

Exploring Managerial Drivers Mediating The Relationship Between Green Supply Chain Behaviour And Sustainable Business Performance

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ABSTRACT

This research examines the mediating effect of managerial drivers between Green Supply Chain Behaviour (GSCB) and Sustainable Business Performance in the industrial setting of Delhi NCR. Based on data gathered from 400 mid-to-senior-level executives, the research uses Structural Equation Modelling (SEM) to examine the direct and indirect effects of greening practices on sustainability performance. Findings show that although some of the GSCB dimensions have minor direct effects, their effects become strong when mediated by managerial drivers like regulatory pressures, supplier cooperation, competitive rivalry, and internal leadership. The model proves high reliability, validity, and explanatory power, accounting for more than 78% of variance in organizational sustainability. This study emphasizes the significance of incorporating managerial drivers to enhance the potency of green initiatives, providing theoretical contributions and practical implications for companies seeking to consolidate supply chain activities with sustainability objectives in progressively competitive and environmentally aware markets.

Keywords: Green supply chain behaviour , managerial drivers , sustainable business performance.

1. Introduction

In recent years, the increasing pressure on environmental sustainability and the mounting regulatory demand have compelled organizations to incorporate green practices in their supply chain activities. Green Supply Chain Behaviour (GSCB) is now a strategic priority involving eco-design, green procurement, sustainable production, green logistics, and waste reduction aimed at attaining both environmental and organizational performance (Zhu & Sarkis, 2006; Daily & Huang, 2001). The concept of GSCB reflects the shift from traditional supply chain paradigms to greener strategies that do not only comply with regulatory requirements but also generate long-term stakeholder value.

India's National Capital Region (NCR), comprising industrial hubs such as Delhi, Noida, Gurugram, Faridabad, Neemrana, and Bhiwadi, is the country's largest manufacturing and service corridor. This area has been facing high-level environmental problems due to rapid industrialization, waste production, and energy consumption (CII, 2020). Industries in this location are thus increasingly adopting green supply chain techniques to enhance sustainability, reduce environmental risks, and become compliant with international levels of sustainability standards.

Current research seeks to investigate the mediating role played by managerial drivers on the relationship between Green Supply Chain Behaviour and Sustainable Business Performance. Managerial drivers like regulatory awareness, supply chain cooperation, competitive benchmarking, and environmental commitment within the organization serve as important facilitators of the green activities leading to real sustainability performance (Vachon & Klassen, 2008; Lin et al., 2013). These drivers influence the extent to which GSCB practices are adopted and the extent to which they are effective in assisting organizational goals related to economic, environmental, and social performance.

Despite the growing body of research on green supply chain management, the literature deficit is empirical testing the mediating processes through which the managerial drivers affect the GSCB-sustainability

relationship, particularly in the Indian industrial environment (Prajogo et al., 2014; Khan & Qianli, 2017). Understanding these processes is crucial in building effective sustainability plans and achieving long-term competitive advantage. The incorporation of SEM enables the analysis of complicated interactions among latent variables, which is important in capturing the multi-dimensional aspect of green supply chain behaviours. Besides, the results of the study are anticipated to inform policymakers while making supportive frameworks that motivate industries to pursue greener initiatives. In a competitive economy, the capacity to use green strategies not only improves environmental performance but also generates brand value, operation efficiency, and long-term stakeholder trust. Therefore, this study lies at the nexus of environmental management, operations, and strategic management, making both an academic and practical contribution to the unfolding discussion on sustainability.

2. Review of Literature

The concept of Green Supply Chain Behaviour (GSCB) has received considerable attention in the academic and industrial spheres over the past two decades. The early literature on environmental management primarily focused on pollution control and regulatory compliance (Porter & van der Linde, 1995). However, with the evolution of sustainability paradigms, the emphasis shifted towards proactive green strategies within supply chain management (Srivastava, 2007).

Green buying, being one of the core pillars of GSCB, encompasses procuring materials and services that are sustainable and eco-friendly. Research by Zhu and Sarkis (2006) and Khan and Qianli (2017) has proven that green buying practices not only minimize negative environmental impacts but also promote supplier relations and organizational image. Eco-design, another crucial dimension, aims to reduce environmental footprints in the stage of designing products, thereby ensuring sustainability in the product life cycle (Bovea & Pérez-Belis, 2012).

Green manufacturing, integrating waste reduction and energy efficiency within production activities, has been found to enhance environmental as well as economic results (Narasimhan & Schoenherr, 2012). Vachon and Klassen (2008) highlighted the significance of cooperation between supply chain partners in driving green manufacturing practices. Likewise, green distribution and logistics have become essential elements for minimizing transportation and packaging-related carbon footprints (Tomar & Oza, 2015).

A number of researchers have also pointed out the serious role played by internal environmental management in implanting green values in organizational culture (Daily & Huang, 2001). It includes employee participation, environmental training and setting quantifiable environmental performance goals. Collaboration with consumers, the second major area, highlights the need to engage end-users in sustainability efforts through eco-labels, recycling programs, and green product knowledge (Lin et al., 2013).

The contribution of GSCB to organizational sustainability is ample on economic, environmental, and social fronts (Zhu et al., 2008). Economic performance pertains to cost reduction, market share, and profitability, whereas environmental performance targets pollution reduction and conservation of resources. Social performance includes stakeholder participation, welfare of the community, and ethical operations (Fraj et al., 2011).

In spite of these developments, few studies have examined the mediating processes through which GSCB translates to sustainability performance (Kumar & Bhatia, 2020). The addition of managerial drivers regulatory pressures, supplier push, competitive forces, and internal leadership has been suggested as a key but less researched area (Prajogo et al., 2014; Lin et al., 2013). These drivers can facilitate or retard the impact of green supply chain practices.

Regulatory drivers, such as government measures and global environmental regulations, are external pressures that compel firms towards green practices (Zhu & Sarkis, 2006). Supplier drivers focus on the nature of supply chains as interdependent, where supplier innovation and eco-efficiency impact downstream results (Vachon & Klassen, 2008). Competitor drivers focus on the importance of competition and industry benchmarks in driving sustainability adoption. Internal drivers, such as top management commitment and employee involvement, are internal motivators that influence organizational behavior towards sustainability (Daily & Huang, 2001).

The use of modern analytical techniques like Structural Equation Modelling (SEM) has facilitated modelling complex interrelations between practices of GSCB, mediating factors, and sustainability performance (Kannan et al., 2014). SEM facilitates the confirmation of both direct and indirect effects and hence is a desirable means of developing theoretical insights in this area (Kumar & Mathur, 2020).

3. Research Methodology

This research uses a quantitative, cross-sectional design whose aim is to empirically explore the mediating role of managerial drivers in the link between Green Supply Chain Behaviour (GSCB) and Sustainable Business Performance. The design is causal and descriptive, and it collects primary data using structured questionnaires while using Structural Equation Modelling (SEM) for the analysis.

3.1 Population and Sample

The target segment is mid-to-senior-level professionals (Supply Chain Managers, Sustainability Officers, Operations Heads) employed in sectors within Delhi NCR's primary industrial hubs (Delhi, Noida, Gurugram, Faridabad, Neemrana, Bhiwadi). A stratified purposive sampling technique was adopted to ensure proportional representation from diverse industrial zones and sectors.

- Sample Size: 400 respondents (based on recommendations for SEM sample adequacy).
- Sampling Technique: Stratified Purposive Sampling.

3.2 Data Collection Method

Primary data was collected using a structured questionnaire administered both online and offline. The questionnaire was divided into sections measuring:

- Green Supply Chain Behaviour dimensions (Eco-Design, Green Purchasing, Green Manufacturing, Green Packaging, Reverse Logistics, etc.)
- Managerial Drivers (Regulatory, Supplier, Competitor, Internal Drivers)

3.3 Construct reliability and validity

Table 1 evaluates the construct reliability and validity of all key factors used in the study, using four indicators: Cronbach's Alpha, Composite Reliability (ρ_a and ρ_c), and Average Variance Extracted (AVE). These indicators confirm whether each construct is measured accurately and consistently, a prerequisite for further structural model analysis.

All constructs exhibit Cronbach's Alpha values above 0.90, indicating excellent internal consistency. The highest alpha is observed for Drivers (0.952) and Organizational Performance (OP) (0.962), while the lowest—Cooperation with Consumers (CC) still meets the threshold at 0.901. This shows that the questionnaire items effectively reflect their respective constructs.

Composite reliability values (ρ_a and ρ_c) for all constructs also exceed the acceptable standard of 0.70, further validating internal consistency. Most constructs, such as Green Purchasing (GP), Internal Environment Management (IEM), and Reverse Logistics (RL), show composite reliability around or above 0.94, confirming the stability of the measurement scales.

Average Variance Extracted (AVE) values are mostly well above 0.50, indicating that the constructs explain more than 50% of the variance in their indicators. RL (0.784), Green Manufacturing (GM) (0.772), and CC (0.771) have particularly high AVE, demonstrating strong convergent validity. However, the Drivers construct has a slightly lower AVE (0.469), which is marginally below the standard but offset by high reliability scores.

In conclusion, Table 4.36 confirms that all constructs in the model are statistically reliable and valid. The high levels of consistency and variance explanation support the robustness of the measurement model, ensuring confidence in the subsequent structural equation modeling and hypothesis testing phases of the research.

Factors	Cronbach's alpha	Composite reliability (ρ_a)	Composite reliability (ρ_c)	Average variance extracted (AVE)
CC	0.901	0.901	0.931	0.771
ED	0.942	0.942	0.952	0.741
GDP	0.935	0.936	0.949	0.756
GM	0.926	0.927	0.944	0.772
GP	0.941	0.942	0.952	0.740
IEM	0.925	0.926	0.944	0.770
IR	0.902	0.902	0.931	0.772
OP	0.962	0.962	0.964	0.521
Drivers	0.952	0.953	0.956	0.469
RL	0.908	0.908	0.936	0.784

3.3.1 Discriminant validity

Table 2 presents the Heterotrait-Monotrait (HTMT) ratio matrix, which is used to assess the discriminant validity among the constructs used in the study. Discriminant validity ensures that each construct is empirically distinct from the others. A commonly accepted HTMT threshold is 0.85; values below this level indicate good discriminant validity.

All the HTMT values in this matrix fall well below the 0.85 threshold, ranging from 0.489 (GDP–IR) to 0.789 (Practices–ED), confirming that each construct is adequately differentiated from the others. Notably, the highest value observed (0.789 between Practices and ED) still remains under the acceptable limit, suggesting that although these constructs are related, they are not overlapping.

Reverse Logistics (RL) maintains acceptable HTMT ratios with all other constructs, including Drivers (0.745) and Organizational Sustainability (OS) (0.725), indicating its unique contribution to the model. Similarly,

constructs such as Green Manufacturing (GM), Green Purchasing (GP), and Internal Environment Management (IEM) demonstrate clear separability.

In conclusion, the HTMT matrix in Table 4.37 provides strong evidence of discriminant validity, confirming that each factor within the green supply chain framework represents a distinct conceptual domain. This validates the structural model's integrity for further hypothesis testing.

Factors	CC	ED	GDP	GM	GP	IEM	IR	OS	Drivers	RL
CC										
ED	0.589									
GDP	0.585	0.592								
GM	0.571	0.603	0.612							
GP	0.570	0.573	0.603	0.555						
IEM	0.603	0.600	0.569	0.552	0.590					
IR	0.618	0.624	0.496	0.584	0.573	0.616				
OP	0.728	0.724	0.682	0.699	0.665	0.707	0.709			
Practices	0.779	0.789	0.717	0.711	0.724	0.726	0.735	0.708		
RL	0.626	0.633	0.601	0.580	0.572	0.597	0.593	0.725	0.745	

3.3.2 Collinearity statistics (VIF)

Table 3 displays the Variance Inflation Factor (VIF) values for all measurement items used in the model. VIF is a key diagnostic used to detect multicollinearity, which occurs when independent variables are highly correlated, potentially distorting regression estimates. A VIF value below 5 is considered acceptable, while values above 10 indicate serious multicollinearity concerns.

In this analysis, all VIF values fall within the acceptable range of 1.6 to 3.6. The highest VIF is 3.579 (EP8), and the lowest is 1.624 (ID5), confirming that there are no significant multicollinearity issues among the variables. Items such as EP4, GP3, RD1, and RD7 have relatively higher VIFs (above 3), but still remain within safe thresholds.

These results validate that the model's constructs are independent of each other, and the statistical relationships among them are reliable. This ensures that the regression coefficients derived in the structural model are stable and interpretable.

Statements Code	VIF
CC1	2.562
CC2	2.751
CC3	2.466
CC4	2.426
CD1	1.711
CD2	1.723
CD3	1.716
CD4	1.738
ED1	3.124
ED2	2.798
ED3	2.902
ED4	2.734
ED5	2.905
ED6	3.084
ED7	2.799
EP1	3.158
EP1_A	2.929
EP2	3.256
EP2_A	3.032
EP3	3.306
EP3_A	2.859
EP4	3.569
EP4_A	2.894
EP5	3.332
EP5_A	3.263
EP6	3.088
EP7	3.189

EP8	3.579
FP1	2.494
FP2	2.819
FP3	3.088
FP4	2.608
FP5	3.039
GDP1	3.144
GDP2	2.877
GDP3	2.801
GDP4	2.972
GDP5	2.846
GDP6	2.925
GM1	3.089
GM2	3.050
GM3	2.914
GM4	2.835
GM5	2.547
GP1	2.453
GP2	3.039
GP3	3.268
GP4	2.666
GP5	3.172
GP6	3.093
GP7	2.745
ID1	1.696
ID2	1.714
ID3	1.718
ID4	1.777
ID5	1.624
IEM1	2.745
IEM2	3.074
IEM3	3.112
IEM4	2.565
IEM5	2.832
IR1	2.712
IR2	2.619
IR3	2.549
IR4	2.421
RD1	3.501
RD2	3.221
RD3	3.169
RD4	3.110
RD5	2.863
RD6	3.111
RD7	3.472
RL1	2.486
RL2	2.817
RL3	2.751
RL4	2.777
SD1	1.855
SD2	1.689
SD3	1.675
SD4	1.725
SP1	3.028
SP2	3.086
SP3	2.734
SP4	3.088
SP5	3.063
SP6	2.982
SP7	3.173
SRD1	1.826

SRD2	1.703
SRD3	1.875
SRD4	1.702
SRD5	1.733

4. Empirical findings

4.1 Path Coefficient

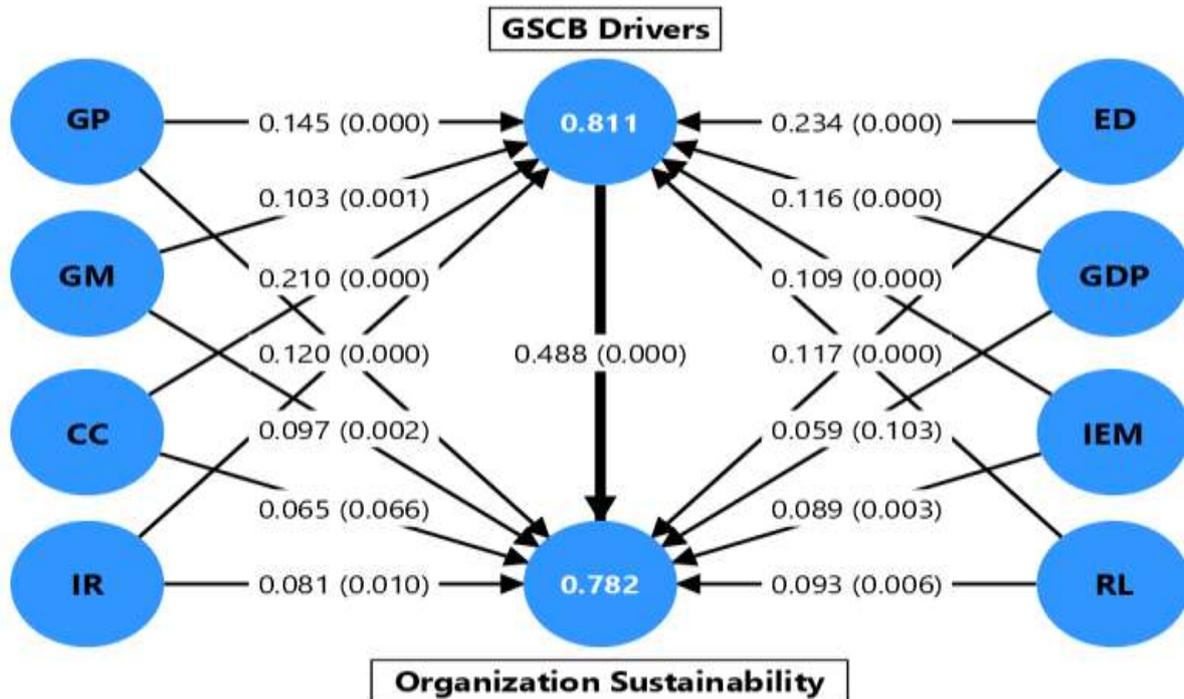


Table 4 presents the structural path coefficients, t-statistics, and p-values that determine the significance and strength of relationships between independent constructs (e.g., green supply chain practices) and dependent constructs—namely Organizational Sustainability (OS) and Drivers. A path is considered statistically significant when the p-value is below 0.05 and the t-statistic is above 1.96.

The results show that many constructs significantly influence Drivers, with the strongest effects observed from Eco Design (ED → Drivers, $\beta = 0.234$, $p = 0.000$) and Drivers → OS ($\beta = 0.488$, $p = 0.000$). These indicate that ED is a key enabler for driving green supply chain behavior, and Drivers play a major mediating role in improving organizational sustainability.

Other green practices Green Purchasing (GP), Internal Environment Management (IEM), Investment Recovery (IR), Green Manufacturing (GM), and Green Distribution & Packaging (GDP) also show statistically significant and positive paths toward Drivers, with p-values well below 0.05 and t-values exceeding the 1.96 threshold. This confirms that these practices are crucial for reinforcing the motivations and institutional drivers behind sustainability efforts.

However, several constructs do not show a direct significant impact on Organizational Sustainability (OS). For example, Cooperation with Consumers (CC → OS, $p = 0.066$), Eco Design (ED → OS, $p = 0.190$), Green Purchasing (GP → OS, $p = 0.571$), and Green Distribution (GDP → OS, $p = 0.103$) are statistically insignificant. This suggests their effect may be indirect channeled through Drivers rather than directly influencing sustainability.

Reverse Logistics (RL) demonstrates both direct (RL → OS, $\beta = 0.093$, $p = 0.006$) and indirect (RL → Drivers, $\beta = 0.117$, $p = 0.000$) significant influence, confirming its strategic role in sustainability.

Path	Original Sample(O)	Sample Mean(M)	S.D	T-Statistics (O/STDEV)	P values
CC -> OS	0.065	0.063	0.035	1.837	0.066
CC -> Drivers	0.210	0.209	0.030	6.994	0.000
ED -> OS	0.041	0.042	0.031	1.310	0.190
ED -> Drivers	0.234	0.235	0.031	7.682	0.000
GDP -> OS	0.059	0.059	0.036	1.632	0.103
GDP -> Drivers	0.116	0.115	0.028	4.112	0.000
GM -> OS	0.097	0.096	0.032	3.027	0.002

GM -> Drivers	0.103	0.104	0.030	3.406	0.001
GP -> OS	0.018	0.018	0.032	0.567	0.571
GP -> Drivers	0.145	0.145	0.027	5.346	0.000
IEM -> OS	0.089	0.089	0.030	2.932	0.003
IEM -> Drivers	0.109	0.110	0.029	3.794	0.000
IR -> OS	0.081	0.081	0.031	2.583	0.010
IR -> Drivers	0.120	0.119	0.028	4.207	0.000
Drivers -> OS	0.488	0.488	0.050	9.671	0.000
RL -> OS	0.093	0.093	0.034	2.773	0.006
RL -> Drivers	0.117	0.118	0.028	4.137	0.000

4.2 Model fit

Table 5 represents the model fit indices for both the saturated and estimated models, assessing the overall fit of the structural equation model. The Standardized Root Mean Square Residual (SRMR) value for both models is 0.047, which is below the commonly accepted threshold of 0.08, indicating a good fit between the observed and predicted data. The squared Euclidean distance measures— d_{ULS} (Unweighted Least Squares) and d_G (Geodesic distance)—are 9.443 and 3.345 respectively for both models. These indices provide additional measures of discrepancy, and lower values typically indicate better model fit. The fact that these values are identical for both saturated and estimated models suggests a strong alignment and stability in the structural model. Overall, the results reflect that the model fits the empirical data well and supports the structural relationships hypothesized in the study. These fit statistics enhance the credibility of further analysis and interpretation of structural paths.

Model Fit Indices	Saturated model	Estimated model
SRMR	0.047	0.047
d_{ULS}	9.443	9.443
d_G	3.345	3.345
Chi-square	10027.943	10027.943
NFI	0.769	0.769

4.3 R-square

Table 6 presents the R-square and adjusted R-square values for Organizational Sustainability and Drivers. The R-square for Organizational Sustainability is 0.782, indicating that 78.2% of its variance is explained by the model, while the adjusted R-square is 0.778, showing minimal overfitting. For Drivers, the R-square is 0.811 and the adjusted value is 0.808, demonstrating that the model explains 81.1% of the variance in Drivers. These high values indicate strong predictive accuracy and a well-fitting structural model. The small differences between R-square and adjusted values confirm the model's robustness and reliability for further analysis.

Variables	R-square	R-square adjusted
Organization Sustainability	0.782	0.778
Drivers	0.811	0.808

4.4 F-square

Table 7 presents the F-square values, indicating the effect size of individual constructs on endogenous variables within the model. According to Cohen's guidelines, values of 0.02, 0.15, and 0.35 represent small, medium, and large effects respectively. The highest effect is seen from "Drivers" (0.207) on an unspecified construct, reflecting a medium effect size. Eco Design (ED) and Cooperation with Consumers (CC) have moderate effects on Practices (0.138 and 0.119 respectively). Other constructs like Green Manufacturing (GM), Green Purchasing (GP), and Internal Environment Management (IEM) show small effects on OP and Practices. Overall, the table highlights varied but mostly small-to-moderate contributions of constructs.

Factors	CC	ED	GDP	GM	GP	IEM	IR	OP	Practices	RL
CC								0.009	0.119	
ED								0.003	0.138	
GDP								0.008	0.036	
GM								0.022	0.029	
GP								0.001	0.058	
IEM								0.018	0.032	

IR								0.015	0.038	
OS										
Drivers								0.207		
RL								0.019	0.036	

4.5 Conclusion

This research aimed to examine the mediating role of managerial drivers in the relationship between Green Supply Chain Behaviour (GSCB) and Sustainable Business Performance within the industrial landscape of Delhi NCR. Using Structural Equation Modelling (SEM), the study provided empirical validation of how various green supply chain practices—such as eco-design, green purchasing, green manufacturing, green distribution and packaging, and reverse logistics—contribute to sustainability outcomes when supported by effective managerial mechanisms.

The findings revealed that while some GSCB dimensions exhibited limited direct impact on organizational sustainability, their indirect influence through key managerial drivers was statistically significant. Specifically, regulatory drivers, supplier collaboration, competitive pressures, and internal environmental management were identified as critical mediating forces that amplify the positive effects of green supply chain initiatives. Constructs such as eco-design and cooperation with consumers, though not significantly influencing sustainability on their own, gained relevance when managerial drivers were integrated into the model.

The model demonstrated strong reliability and validity with excellent model fit indices, explaining over 78% of the variance in organizational sustainability. These results highlight the importance of aligning green supply chain behaviours with strategic management practices to achieve enhanced environmental, economic, and social performance. Additionally, the study provides actionable insights for industry leaders and policymakers by emphasizing the role of leadership, regulatory alignment, and stakeholder engagement in fostering sustainable development.

Limitations

This study is limited to Delhi NCR industries, restricting generalizability. The cross-sectional design prevents assessment of long-term effects, and reliance on self-reported data may introduce response bias. Additionally, the focus on managerial drivers excludes other external factors that could influence green supply chain and sustainability relationships.

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