

The effects of environmental sustainability orientation on the sustainable performance, the mediating role of green supply chain management and moderating role of environmental collaboration: Evidence from Algeria

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ABSTRACT

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The purpose of this study is to investigate the direct effects of environmental sustainability orientation (ESO) on green supply chain management (GSCM), ESO on sustainable performance (SP), and GSCM on sustainable performance (SP). It also examines the indirect effect of GSCM on SP through the mediating role of GSCM. Moreover, it tests the moderating role of environmental collaboration (EC) between GSCM and SP. A total of 155 survey questionnaires were collected from firms with ISO 14000 certification in the manufacturing sector in Algeria. The gathered data was examined using (PLS-SEM) model. The findings showed positive effects between ESO, GSCM, and SP. However, no such effect was detected for the moderating role of environmental collaboration on the links between GSCM and SP. The limitation of this study was the use of only firms with ISO 14000 certification, so future studies should consider a wider range of firms and different scales. Regarding environmental problems, firms in Algeria can apply ESO and GSCM to achieve sustainable performance.

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1. Introduction

Businesses are under growing pressure to incorporate environmental goals into their operations as concerns about pollution, resource depletion, and climate change continue to rise. The negative environmental impacts of firms have emerged due to competition and poor practices aimed at achieving high performance without respecting environmental regulations (Biggi et al., 2023). Environmental sustainability orientation (ESO) has become an obligation and a strategic choice for firms to profit and remain in the market. Environmental sustainability advantage arises when a company utilizes input resources more efficiently in producing goods, while also striving to avoid waste and pollution generation, alongside minimizing resource depletion (Boeske & Murray, 2022). GSCM has become crucial, as demonstrated by Sony's 2001 incident: After cadmium, an environmentally hazardous material, was found in the company's game machine parts, 1.3 million of the manufactured equipment *was* retrieved, and the enormous losses were shifted to the business. As a result, collaboration in the green supply chain is of paramount importance (Lee & Joo, 2020). Businesses have been implementing GSCM techniques along with ESO to assist in reducing their negative environmental effects while enhancing business performance. GSCM can be a method to solve many problems for the firm, such as motivating stakeholders to adopt green practices, removing obstacles that stakeholders face in adopting green practices, and responding to customer requirements about the environment (Novitasari & Agustia, 2019). The firm seeks to collaborate with customers and monitor suppliers on environmental issues to achieve environmental collaboration, which can help the firm easily implement GSCM and achieve sustainable performance (SP) (Menon & Menon, 1997).

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By improving its SP, a company can satisfy present-day wants without jeopardizing the capacity of future generations to satisfy their own needs. With an eye toward the long term, SP aims to outperform competitors' above-average performance and establish a sustainable competitive edge (Sahoo et al., 2023). Algeria, like other developing countries, is going through environmental crises, and the issue of the environment, its protection, and preservation has become one of the most pressing issues. The state has developed indicators within the environmental dimension, the most important of which are the area of cultivated land, the area of forests, per capita freshwater supply, and air pollution rate. The government has also approved necessary laws to protect the terrestrial and marine environment. However, Algerian companies consider environmental issues only as a means of complying with legislation, not as a competitive factor. Therefore, the need to create and implement procedures that guarantee environmental performance (EP), ESO, and GSCM as part of an organization's daily operations is one of the biggest issues confronting these companies today. Moreover, there is a severe lack of studies that address the role of Algerian companies in moving towards environmental sustainability, green supply chains, and environmental performance. Therefore, this study aims to cover this void.

This research is the mediation of GSCM in the relationship between ESO and SP and if the mediation effect helps the firms to achieve SP through the environmental orientation approach; moreover; this study will test the moderation impact of the EC in the relationship between GSCM and SP, as shown in Fig. 1 as follows,

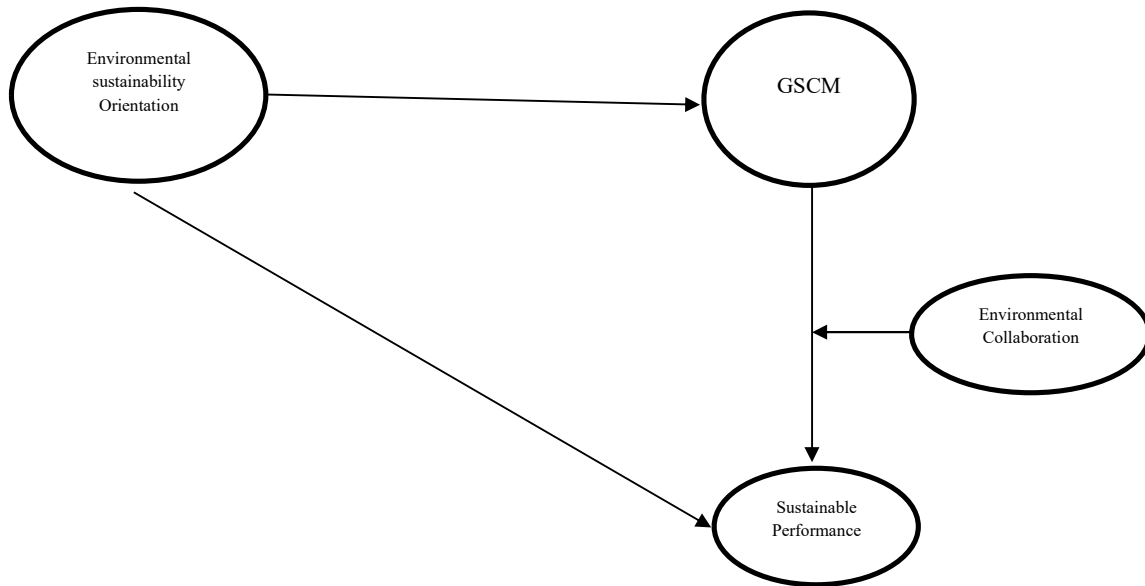


Fig. 1. The Conceptual Model

2. Literature Review

2.1. ESO

ESO can be described as a pro-environmental corporate culture or strategic orientation that represents a company's attitude toward operating sustainably (Chan 2010). Also, understanding the environment and the steps that are taken to reduce its negative impacts in favor of sustainable methods and more environmentally friendly behaviors. It is an approach for improving firm performance to boost public trust, productivity, cost efficiency, and market share (Hörisch et al., 2017). Environmentally conscious companies also do a better job of incorporating environmental factors into their corporate culture, operations, decision-making, and contacts with important stakeholders (Linnenluecke & Griffiths, 2010). Green values are being integrated into the firm's culture in response to a shift in traditional marketing strategies that compels companies to broaden their marketing scope to include social stakeholders and environmental conservation (Andrés et al., 2006).

By adopting sustainable practices, firms may eventually see cost savings. They may reduce their operating costs and boost their profitability by doing away with waste and conserving resources (Caldera et al., 2019). An additional benefit of being environmentally conscious for a business is that it will often have a better reputation. Customers, stakeholders, and other members of the public tend to think more favorably of companies that practice environmental responsibility. As consumers grow more conscious of the impact of their purchases on the environment, they are more likely to choose companies committed to sustainability (Afoakwa & Kemevor, 2023). Energy-efficient practices must be prioritized by environmentally conscious businesses to prioritize sustainability and reduce their environmental effects (Iqbal et al., 2021).

2.2. Green Supply Chain Management

GSCM refers to a supply chain that is adopted with “green” characteristics or environmental considerations, beginning with the firm selecting and purchasing resources from the suppliers, product design, and processing, and ending with the product

reaching customers (Choi et al., 2019). Also, the GSCM is the tasks of supply chain management that reduce wastes and pollution, improve ecosystem quality, and install new technologies without the negligence of environmental protection (Novitasari & Agustia, 2019). GSCM can be a strategy of differentiation in the markets; by getting a good reputation the firm earns a significant profit from paying attention to environmental protection (Abu Seman et al., 2019). According to Sakris (2012) integrating green practices in supply chain management is an important benefit, especially in the long term. Implementing green supply chain management practices may require organizations to collaborate closely with their suppliers to verify that they, too, are embracing sustainable practices. This partnership could be difficult, especially if suppliers are unwilling to invest in modern technology or procedures to improve SP (Saberri et al., 2019). The practices of GSCM; using recycled materials, and reducing the raw materials that can negatively affect the environment, this kind of practice will help the firm to lower the cost of production and will increase the profits of the company (Novitasari & Agustia, 2019). GSCM can help the company to improve its performance and increase its performance in the long term by achieving a sustainable competitive advantage based on a good reputation and based on natural resources (Choi & Hwang 2015).

2.3. Environmental Collaboration

EC is described as the company's environmental management procedures, like; eco-labeling of products manufactured, reducing wastes and pollution, the environmental audit of departments, and ISO 14001 certification. EC aims to reduce the negative effects of cooperation with stakeholders (Ahmed et al., 2020). Nowadays firms strive to coordinate with their suppliers in the environmental issues to be sure that the products that are given to the firm are environmentally friendly and created with green raw materials, and some firms obligate and monitor their suppliers for that (Rao & Holt 2005). In the context of intense competition, firms started to collaborate with customers not only to know their needs but also; to collaborate with customers on environmental issues (Ahmed et al., 2020). In terms of environmental goals, objectives, and initiatives, an organization's level of EC with its suppliers is measured in terms of how well the supplier supports the entrepreneurial firm in achieving its stakeholder and commercial goals. Increasing its EC with suppliers is how the company can best serve its stakeholders. By doing this, it may also serve to counteract the inclination to divert resources for profit-driven endeavors and promote environmental conservation (Bouguerra et al., 2023).

2.4. Sustainable Performance

SP is described as the combination of the environmental, social, and economic performances of a firm (Baumann & Genoulaz, 2020). With the rising competition between the firms; the goal of achieving a SP becomes very difficult. The perspective based on resources theory is used to clarify the effect of GSCM on firm SP (Cankaya & Sezen, 2019). A durable competitive advantage can be achieved by utilizing internal resources and competencies that are rare, indispensable, valuable, and non-substitutable. Hart (1995), argues that a firm can achieve a sustainable competitive advantage by the implementation strategies of product stewardship, pollution prevention, and sustainable development. The implementation of this kind of strategy in the firm can be a very important resource for achieving sustainable performance (Choi & Hwang, 2015). Manufacturing companies can cut back on harmful material use, water and solid waste, and hazardous air pollutants. Manufacturing companies' environmental performance will deteriorate if external green practices are not coordinated (Ahmed et al., 2020). The notion of firm performance pertains to the financial and operational efficacy and prosperity of the enterprise. It is a crucial sign of how well a company achieves its goals and objectives. The importance of business performance lies in its ability to evaluate a company's long-term sustainability and performance in the market (Afoakwah & Kemevor, 2023).

2.5 Hypnosis Development

One of the most contentious discussions about the repercussions of environmental policies has been whether these activities provide competitive benefits and possibilities (Andrés et al., 2006). Environmental sustainability orientation can take many forms, including the development of business environmental policies and procedures, the creation of sustainability reports, and employee environmental training (Chan & Ma, 2016). Some studies claim that environmental sustainability orientation hurts a company's competitiveness since environmental activities involve big upfront investments that can be difficult to recoup (Andrés et al., 2006). In recent years; the unethical behavior toward the environment increased the research about; how the investment in environmental issues can increase the performance of the firms, Hart provided a new perspective on enterprises based on their resource base, one that considers ecology as a source of sustainable competitive advantage. Hart asserted that incorporating environmental restrictions into an organization's management processes will enable it to develop resources and competencies that will help it compete more effectively. Based on the recent studies this study will search the effect of EO on the firm sustainable performance.

Hypothesis 1: *ESO has a positive influence on firm sustainable performance.*

According to organizational learning theory; internal environmental orientation's effect on GSCM is mostly ascribed to intra-organizational learning and information sharing among company members, Internal environmental orientation can be seen as an element of a company's basic principles and beliefs. Corporate CEOs are frequently the ones who start it because of their pro-environmental attitude (Chan et al., 2012). The institutional theory explains the influence of external environmental orientation the best. According to this theory, businesses must deal with a variety of restraints imposed by a variety of significant organizations. Managers who feel a strong need to respond to major stakeholders' environmental demands are more

likely to engage in pro-environmental efforts, according to this viewpoint. Managers who feel a strong need to respond to major stakeholders' environmental demands are more likely to engage in pro-environmental efforts, according to this viewpoint (e.g., GSCM) (Banerjee, 2001). Based on the recent studies this study will search the effect of ESO on the firm green supply chain management.

According to (Zaid et al., 2018), when a company is outwardly environmentally oriented, it is more likely to give environmental factors top priority during the supplier selection process. This implies that businesses are more inclined to choose suppliers that have proven their dedication to environmentally friendly activities and who have put in place environmental management systems. On the other hand, according to (Bastas & Liyanage, 2018), these suppliers have a history of minimizing their environmental effects using eco-friendly materials, recycling initiatives, and reducing energy consumption.

Hypothesis 2: *ESO has a positive effect on green supply chain management.*

The goal of Yu et al.'s (2017) study is to create and evaluate the GSCM and SP. Data from 126 Chinese automakers served as a sample for testing the suggested model. The findings imply that developing green cooperation with suppliers is considerably and favorably related to both environmental and operational performance and that green purchasing staff and green supplier selection have a major positive impact on green supplier collaboration.

According to (Çankaya & Sezen, 2019) studies, using green supply chain management techniques can boost suppliers' output. These are the green practices that improve businesses' performance. Businesses can handle the main performance of their organizations with the aid of GSCM.

The selection of suppliers is crucial in managing the businesses' operational performance. The sustainability performance of the companies is impacted by the environmental selection of their suppliers. Businesses can increase productivity and performance by carefully selecting their suppliers. It is essential to the company's operational effectiveness and the management of the green supply chain (Ahmed et al., 2020).

The study by (Govindan et al., 2020) found that supply chain management techniques are critical to raising company performance. The choice of the business supply chain is crucial for enhancing the organization's performance management and big data analytics. With the evidence of environmental selection of suppliers, business companies can improve the sustainable performance of the companies.

According to the study of (Dubey et al., 2020), businesses may ensure the efficient operation of their businesses and enhance sustainable practices with the use of green supply chain management. Organizational growth is positively impacted by the role of supplier sustainability in this regard. This is essential to the way the sustainable performance metrics used by the businesses are classified.

Hypothesis 3: *GSCM influences positively on the firm SP.*

The implementation of GSCM can be a very important way to the environmental sustainability orientation for the company; adapting the GSCM practices in the firm helps the firm, and these practices will directly to performance firm; by reducing the raw materials; using the recycling materials, and the most important this practices will gain a sustainable competitive advantage from the good reputation about the firm; that is a firm achieving her goals Without harming the environment; moreover by preserving the environment (Novitasari & Agustia, 2019). Nowadays firms work to achieve sustainable performance through the environmental orientation; in this orientation, the mediating role of GSCM between ESO and achieving a sustainable performance can be very helpful for the firms. This study offers the following hypothesis based on past research:

Hypotheses 4: *GSCM mediates the relationship between ESO and firm SP.*

The coordination theory is described as a set of ideas for coordinating the activity of several actors systematically to achieve any objective, according to the coordination theory the firm is composed from three general constituents; goals, resources, and actors (Ahmed et al. 2020). Crowston (1998) emphasizes that stakeholders in the firm face coordination challenges as a result of organizational relationships inside the firm, which limit the effectiveness and efficiency of process performance in the firm (Ahmed et al. 2020). Zhu et al. (2012) recommended that coordinating external and internal GSCM processes has resulted in better overall supply chain performance. internal and external coordination mechanisms in the GSCM by the monitoring of suppliers and the collaboration with the customers in the environmental issues can help the firms as a mechanism to the environmental collaboration to achieve sustainable performance based on the natural resource-based view (Ahmed et al. 2020). Based on the literature review's conclusions, the study will search for the moderating effect of EC between GSCM and FSP. The purpose of (Mishra et al.,2022) is to examine how environmental collaboration practices and environmental orientation contribute to the achievement of sustainable production and consumption objectives in the Indian automotive supply chain. The results highlight the strategic importance of a company working together with its internal divisions, customers, and suppliers to enhance supply chain performance.

Hypothesis 5: *EC moderates the relationship between GSCM and SP.*

3. Research Methodology

3.1. Sample and Data Collection

The study focused on the firms that work in the Algerian manufacturing industry; and because the research focused on exploring the mechanisms of environmental practices; we selected only the firms that have the ISO 14000 certification, to be sure that these firms apply environmental practices. A total of 250 copies of the survey questionnaire were distributed to general managers, managers, assistant managers, logistic managers, senior officers, or directors in these selected firms. A total of 180 copies of the survey questionnaire were collected, after the first control of the collected copies, we found only 155 copies were considered appropriate for data analysis. In this research; the partial least squares structural equation modelling (PLS-SEM) technique was used to examine the hypotheses. PLS is employed because of its capacity to predict outcomes and manage complex models. This method works well with small sample sizes and complex models (Hair Jr et al., 2014).

3.2. Measures

The study consisted of 4 variables: ESO, GSCM, environmental collaboration, and sustainable performance. The variables were measured by multiple items, and the scoring method was on a five-point Likert scale (1 to 5), where; 1 = Strongly disagree and 5 = strongly agree. The scales were developed by previous researchers shown in Table number 1:

Table 1
Sources of the variables from previous studies

N	Variable	Dimensions	N of Items	Source
1	Environmental sustainability orientation	Knowledge	6	Roxas, (2012)
		Practices	8	
		Commitment	4	
2	Green Supply Chain Management	Green Supply	5	Chengendzai and Muposhi, (2017)
		Green logistics	5	
		Green production	5	
3	Environmental collaboration	Environmental collaboration	6	Chengendzai and Muposhi, (2017)
		Operational performance	6	
4	Sustainable performance	Economic performance	5	Aktas, (2017)
		Environmental performance	6	

4. Results

4.1. Measurement Model

The PLS-SEM model was used as an analysis method to evaluate the measurement and the structural model. Table 2 shows the outer loading of the indicators for each latent variable.

Table 2
Constructs' outer loadings

Items	The outer loadings
Knowledge	
<i>We (managers/employees) are sufficiently informed on climate change and global warming.</i>	0.885
<i>We (managers/employees) are aware of the city's solid and liquid waste management issues.</i>	0.828
<i>We (managers/employees) are conscious of the problems with the city's drinking water sources.</i>	0.892
<i>We (managers/employees) are conscious of the problems with the city's electrical supply.</i>	0.761
<i>We (managers/employees) all know that corporations play a critical role in environmental conservation.</i>	0.799
<i>We (managers/employees) know that the city's government, commercial sector, and non-governmental organizations all have environmental protection programs.</i>	0.836
Practices	
<i>In our company, recycling of production waste is standard procedure.</i>	0.786
<i>In our company, we are taking steps to conserve water and power.</i>	0.825
<i>Employee training incorporates environmental awareness.</i>	0.892
<i>We participate in environmental activities voluntarily.</i>	0.818
<i>Our firm invests in manufacturing technology and machinery that have a low environmental impact.</i>	0.737
<i>We discuss environmental issues with our customers/buyers.</i>	0.803
<i>We only do business with environmentally conscious suppliers and/or distributors.</i>	0.821
<i>We design products and/or services with an eye toward their natural environmental impact.</i>	0.823
Commitment	
<i>We feel that environmental conservation is an important component of our business.</i>	0.757
<i>We understand that environmentally responsible production processes are beneficial to my company.</i>	0.913
<i>As a result of being environmentally responsible, the company wins more customers.</i>	0.910
<i>Because of our environmentally responsible production procedures, we are proud to do business in our neighborhood.</i>	0.862
Green Supply	
<i>Suppliers who have achieved ISO 14001 certification have been chosen.</i>	0.950
<i>Green goals can be achieved through collaboration with suppliers.</i>	0.761
<i>Green guidelines are available to vendors.</i>	0.757
<i>Second-tier suppliers' environmental issues are assessed.</i>	0.942
<i>Green audits of suppliers are being conducted.</i>	0.913

Table 2
Constructs' outer loadings (Continued)

Items	The outer loadings
Green logistics	
<i>Creating a company's alternative energy plans.</i>	0.797
<i>Vehicle emissions are being monitored.</i>	0.877
<i>Reusable packing materials and logistical containers are used.</i>	0.881
<i>Transportation waste recycling is being monitored.</i>	0.798
<i>Certifications for environmental management, lick the ISO14000 series.</i>	0.818
Green production	
<i>We (managers/employees) are working with Adequate technology competence.</i>	0.786
<i>We (managers/employees) are working in Compliance with regulations.</i>	0.978
<i>We (managers/employees) are working for environmental conservation.</i>	0.918
<i>We (managers/employees) are working for sustainable production processes.</i>	0.975
<i>We (managers/employees) are working for innovation.</i>	0.944
Environmental collaboration	
<i>Being informed about the actions taken by suppliers to lessen their environmental impact.</i>	0.881
<i>Environmental criteria for purchased inputs are communicated to suppliers.</i>	0.879
<i>Working with suppliers to develop solutions that will have a lower environmental impact.</i>	0.856
<i>Collaboration with customers on packaging reduction, reuse, and recycling.</i>	0.831
<i>Collaboration with customers to reduce energy consumption while travelling.</i>	0.818
<i>Collaboration with customers to develop solutions that lessen environmental effects.</i>	0.783
Operational performance	
<i>We (managers/employees) are working to increase the number of goods delivered on time.</i>	0.779
<i>We (managers/employees) are working to decrease inventory levels.</i>	0.762
<i>We (managers/employees) are working to decrease in scrap rate.</i>	0.784
<i>We (managers/employees) are working to increase product quality.</i>	0.865
<i>We (managers/employees) are working to increase the product lines.</i>	0.799
<i>We (managers/employees) are working to improve capacity utilization.</i>	0.818
Economic performance	
<i>We (managers/employees) are working to decrease the cost of materials purchasing.</i>	0.838
<i>We (managers/employees) are working to decrease the cost of energy consumption.</i>	0.830
<i>We (managers/employees) are working to reduce the cost of garbage treatment.</i>	0.849
<i>We (managers/employees) are working to reduce the garbage discharge fee.</i>	0.892
<i>We (managers/employees) are working to decrease fines for environmental accidents.</i>	0.886
Environmental performance	
<i>We (managers/employees) are working to the reduction of air emissions.</i>	0.788
<i>We (managers/employees) are working on the reduction of effluent waste.</i>	0.501
<i>We (managers/employees) are working on the reduction of solid waste.</i>	0.537
<i>We (managers/employees) are working on the reduce in the use of poisonous, dangerous, and hazardous products.</i>	0.800
<i>We (managers/employees) are working on reducing the number of environmental mishaps.</i>	0.906
<i>We (managers/employees) are working on the enhancement of the environmental status of a business.</i>	0.863

To assess the construct validity and reliability, composite reliability (CR) and Cronbach's alpha measures are used for internal consistency, Factor loadings and Average variance extracted (AVE) for convergent validity, and Fornell-Larcker criterion to assess the discriminant validity. Table 3 indicates that all values of Cronbach's Alpha and the values of composite reliability are above the threshold of 0.7 (Hair et al., 2019) indicating good construct reliability. For the convergent validity, AVE values are all above the threshold of 0.5 (Hair et al., 2019) along with the outer loadings that range between 0.737 and 0.950 above the suggested threshold of 0.708 (Hair et al., 2019) indicating a supported convergent validity.

Table 3
Construct's validity and reliability

	Cronbach's Alpha	rho A	CR	AVE
Knowledge	0.912	0.914	0.932	0.697
Environmental collaboration	0.947	0.950	0.956	0.730
Environmental performance	0.881	0.996	0.880	0.561
Economic performance	0.911	0.914	0.934	0.739
Operational performance	0.888	0.889	0.915	0.643
Commitment	0.883	0.889	0.921	0.745
Practices	0.927	0.929	0.940	0.663
Green logistics	0.892	0.899	0.920	0.697
Green Supply	0.918	0.960	0.938	0.755
Green production	0.955	0.956	0.966	0.852

Discriminant validity was also supported by the Fornell-Larcker criterion, indicating that all square roots of the Average variance extracted (AVE) of each latent variable are higher than its highest correlation with another latent variable.

Table 4
Fornell-Larcker criterion

	Knowledge	Environmental collaboration	EnvP	EcoP	OpeP	Commit	Pract	GL	GS	GP
Knowledge	0.835									
Environmental collaboration	0.457	0.854								
Environmental performance	0.041	0.345	0.749							
Economic performance	0.823	0.525	0.073	0.859						
Operational performance	0.774	0.686	0.206	0.864	0.802					
Commitment	0.585	0.769	0.115	0.616	0.696	0.863				
Practices	0.586	0.779	0.192	0.730	0.864	0.799	0.814			
Green logistics	0.112	0.436	0.470	0.188	0.351	0.291	0.429	0.835		
Green Supply	0.771	0.409	0.274	0.666	0.677	0.412	0.430	0.141	0.869	
Green production	0.071	0.301	0.476	0.103	0.231	0.043	0.157	0.476	0.159	0.923

4.2. Structural Model

The structural model's evaluation and the test of the proposed hypotheses were carried out by using regression and mediation analyses. Table 5 reports causal relationships among the constructs, using the measures of regression weights β , significance level (P-values), and coefficient of determination (R²).

Table 5
Regression Paths

	β	P Values	Description
ESO → Sustainable performance	0.909	0.000	Significantly Positive
ESO → GSCM	0.515	0.000	Significantly Positive
GSCM → Sustainable performance	0.240	0.000	Significantly Positive

All the causal relationships showed positive significant regression paths, indicating the significant effect of environmental sustainability orientation on sustainable performance ($\beta=0.909$, $p<0.001$), the significant positive effect of ESO on GSCM ($\beta=0.515$, $p<0.001$), and the significant effect of GSCM on sustainable performance ($\beta=0.240$, $p<0.001$) confirming the first, the second and the third hypotheses (H1, H2, and H3 respectively).

4.3. Mediation

Table 6
Mediation analysis

	Std.	Confidence Interval (Bias Corrected)		P Values	Description
		Lower level (LL) 2.5%	Upper level (UL) 97.5%		
ESO----GSCM---- Sustainable Performance	0.124	0.069	0.199	0.000	Significantly Positive

To assessment of the mediation effect is done by the bootstrapping analysis. Table 5 shows a significant indirect effect with $b = 0.124$ and $p < 0.001$. The indirect effect 95% confidence interval bias-corrected [LL = 0.069, UL = 0.199] does not cross the value of 0, indicating the existence of a significant mediation.

4.4. Moderation

Table 6
Moderation analysis

	Std.	Confidence Interval (Bias Corrected)		P Values	Description
		Lower level (LL) 2.5%	Upper level (UL) 97.5%		
Moderating Effect → Sustainable Performance	-0.058	-0.133	0.022	0.158	Not significant

The results in Table 6 showed a non-moderation effect of CI in the relation between ESO and sustainable performance ($\beta = -0.058$, $p = .158$). These findings show no support for the fifth hypothesis H5.

5. Discussion and Conclusion

GSCM has been developed for manufacturing firms as an important corporate environmental strategy under environmental pressures (Zhu et al., 2012). The main purpose of this study is to understand if *adopting* green practices through the ESO will affect the GSCM and SP by examining the relationship between ESO, GSCM, sustainable performance, and the moderation effect of EC. The results showed that ESO has a clear positive influence on SP, with a regression weight of $\beta = 0.909$ and p -value < 0.000 . This means that firms with enough knowledge about environmental issues and a commitment to adopting environmental practices as daily routines will achieve SP, as these daily environmental practices will affect the three elements of SP: operational performance, economic performance, and environmental performance.

The results showed a significant positive direct effect of ESO on firm GSCM, with a regression weight of $\beta = 0.515$ and p-value < 0.000 . This means that firms with enough knowledge about environmental issues and a commitment to adopting environmental practices as daily routines will help them achieve GSCM.

Furthermore, the results showed that GSCM has a direct positive influence on SP, with a regression weight of $\beta = 0.240$ and p-value < 0.000 . This means that firms respecting environmental obligations by selecting suppliers who respect environmental issues in their processes will achieve sustainable performance through positive effects on operational performance, economic performance, and sustainable performance. This finding is consistent with the research of Cankaya and Sezen (2019), Sarwar et al. (2020), and Firmansyah et al. (2021), but differs from Novitasari and Agustia (2021), who found that GSCM did not affect firm performance. For the fourth hypothesis, the results showed a significant indirect effect with $b=0.124$ and $p<0.001$. This means that GSCM mediates the relationship between ESO and SP. For the fifth hypothesis, the outcomes demonstrated a non-moderation effect of environmental collaboration on the relation between GSCM and sustainable performance, with a regression weight of $\beta = -0.058$ and p-value = 0.158. This means that environmental collaboration has no significant effect on the relationship between GSCM and sustainable performance. Despite the interesting findings and their concordance with past research, some limitations need to be highlighted. First, this study was not done on a representative sample of the country as a whole, so the research findings are restricted to the scope of the study. Future studies require more research on environmental issues, as these kinds of studies present a deep comprehension of the importance of adopting environmental practices in firms and may yield interesting results by examining the model in some sectors known for their negative environmental effects, such as the petrochemical or mineral exploration sectors. This model may also be investigated in depth through other scales that reduce the number of questions in the survey and focus on specific sectors.

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References

- Ahmed, W., Ashraf, M. S., Khan, S. A., Kusi-Sarpong, S., Arhin, F. K., Kusi-Sarpong, H., & Najmi, A. (2020). Analyzing the impact of environmental collaboration among supply chain stakeholders on a firm's sustainable performance. *Operations Management Research*, 13, 4-21.
- Afoakwa, E.A., & Kemevor, H. (2023). A literature review on the effect of environmental orientation on firm performance, mediating factor of green supply chain management and electronic transaction levy. *Journal of Environmental Science and Economics*, 2(3), 59–85. <https://doi.org/10.56556/jescae.v2i3.627>
- Banerjee, S. B. (2002). Corporate environmentalism: the construct and its measurement. *Journal of Business Research*, 55(3), 177–191.
- Bastas, A., & Liyanage, K. (2018). Sustainable supply chain quality management: A systematic review. *Journal of Cleaner Production*, 181, 726–744. <https://doi.org/10.1016/j.jclepro.2018.01.110>
- Biggi, G., Mina, A., & Tamagni, F. (2023). *There are different shades of green: heterogeneous environmental innovations and their effects on firm performance*. 1–26. <http://arxiv.org/abs/2310.08353>
- Bouguerra, A., Hughes, M., Cakir, M. S., & Tatoglu, E. (2023). Linking Entrepreneurial Orientation to Environmental Collaboration: A Stakeholder Theory and Evidence from Multinational Companies in an Emerging Market. *British Journal of Management*, 34(1), 487–511. <https://doi.org/10.1111/1467-8551.12590>
- Caldera, H. T. S., Desha, C., & Dawes, L. (2019). Evaluating the enablers and barriers for successful implementation of sustainable business practice in 'lean' SMEs. *Journal of Cleaner Production*, 218, 575–590. <https://doi.org/10.1016/j.jclepro.2019.01.239>
- Chan, R. Y. K. (2010). Corporate environmentalism is pursued by foreign firms competing in China. *Journal of World Business*, 45(1), 80–92.
- Chan, R. Y., & Ma, K. H. (2016). Environmental orientation of exporting SMEs from an emerging economy: Its antecedents and consequences. *Management International Review*, 56(5), 597-632.
- Chan, R. Y., He, H., Chan, H. K., & Wang, W. Y. (2012). Environmental orientation and corporate performance: The mediation mechanism of green supply chain management and the moderating effect of competitive intensity. *Industrial Marketing Management*, 41(4), 621-630.
- Choi, D., & Hwang, T. (2015). The Impact of Green Supply Chain Management Practices on Firm Performance: The Role of Collaborative Capability. *Operations Management Research*, 8(3-4), 69-83.
- Choi, T. M., Cai, Y. J., & Shen, B. (2019). Sustainable Fashion Supply Chain Management: A System of Systems Analysis. *IEEE Transactions on Engineering Management*, 66(4), 730–745. <https://doi.org/10.1109/TEM.2018.2857831>
- Dubey, R., Gunasekaran, A., Childe, S. J., Bryde, D. J., Giannakis, M., Foropon, C., Roubaud, D., & Hazen, B. T. (2020). Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations. *International Journal of Production Economics*, 226, 107599. <https://doi.org/10.1016/j.ijpe.2019.107599>
- Govindan, K., Rajeev, A., Padhi, S. S., & Pati, R. K. (2020). Supply chain sustainability and performance of firms: A meta-analysis of the literature. *Transportation Research Part E: Logistics and Transportation Review*, 137(March), 101923. <https://doi.org/10.1016/j.tre.2020.101923>
- Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review*, 20(4), 986-1014.

- Hörisch, J., Kollat, J., & Brieger, S. A. (2017). What influences environmental entrepreneurship? A multilevel analysis of the determinants of entrepreneurs' environmental orientation. *Small Business Economics*, 48(1), 47–69. <https://doi.org/10.1007/s11187-016-9765-2>
- Iqbal, N., Abbasi, K. R., Shinwari, R., Guangcai, W., Ahmad, M., & Tang, K. (2021). Does exports diversification and environmental innovation achieve carbon neutrality target of OECD economies? *Journal of Environmental Management*, 291(February), 112648. <https://doi.org/10.1016/j.jenvman.2021.112648>
- Lee, J., & Joo, H. Y. (2020). The impact of top management's support on the collaboration of green supply chain participants and environmental performance. *Sustainability (Switzerland)*, 12(21), 1–20. <https://doi.org/10.3390/su12219090>
- Linnenluecke, M., & Griffiths, A. (2010). Corporate sustainability and organizational culture. *Journal of World Business*, 45(4), 357–366.
- Novitasari, M., & Agustia, D. (2021). Green supply chain management and firm performance: The mediating effect of green innovation. *Journal of Industrial Engineering and Management*, 14(2), 391-403.
- Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations and Production Management*, 25(9), 898–916.
- Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117–2135. <https://doi.org/10.1080/00207543.2018.1533261>
- Sahoo, S., Upadhyay, A., & Kumar, A. (2023). Circular economy practices and environmental performance: Analysing the role of big data analytics capability and responsible research and innovation. *Business Strategy and the Environment*, 32(8), 6029–6046. <https://doi.org/10.1002/bse.3471>
- Seman, N. A. A., Govindan, K., Mardani, A., Zakuan, N., Saman, M. Z. M., Hooker, R. E., & Ozkul, S. (2019). The mediating effect of green innovation on the relationship between green supply chain management and environmental performance. *Journal of Cleaner Production*, 229, 115-127.
- Yildiz Çankaya, S., & Sezen, B. (2019). Effects of green supply chain management practices on sustainability performance. *Journal of Manufacturing Technology Management*, 30(1), 98–121. <https://doi.org/10.1108/JMTM-03-2018-0099>
- Yu, W., Chavez, R., & Feng, M. (2017). Green supply management and performance: a resource-based view. *Production Planning and Control*, 28(6–8), 659–670. <https://doi.org/10.1080/09537287.2017.1309708>
- Zaid, A. A., Jaaron, A. A. M., & Talib Bon, A. (2018). The impact of green human resource management and green supply chain management practices on sustainable performance: An empirical study. *Journal of Cleaner Production*, 204, 965–979. <https://doi.org/10.1016/j.jclepro.2018.09.062>
- Zhu, Q., Sarkis, J., & Lai, K.H. (2012). Examining the effects of green supply chain management practices and their mediations on performance improvements. *International Journal of Production Research*, 50(5), 1377–1394.



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