearity VIF. A common latent method-factor model was attempted but was inadmissible because the latent covariance matrix was not positive definite; no defensible marker variable was identified. These diagnostics were treated as evidence about plausibility rather than proof that common-method variance was absent (Fuller et al., 2016).

The structural specification estimated EMP, SP and EP as predictors of SCI and EMP, SP, EP and SCI as predictors of OP. The primary coefficients were estimated with MLR using $\text{std.lv} = \text{TRUE}$, a mean structure and FIML for missing data. Because non-parametric bootstrap confidence intervals were obtained in a separate estimation step, the identical measurement and structural specification was re-estimated with conventional maximum likelihood (ML), $\text{std.lv} = \text{TRUE}$ and a mean structure. After a 2000-resample convergence/admissibility check, the final defined indirect and total associations used 5000 non-parametric resamples and percentile 95% bootstrap confidence intervals. This procedure follows the modern emphasis on directly estimating indirect effects rather than inferring them from the significance of component paths. A parsimonious control model included firm-size category, manufacturing sector and standardised respondent tenure. Robustness checks compared control specifications, outlier exclusions, a two-indicator SCI specification, WLSMV, complete-case and FIML estimation, observed-score path analysis with HC3 standard errors, and the SP1-retained sensitivity model.

4. Results

4.1. Descriptive Statistics and Data Quality

As shown in **Table 2**, the five construct means were above the scale midpoint: $EMP = 3.864$, $SP = 3.892$, $EP = 3.940$, $SCI = 4.029$ and $OP = 3.954$. Standard devi-

ations ranged from 0.906 to 0.993. The distributions were negatively skewed, consistent with the ceiling concentration observed at the item level, but no focal data correction or imputation was required. Complete-case and FIML estimation therefore used the same 475 observations.

Table 2. Descriptive statistics for focal constructs.

Construct	N	Mean	SD	Minimum	Maximum	Median	Skewness	Excess kurtosis
EMP	475	3.864	0.993	1.000	5.000	4.000	−0.827	−0.052
SP	475	3.892	0.906	1.200	5.000	4.200	−0.725	−0.277
EP	475	3.940	0.944	1.000	5.000	4.000	−0.592	−0.621
SCI	475	4.029	0.956	1.000	5.000	4.333	−0.981	0.149
OP	475	3.954	0.939	1.333	5.000	4.000	−0.726	−0.302

Note. Construct scores are shown descriptively; hypothesis tests are based on the latent-variable model.

4.2. Reliability, Convergent Validity and Discriminant Validity

As shown in **Table 3**, reliability and convergent validity were satisfactory for all constructs. Cronbach's alpha ranged from 0.814 to 0.862, omega and composite reliability ranged from 0.815 to 0.862, and AVE ranged from 0.557 to 0.635. All MLR standardised loadings were positive and statistically significant, ranging from 0.671 to 0.848. SP2 had the smallest loading but remained substantively meaningful and was retained to preserve content coverage.

Discriminant validity was also supported. The largest HTMT ratio was 0.702 for SCI and OP, with a 95% bootstrap interval of [0.620, 0.774]. All HTMT values were below 0.85, no interval included 1, and each square root of AVE exceeded the relevant interconstruct correlations. The largest latent correlation was 0.695 between SCI and OP, which was high enough to be theoretically meaningful but not indicative of construct redundancy.

Table 3. Reliability, convergent validity and factor-loading ranges.

Construct	Items	Cronbach's α	McDonald's ω	Composite reliability	AVE	Loading range
EMP	3	0.815	0.816	0.816	0.597	0.715 - 0.824
SP	5	0.862	0.862	0.862	0.557	0.671 - 0.796
EP	3	0.814	0.815	0.815	0.595	0.741 - 0.801
SCI	3	0.839	0.839	0.839	0.635	0.781 - 0.827
OP	3	0.828	0.831	0.831	0.622	0.742 - 0.848

Note. All loadings were statistically significant at $p < 0.001$.

4.3. Confirmatory Factor Analysis and Model Comparison

Table 4 summarises the measurement-model fit and comparison results. The hypothesised five-factor model demonstrated excellent fit under both estimators.

MLR produced $\chi^2 (109) = 117.700$, $p = 0.268$, CFI = 0.997, TLI = 0.997, RMSEA = 0.014, 90% CI [0.000, 0.029], and SRMR = 0.024. WLSMV yielded $\chi^2 (109) = 115.542$, $p = 0.316$, CFI = 0.995, TLI = 0.994, RMSEA = 0.021, 90% CI [0.000, 0.039], and SRMR = 0.029. The largest modification index was modest, and the model was retained without post hoc residual correlations.

Alternative models performed materially worse. Combining EMP, SP and EP into one first-order SSCM factor produced CFI = 0.727 and RMSEA = 0.134; the one-factor model produced CFI = 0.588 and RMSEA = 0.163. A higher-order SSCM model fitted well in absolute terms, but robust comparison favoured the unconstrained five-factor model, $\Delta\chi^2 (4) = 13.587$, $p = 0.009$. The results therefore support analysing the three sustainability dimensions separately.

Table 4. Confirmatory factor analysis and measurement-model comparison.

Model	Estimator	χ^2	df	CFI	TLI	RMSEA	SRMR	AIC	BIC
Five-factor	MLR	117.700	109	0.997	0.997	0.014	0.024	21171.300	21425.262
Five-factor	WLSMV	115.542	109	0.995	0.994	0.021	0.029	—	—
Combined SSCM	MLR	1027.610	116	0.727	0.679	0.134	0.124	22147.415	22372.234
One-factor	MLR	1494.710	119	0.588	0.529	0.163	0.119	22648.380	22860.709
Higher-order SSCM	MLR	131.377	113	0.994	0.993	0.019	0.036	21178.281	21415.590

Note. Robust difference tests favoured the hypothesised five-factor model over all constrained alternatives.

4.4. Common-Method Assessment

Harman's first unrotated component explained 35.81% of item variance. More importantly, the one-factor CFA fitted very poorly, and full-collinearity VIF values ranged from 1.270 to 1.819. The attempted common latent method-factor model was inadmissible and therefore not interpreted. Taken together, the diagnostics suggest that a single method source is unlikely to account fully for the covariance structure; however, the cross-sectional single-informant design means common-method influence cannot be ruled out.

4.5. Structural Model

As shown in **Table 5**, EMP ($\beta = 0.377$, $p < 0.001$), SP ($\beta = 0.284$, $p < 0.001$) and EP ($\beta = 0.320$, $p < 0.001$) were positively associated with SCI, supporting H1a–H1c. SCI was positively associated with OP ($\beta = 0.440$, $p < 0.001$), supporting H2. Because all exogenous predictors were freely covaried and direct paths from the SSCM dimensions to both endogenous constructs were estimated, the structural portion was just-identified conditional on the validated five-factor measurement model. Consequently, its global fit indices are identical to those of the measurement model and do not constitute an independent test of the directional or indirect structural specification. Structural inference is therefore based on path esti-

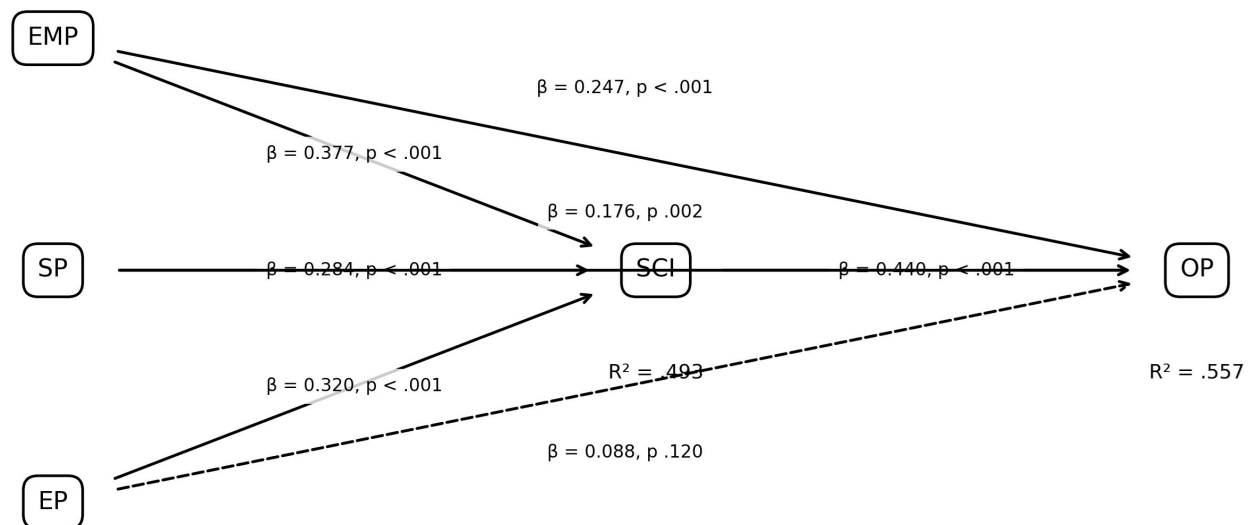
mates, uncertainty intervals, explained variance and robustness analyses rather than on repeated global-fit statistics.

The direct EMP-OP association was positive ($\beta = 0.247$, $p < 0.001$), as was the direct SP-OP association ($\beta = 0.176$, $p = 0.002$), supporting H3a and H3b. The direct EP-OP path was positive but not statistically supported ($\beta = 0.088$, $p = 0.120$), so H3c was not supported. The three SSCM dimensions explained 49.3% of the variance in SCI, and the full structural specification explained 55.7% of the variance in OP. **Figure 2** summarises the standardised structural relationships.

Table 5. Structural path estimates and hypothesis decisions.

Outcome	Predictor	B	Robust SE	β	95% CI for B	p	Decision
SCI	EMP	0.529	0.083	0.377	[0.366, 0.693]	<0.001	H1a supported
SCI	SP	0.399	0.080	0.284	[0.243, 0.555]	<0.001	H1b supported
SCI	EP	0.450	0.085	0.320	[0.284, 0.616]	<0.001	H1c supported
OP	SCI	0.471	0.090	0.440	[0.294, 0.647]	<0.001	H2 supported
OP	EMP	0.371	0.084	0.247	[0.206, 0.536]	<0.001	H3a supported
OP	SP	0.264	0.084	0.176	[0.100, 0.429]	0.002	H3b supported
OP	EP	0.132	0.085	0.088	[-0.035, 0.299]	0.120	H3c not supported

Note. B denotes unstandardised coefficients; β denotes standardised coefficients. $R^2_{SCI} = 0.493$; $R^2_{OP} = 0.557$.



Standardised coefficients from the primary robust maximum-likelihood latent SEM. Dashed path is not statistically supported.

Figure 2. Standardised structural model.

4.6. Indirect Associations

As shown in **Table 6**, all three hypothesised indirect associations through SCI were supported by the percentile-bootstrap intervals. Using the separate ML bootstrap model with 5000 resamples, the EMP indirect association was 0.249 un-

standardised and 0.166 standardised, 95% bootstrap CI [0.149, 0.384]. The SP indirect association was 0.188 unstandardised and 0.125 standardised, CI [0.099, 0.309]. The EP indirect association was 0.212 unstandardised and 0.141 standardised, CI [0.123, 0.330]. H4a - H4c were therefore supported as indirect-association hypotheses.

The EP pattern is especially informative. Although EP was positively associated with SCI and had a positive indirect association with OP, its direct latent path to OP was not statistically distinguishable from zero. The cross-sectional design does not establish temporal mediation; rather, the fitted model indicates that the operational relevance of economic practices in this sample was expressed principally through the SCI pathway.

Table 6. Bootstrapped indirect associations through supply chain integration.

Indirect pathway	Indirect B	Bootstrap SE	95% bootstrap CI	Standardised indirect	Total standardised	Decision
EMP → SCI → OP	0.249	0.060	[0.149, 0.384]	0.166	0.413	H4a supported
SP → SCI → OP	0.188	0.054	[0.099, 0.309]	0.125	0.301	H4b supported
EP → SCI → OP	0.212	0.054	[0.123, 0.330]	0.141	0.229	H4c supported

Note. Percentile-bootstrap confidence intervals are based on a separate ML model with the same measurement and structural specification as the primary MLR model and 5000 non-parametric resamples.

4.7. Robustness and Supplementary Analyses

The focal conclusions were stable across the principal sensitivity checks. Adding firm-size category, sector and respondent tenure changed no standardised focal coefficient by more than 0.01; SCI R^2 rose from 0.493 to 0.498 and OP R^2 from 0.557 to 0.562. Excluding the two multivariate outliers, estimating SCI with two indicators, using WLSMV, comparing complete-case with FIML, and estimating observed-score paths with HC3 standard errors did not change the conclusion that all three indirect associations through SCI were positive and statistically supported.

The observed-score model produced a small statistically significant direct EP-OP coefficient, whereas the latent SEM did not. Because the latent model accounts explicitly for measurement error and was specified after an acceptable measurement model, the hypothesis decision is based on the latent estimate. Sector multigroup analysis supported configural, metric and scalar invariance, and equality of structural paths was not rejected, robust $\Delta\chi^2(14) = 13.302$, $p = 0.503$. These subgroup results are exploratory. An alternative-ordering model fitted equivalently, underscoring that the cross-sectional data cannot establish temporal direction.

As an additional reviewer-requested sensitivity analysis, the full model was re-estimated with SP1 restored to the SP factor while all other indicators and structural paths were held constant. Although SP1 and SCI3 were not response-level duplicates ($r = 0.058$; 33.05% identical responses), SP1 had a near-zero, nonsig-

nificant loading on SP ($\lambda = -0.007$, $p = 0.872$). Restoring SP1 reduced SP reliability ($\alpha = 0.862$ to 0.809 ; $CR = 0.862$ to 0.812) and AVE (0.557 to 0.464), while HTMT for SP-SCI remained below conventional thresholds (0.488 versus 0.517). The absolute magnitudes and statistical support of $SP \rightarrow SCI$ and $SP \rightarrow OP$ were unchanged, R^2 remained 0.493 for SCI and 0.557 for OP, and the SP indirect association remained statistically supported with essentially the same magnitude. The apparent sign reversal in the SP coefficients under the six-item specification reflected arbitrary latent-factor orientation rather than a substantive reversal. These results support retaining the five-item SP specification on measurement grounds without changing the study's structural conclusions.

5. Discussion

5.1. Main Findings

EMP exhibited the strongest association with SCI among the three SSCM dimensions ($\beta = 0.377$, $p < 0.001$), supporting H1a. Theoretically, this result does more than confirm that environmental practices and integration coexist. It supports the dynamic-capabilities proposition that sustainability-oriented routines create value when firms possess mechanisms for sensing external requirements, seizing opportunities for resource efficiency and reconfiguring inter-organisational activities accordingly. Environmental management systems, eco-design and reductions in material or energy intensity generate information and coordination demands that extend beyond a single function. Their positive association with SCI therefore indicates that EMP is linked to the organisational capacity to translate environmental requirements into supplier specifications, production plans and coordinated operating responses. This interpretation is consistent with studies showing that green integration connects environmental practices to broader sustainability and performance outcomes (Han & Huo, 2020; Hong et al., 2018; Khan et al., 2022), but the present evidence adds a more explicit capability implication: environmental routines appear to activate, or at least accompany, the integrative processes through which firms coordinate sustainability across organisational boundaries.

H3a and H4a provide an important qualification to a simple single-path account. EMP retained a positive direct association with OP ($\beta = 0.247$, $p < 0.001$) while also exhibiting a positive indirect association through SCI (standardised indirect = 0.166 , 95% bootstrap CI [0.099 , 0.256]). Dynamic Capabilities Theory would be overstated if these findings were interpreted to mean that integration is always necessary for environmental practices to be associated with operational value. Instead, the evidence suggests two pathways. Some environmental routines may yield relatively immediate internal benefits through waste reduction, process discipline and lower resource intensity, whereas SCI supplies an additional inter-organisational conversion pathway by connecting customer concerns, supplier communication and production planning. Thus, the theory is supported but also bounded: integrative capability enhances the operational deployment of EMP, yet

it does not exhaust the mechanisms through which environmental practices are associated with performance.

SP was positively associated with SCI ($\beta = 0.284$, $p < 0.001$), supporting H1b, and was also directly associated with OP ($\beta = 0.176$, $p = 0.002$), supporting H3b. From a dynamic-capabilities perspective, the H1b result indicates that social sustainability is not merely a reputational or legitimacy-oriented domain; it also creates coordination requirements that firms must integrate into operational routines. Safety, remuneration and community commitments involve multiple stakeholders and organisational functions, so their implementation requires information to be interpreted, priorities to be reconciled and resources to be redeployed. In this sense, SCI provides a mechanism through which dispersed social obligations can be converted into coordinated operating responses. The result therefore extends the capability argument beyond the environmentally dominated applications common in SSCM research and is consistent with evidence that social responsibility contributes to sustainable performance when embedded in governance and coordination arrangements (Chowdhury & Quaddus, 2021; Yu et al., 2023).

The supported indirect association for SP through SCI (standardised indirect = 0.125, 95% bootstrap CI [0.066, 0.206]) provides evidence for H4b, but the simultaneous direct SP-OP association again qualifies a universal conversion claim. If SCI were the only capability through which social practices became operationally consequential, the residual direct pathway would be difficult to explain. Instead, the findings imply that social practices may generate internal operational benefits—such as workforce stability, reduced disruption, stronger organisational commitment and stakeholder cooperation—while integration creates a complementary cross-boundary route through supplier communication and production planning. This distinction refines Dynamic Capabilities Theory in the present context: not every performance consequence of a sustainability routine requires reconfiguration across the supply chain. Some value may arise from relatively local organisational mechanisms, whereas dynamic or integrative capabilities become particularly important when the practice must be coordinated across functions and partners. The empirical coherence of the five-item SP factor supports this interpretation at the construct level, although the mixture of employee- and community-oriented practices remains a boundary condition for future research.

The EP findings provide the most stringent test of the capability-conversion argument. EP was positively associated with SCI ($\beta = 0.320$, $p < 0.001$), supporting H1c, but its direct latent association with OP was not statistically supported ($\beta = 0.088$, $p = 0.120$), so H3c was rejected. At the same time, the EP $\rightarrow$ SCI $\rightarrow$ OP indirect association was positive and statistically supported (standardised indirect = 0.141, 95% bootstrap CI [0.082, 0.220]), supporting H4c. This pattern is theoretically important because transport economies, inventory control and lean production are ostensibly designed to improve operations directly. Yet, once measurement error and SCI were accounted for in the latent model, their operational relevance was expressed principally through integration. The evidence therefore ac-

cords closely with the dynamic-capabilities claim that possession of efficiency-oriented routines is insufficient when those routines depend on coordination with external and internal actors.

Rather than simply being “consistent with” Dynamic Capabilities Theory, the EP pattern identifies a boundary condition under which the theory has particular explanatory force. Lean and just-in-time routines require reliable supplier deliveries, synchronized production schedules and timely demand information; transportation economies likewise depend on coordinated inbound and outbound flows. Without such integration, firms may relocate inventory, delay, or risk rather than eliminate it. The supported indirect pathway and unsupported direct latent pathway therefore suggest that SCI functions as a feasibility mechanism through which economic sustainability routines are recombined and deployed across organisational boundaries. This finding strengthens earlier evidence that operations and supply-chain strategies generate performance when aligned with integration capabilities (Qi et al., 2017; Tarigan et al., 2019), while also qualifying the assumption that economically oriented SSCM practices possess automatic operational value. Among the three dimensions, EP consequently offers the clearest empirical support for the paper’s central conversion proposition.

SCI was the strongest immediate predictor of OP ($\beta = 0.440$, $p < 0.001$), supporting H2, and the full model explained 55.7% of the variance in OP. This result provides the central test of whether the proposed mediator behaves as the type of capability posited by the theoretical framework. Dynamic Capabilities Theory argues that superior outcomes arise not simply from owning resources or routines but from the capacity to sense changing conditions, seize emerging opportunities and reconfigure resource combinations. The SCI indicators in this study—communicating future customer needs to suppliers, updating and sharing production plans, and responding to changing requirements—map onto this logic because they concern the interpretation of external signals, coordinated commitment of resources and adjustment of operating arrangements. The positive SCI-OP association therefore supports the proposition that integrative coordination is a consequential mechanism through which firms convert sustainability-related routines into lower costs and more efficient inbound and outbound logistics. This interpretation is consistent with meta-analytic and capability-based evidence linking integration to performance (Ataseven & Nair, 2017; Raj et al., 2025).

The findings nevertheless impose an important theoretical boundary. They do not establish that SCI is intrinsically or universally a dynamic capability, because routine information exchange and stable coordination can constitute ordinary capabilities. Nor do the cross-sectional data demonstrate that SCI developed before the observed performance differences. The stronger inference is narrower: the form of SCI measured here has capability-like properties, and the observed structural pattern is compatible with a conversion process in which coordinated sensing, planning and response help deploy SSCM practices. The alternative-ordering model fitted equivalently, which prevents the data from adjudicating temporal di-

rection. Consequently, the study supports the explanatory usefulness of the dynamic-capabilities lens while withholding a stronger causal claim. This distinction is theoretically important because it converts the theory from a decorative label into a falsifiable interpretive framework: the evidence supports its coordination-and-reconfiguration mechanism, but the design cannot test the temporal process assumptions that distinguish a genuinely dynamic capability from a correlated organisational routine.

5.2. Theoretical Implications

The first theoretical contribution is therefore a move from an adoption logic to a conditional conversion logic. The supported H1a-H1c and H4a-H4c pathways show that all three sustainability-practice domains are associated with SCI and possess positive indirect associations with OP through it. This pattern supports a core dynamic-capabilities proposition: organisational routines are not valuable solely because they exist; their performance implications depend partly on how firms combine and deploy them. Yet the simultaneous direct effects for EMP and SP demonstrate that this proposition should not be universalised. Integration is one conversion mechanism, not the only mechanism. The evidence therefore refines Dynamic Capabilities Theory by showing that the need for integrative deployment varies with the operational content of the underlying sustainability routine.

Second, the results establish dimension-specific theoretical boundary conditions. The measurement analysis showed that EMP, SP and EP are empirically distinct, and the structural model showed that their performance pathways are also non-equivalent. EMP and SP retained both direct and indirect associations with OP, whereas EP was expressed principally through SCI in the latent model. Theoretically, this means that SSCM should not be represented as a homogeneous resource bundle whose components depend identically on dynamic capabilities. Environmental practices may generate internal process efficiencies as well as integration-enabled benefits; social practices may operate through workforce and stakeholder stability alongside coordinated supply-chain action; and economic routines appear especially dependent on synchronisation across organisational boundaries. Collapsing these dimensions would therefore obscure when and why an integrative capability matters.

Third, the study clarifies what the evidence does—and does not—test about dynamic capabilities. The strong SCI-OP path, the three supported indirect associations and the stability of those conclusions across controls, outlier exclusion, the two-indicator SCI specification, WLSMV and observed-score analyses strengthen the argument that integration is a substantive conversion mechanism rather than a modelling artefact. At the same time, the equivalent fit of an alternative temporal ordering and the cross-sectional single-source design mean that the study cannot establish the evolutionary sequence of sensing, seizing and reconfiguring proposed by Dynamic Capabilities Theory. The contribution is therefore one of mech-

anism specification and theoretical qualification, not causal verification. SCI is positioned neither as a generic “good practice” nor automatically as a dynamic capability; rather, the findings show that its measured coordination behaviours are compatible with the capability logic and are especially consequential where sustainability routines, such as EP, require cross-boundary synchronisation. This interpretation extends capability-based SSCM research while preserving the distinction between evidence that supports a theoretical mechanism and evidence that would be needed to demonstrate that mechanism causally (Chowdhury et al., 2019; Elnadi et al., 2026; Hong et al., 2018; Siddiqi et al., 2025; Teece, 2018).

5.3. Managerial and Policy Implications

Managers should avoid treating sustainability and operations as separate portfolios. Environmental targets, social commitments and economic-efficiency initiatives should be embedded in supplier communication and production planning. Practically, firms should communicate anticipated customer sustainability requirements to suppliers, revise production plans jointly when those requirements change, and connect environmental and social indicators to inventory and logistics decisions.

The EP result has a particularly direct managerial implication: lean production, inventory control and transport consolidation may produce limited operational value when information remains fragmented. Managers should therefore evaluate whether suppliers receive timely demand and production information, whether purchasing and manufacturing schedules are synchronised, and whether customer feedback reaches upstream partners quickly.

The results also suggest that the three SSCM dimensions deserve differentiated implementation strategies. EMP appears to provide the largest integration leverage, whereas SP contributes through both integration and direct organisational stability. Managers should preserve these distinct pathways while using SCI as a shared platform that connects sustainability priorities to operational execution.

5.4. Limitations and Future Research

Several limitations circumscribe the conclusions. First, the cross-sectional design cannot establish temporal precedence. The indirect coefficients are compatible with the proposed conversion mechanism but do not demonstrate causal mediation. Longitudinal studies should measure SSCM practices before integration and operational outcomes, while quasi-experimental or panel designs should address reverse causality and time-varying confounding.

Second, the focal variables were collected in the same survey period from a single knowledgeable informant in each participating firm. Measurement-model comparisons and collinearity diagnostics weaken a simple single-factor explanation, but common-method variance and informant-specific perceptual bias cannot be eliminated statistically. Future research should therefore adopt longitudinal and multi-informant designs and, where possible, combine sustainability-practice

reports from operational managers, integration measures from supply-chain partners and performance indicators from archival or other objective sources.

Third, OP is perceptual and narrowly defined around production cost and logistics efficiency. This focus improves construct precision but does not capture quality, flexibility, market, financial or environmental outcomes. Replication should examine whether the capability-conversion mechanism varies across performance domains.

Fourth, all items exhibited ceiling concentration, which may reduce discrimination among high-performing firms. WLSMV sensitivity analysis mitigates some distributional concerns, but future instruments should use more behaviourally specific response anchors or objective practice indicators.

Fifth, SCI contains only three indicators, and one item concerns responsiveness through finished-goods availability. Although the construct achieved good reliability, convergent validity and fit, future work should measure internal, supplier and customer integration more comprehensively. Sixth, the retained SP factor combines employee-oriented practices (safety and remuneration) with community-oriented practices (education, employment/business opportunities and healthcare), which [Das \(2017\)](#) originally distinguished as separate domains. The acceptable one-factor measurement results support the pragmatic aggregate used here, but the conceptual heterogeneity remains a construct-level limitation and should be tested explicitly with multidimensional social-sustainability models in future studies. Finally, the sectoral sample is concentrated in food products, apparel and furniture manufacturing. Scalar invariance and equal structural paths were supported across sectors, but broader replication is needed before generalising beyond these industries or the study setting.

6. Conclusion

This study examined how environmental, social and economic supply-chain practices are associated with operational performance directly and indirectly through SCI. The validated five-factor measurement model and latent structural estimates show that all three SSCM dimensions are positively associated with integration and that integration is positively associated with lower production costs and more efficient inbound and outbound logistics. EMP and SP retain direct associations with OP, while the EP association is expressed primarily through the SCI pathway.

The central conclusion is therefore not simply that sustainability improves performance. The results are consistent with a capability-conversion account in which sustainability practices become more operationally consequential when firms possess the integrative capacity to translate them into shared information, coordinated production plans and responsive inter-organisational action. Because the data are cross-sectional and based on one organisational informant per firm, these pathways are interpreted as model-consistent associations rather than causal mediation effects. Their stability across measurement, estimator and robustness checks nonetheless provides a strong basis for longitudinal and multi-informant tests of

SCI as a conversion mechanism linking sustainability practices to operational outcomes.

Author Contributions

K.A. and W.N.A. contributed to manuscript preparation, critical review and editing. Both authors read and approved the final version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix A. Measurement Items, Source Domains and Response Anchors

The full focal item wording is reproduced from the archived questionnaire. SP1 is shown for transparency but was excluded from the primary CFA/SEM before modelling because of wording overlap with SCI3. The third EMP item is labelled EMP4 in the questionnaire but coded EMP3 in the analysis dataset. The source-domain mapping reflects the traceable Das (2017) SSCM scale family; the questionnaire itself labels the SCI and OP blocks “Das, 2018”.

Table A1. Focal measurement items and response anchors.

Analysis code	Exact questionnaire wording	Source-domain mapping	Response anchors
EMP1	Environmental management systems (EMSs) are in place in our organization in terms of ISO 14001 certification or any comparable EMS	Das (2017): Environmental Management Practices	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
EMP2	We address environmental concerns of our customers in terms of eco-friendly design/distribution of products	Das (2017): Environmental Management Practices	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
EMP3 (questionnaire EMP4)	We have successfully designed our products to reduce the amount of input materials/energy required	Das (2017): Environmental Management Practices	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
SP1 (excluded)	Our organization responds to the needs of customers fairly quickly by keeping adequate amount of finished goods inventory	Archived SP block; excluded because wording overlaps SCI3	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
SP2	The safety measures undertaken by our organization, being quite advanced, reduce the risk to accident	Das (2017): Socially Inclusive Practices for Employees	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
SP3	The wages and perquisite given out to the employees to meet their basic needs in our organisation are adequate	Das (2017): Socially Inclusive Practices for Employees	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
SP4	We provide vocational/primary education facilities to the surrounding people	Das (2017): Socially Inclusive Practices for Community	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
SP5	We provide employment/business opportunities to the surrounding community	Das (2017): Socially Inclusive Practices for Community	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent

Continued

SP6	We provide health care facilities to the local community	Das (2017): Socially Inclusive Practices for Community	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
EP1	We attempt to achieve economies of scale in inbound and or outbound transportation	Das (2017): Operations Practices	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
EP2	We follow Just-in-time/Scientific inventory control technique consistently to keep inventory under control in the production environment.	Das (2017): Operations Practices	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
EP3	We have implemented lean production and follow it consistently to minimize waste	Das (2017): Operations Practices	1 = Not at all; 2 = To a Small Extent; 3 = To a Moderate Extent; 4 = To a Considerable Extent; 5 = To a Great Extent
SCI1	We communicate customers' future needs to the suppliers quickly.	Das (2017) scale family; questionnaire labels SCI block "Das, 2018"	1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree
SCI2	We update our production plan as per the changing needs of customers and share the same with suppliers.	Das (2017) scale family; questionnaire labels SCI block "Das, 2018"	1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree
SCI3	Our organization responds to the needs of customers fairly quickly by keeping adequate amount of finished goods inventory	Das (2017) scale family; questionnaire labels SCI block "Das, 2018"	1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree
OP1	Decrease in the cost of production	Das (2017): Operations Performance; questionnaire labels OP block "Das, 2018"	1 = Strongly Deteriorated; 2 = Deteriorated; 3 = Stayed the Same; 4 = Improved; 5 = Strongly Improved
OP2	Improvement in the efficiency of inbound logistics	Das (2017): Operations Performance; questionnaire labels OP block "Das, 2018"	1 = Strongly Deteriorated; 2 = Deteriorated; 3 = Stayed the Same; 4 = Improved; 5 = Strongly Improved
OP3	Improvement in the efficiency of outbound logistics	Das (2017): Operations Performance; questionnaire labels OP block "Das, 2018"	1 = Strongly Deteriorated; 2 = Deteriorated; 3 = Stayed the Same; 4 = Improved; 5 = Strongly Improved