Original Paper

Sustainable performance of bottled water firms in Ethiopia:

The role of green supply chain management

Geda Jebel Ababulgu, Zerihun A. Birbirsa, Misganu Getahun Wodajo

Received: 20 November 2023 | **Accepted:** 1 February 2024 | **Published:** 10 February 2024

Keywords: green supply chain management (GSCM); sustainable performance; environmental sustainability; economic performance; bottled water manufacturing; Ethiopia.

Abstract. *Due to growing awareness of the negative environmental effects associated with the bottled water industry, there is increased pressure from customers, the government, and stakeholders for firms to adopt green supply chain management (GSCM) practices. These practices aim to minimize environmental consequences while enhancing social and economic*

performance. However, GSCM and sustainable development are still in their early stages of practice, particularly in Ethiopia where research investigations are limited. This study examines the impact of GSCM practices on environmental, economic, and social performance in the bottled water manufacturing industry in Ethiopia. A survey of 323 managers reveals that GSCM practices have a positive impact on all three dimensions of sustainability performance: environmental, social, and economic. However, the specific impact of each practice varies. All five GSCM practices improve the environmental performance of firms. Some practices also improve other dimensions of sustainability performance. For example, internal environmental management and cooperation with customers significantly improve social performance, but not economic performance. On the other hand, investment recovery improves economic performance. However, eco-design and green purchasing do not have a significant impact on economic or social performance. The findings of this study have theoretical implications and practical insights regarding sustainable performance for managers.

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1. Introduction

The food and beverage industry in Ethiopia plays a significant role in the country's economy, contributing 20.7% to overall manufactured exports, surpassing well-established industries like apparel, leather, and footwear (UNIDO, 2020). The bottled water market is the fastest growing and most dynamic sector within the food and beverage industry. However, despite its growth and contribution to the economy, it is also major source of environmental pollution and deterioration (Ensermu, 2014). To address this issue while achieving economic goals, it is increasingly important to implement environmentally friendly operations (Ghosh et al., 2022a), such as green supply chain management (GSCM), which integrates environmental considerations into supply chain management practices (Assumpçao et al., 2022). In recent decades, GSCM practices have become a top priority for business organizations due to regulatory pressure, market-based pressure, and stakeholder' requirements to address environmental, social, and economic concerns (Huang & Huang, 2021). Numerous studies have investigated the potential outcomes of GSCM practices

and found that they positively affect firms' environmental performance (García Alcaraz et al., 2022; Pinto, 2020), economic performance (Akhtar, 2019; Cousins et al., 2019; Pinto, 2020), and social performance (Han & Huo, 2020; Le, 2020). However, some studies have failed to establish a significant relationship between GSCM practices and firms' economic performance (Abdul-Rashid et al., 2017; Laari et al., 2017; Petljak et al., 2018), leading to inconclusive results. Further research is needed (Nguyen & Adomako, 2021) to determine the conditions under which the relationship can be significant.

The unique environmental challenges faced by the bottled water industry, involving pollution and deterioration, highlight the pressing need for the implementation of sustainable practices. Bottled water firms in Ethiopia face an increasing demand for compliance with GSCM practices from customers, the government, and other stakeholders to prevent environmental impacts and improve social and economic performance. This study contributes to the literature in several ways. First, it provides empirical insights into GSCM practices in developing countries, where they are still not mature. Second, it integrates resource-based views and a triple bottom-line perspective to fill a gap in the research on GSCM in Ethiopia. Third, it examines the relationship between GSCM practices and integrated sustainable performance, including environmental, economic, and social dimensions. The rest of the paper is structured as follows. Section 2 presents the theoretical background and conceptual framework, defining the relationship between GSCM practices and sustainable performance of the firm. Section 3 outlines the research methodology used and section 4 presents the empirical approach used to validate the model and the main results. The final section discusses the key findings and conclusions.

2. Literature review

2.1 Theoretical background

Several theories have been used to study GSCM practices and their relationship to performance, including the resource-based view (RBV) theory, transaction-cost theory, institutional theory, and stakeholder theory (Liu et al., 2018; Touboulic & Walker, 2015). However, as the main aim of this study is to investigate the sustainability performance outcomes of GSCM practices, only the resource-based view (RBV) theory and Triple Bottom Line (TBL) perspective were considered as its theoretical underpinnings. The RBV theory was preferred to explain how firm GSCM practices affect sustainable performance, as opposed to stakeholder theory and institutional theory, which have been widely used to

investigate the motivations and drivers for the adoption of GSCM practices. The TBL approach was used to understand how firms integrate sustainability practices into the entire supply chain, from sourcing raw materials to product disposal, to achieve economic, environmental, and social performance.

The RBV theory suggests that developing and leveraging unique internal resources and capabilities such as GSCM practices, environmental management systems, and green technologies allows a company to achieve a sustainable competitive advantage (Barney, 1991). For this advantage to be sustained, a firm's resources must be valuable, rare, inimitable, and non-substitutable (VRIN) (Barney et al., 2021). For instance, competitors find it difficult to replicate the positive public image a company has built via the proper implementation of GSCM practices (Cankaya & Sezen, 2019). Furthermore, the environmental and economic performance of a company has also been shown to be significantly related to its internal green practices (Raza et al., 2021). Therefore, the RBV is useful for understanding how GSCM practices contribute to firm's sustainable performance.

Although not a theory per se, another relevant concept is the Triple Bottom Line (TBL), which focuses on the need for firms to consider not only economic viability but also environmental and social dimensions when making supply chain decisions such as GSCM practices (Longoni & Cagliano, 2018; Yee et al., 2021). While a staggering number of studies have been conducted to evaluate the performance of sustainable supply chains using the TBL approach (Lopes de Sousa Jabbour et al., 2017), the major emphasis has been on individual TBL dimensions rather than all three integrated TBL dimensions (Touboulic & Walker, 2015; Tseng et al., 2019). Therefore, based on the Triple Bottom Line (TBL) concept, this study argues that the implementation of GSCM practices can be considered to achieve TBL (environmental, economic, and social). For example, GSCM practices that contribute to reducing waste are thought to result in improvements in the environmental bottom line, while GSCM practices that improve working conditions and the welfare of the surrounding community are thought to result in social performance (Saeed & Kersten, 2019; Yee et al., 2021). In general, this study argues that the availability of unique resources and capabilities, as well as the commitment to successfully execute them, are considered crucial to improving the sustainable performance of firms. Additionally, the demand of the firm to maintain a competitive advantage and align their green supply chain practices accordingly would significantly affect their sustainable supply chain performance.

2.2 Conceptual framework and hypothesis development

This study integrates the five most commonly used GSCM practices based on RBV theory and sustainable performance based on the TBL concept to build a comprehensive holistic model in an attempt to address the gap in previous studies. Building on previous studies, Figure 1 shows the conceptual framework of the study, where the arrows moving from the five GSCM practices to each sustainable performance dimension indicate the five specific hypotheses related to each performance outcome.

2.2.1 Green supply chain management (GSCM) practices and firms' environmental performance

GSCM practices have been shown to improve environmental performance (Ma et al., 2022; Vijayvargy & Sahoo, 2021). For instance, Petljak et al. (2018) stated that green purchasing and cooperation with customers are components of GSCM practices that are thought to improve environmental sustainability. Additionally, Micheli et al. (2020) and Pinto (2020) found that companies that cooperate with customers to implement GSCM practices tend to have improved environmental performance, while Cankaya & Sezen (2019) and Younis et al. (2019) argued that investment recovery practices can help companies improve environmental sustainability. Furthermore, eco-design and internal environmental management practices significantly influence the environmental performance of a firm (Namagembe et al., 2019). The available study evidence shows that GSCM practices help companies minimize their environmental impact and perform better in terms of environmental performance. However, it is important to note that the relationship between GSCM practices and environmental impact is not always direct and can be influenced by several contextual factors (Zhu et al., 2008). Therefore, we hypothesized,

H_{1a}: Internal environmental management has a significant positive effect on firm environmental performance.

H_{1b}: Eco-design has a significant positive effect on firm environmental performance.

H_{1c}: Green purchasing has a significant positive effect on firm environmental performance.

H_{1d}: Cooperation with customers has a significant positive effect on firm environmental performance.

H_{1e}: Investment recovery has a significant positive effect on firm environmental performance.

2.2.2 Green supply chain management (GSCM) practices and firms' economic performance

Green supply chain management (GSCM) practices have been linked to improved economic performance for firms (Huang & Huang, 2021)—,reducing costs (e.g., energy, waste, and material inputs), enhancing brand recognition, and increasing market share (Sarwar et al., 2021). For example, green purchasing can help firms save money on energy and waste disposal costs (Taghavi et al., 2021). A study by Ma et al. (2022) also indicates that implementing GSCM practices can improve the environmental and financial performance of pesticide firms in Pakistan and recommends further studies in other countries and sectors to increase the generalizability of the findings. However, some GSCM practices can have a negative effect on economic performance in the short term, such as increased production costs (Cousins et al., 2019). Despite inconclusive findings (Fang & Zhang, 2018), most empirical studies show that effective GSCM practices are imperative for a firm's economic sustainability. Hence, this study aims to evaluate this relationship in different settings—a developing country and an industry with high economic and environmental impact—the bottled water manufacturing industry—to obtain an improved understanding. Therefore, we formulate the following hypotheses:

H_{2a}: Internal environmental management has a significant positive effect on firm economic performance.

H_{2b}: Eco-design has a significant positive effect on firm economic performance.

H_{2c}: Green purchasing has a significant positive effect on firm economic performance.

H_{2d}: Cooperation with customers has a significant positive effect on firm economic performance.

H_{2e}: Investment recovery has a significant positive effect on firm economic performance.

2.2.3 Green supply chain management (GSCM) practices and firm social performance

The concept of social performance pertains to the evaluation of the effects that firm practices have on its customers, employees, and the community at large (Cankaya & Sezen, 2019; Sarwar et al., 2021). Firms with high social performance has the potential to enhance healthcare facilities, employment opportunities, and business opportunities within local communities (Das, 2018). Scholarly literature

indicates that GSCM practices have a positive influence on social performance. For instance, Micheli et al. (2020) found that firms that embraced GSCM practices exhibits improved working conditions, increased wages, and reduced environmental impacts. Awan (2019) also suggests that organisations that effectively adopt GSCM practices have lower staff turnover, increased employee satisfaction, and improved customer satisfaction. Although there is a wealth of research on the relationship between GSCM practices and environmental, economic, and operational performance, few studies have explicitly examined the social dimension of sustainable performance (Baah et al., 2021; Jia et al., 2020; Micheli et al., 2020). Hence, this research posits that an in-depth examination of the influence of GSCM practices necessitates consideration of all three aspects of sustainable performance. Accordingly, the following hypotheses are developed:

H_{3a}: Internal environmental management has a significant positive effect on firm social performance.

H_{3b}: Eco-design has a significant positive effect on firm social performance.

H_{3c}: Green purchasing has a significant positive effect on firm social performance.

H_{3d}: Cooperation with customers has a significant positive effect on firm social performance.

H_{3e}: Investment recovery has a significant positive effect on firm social performance.

3. Material and methods

3.1 Target population and sampling procedure

This study targeted a population of 134 bottled water factories in Ethiopia. The bottled water manufacturing industry in Ethiopia was selected as the focus of this study due to its significant growth and contribution to the country's economy, as well as the environmental challenges it faces. While the specific industry choice may limit the generalizability of the findings, we believe that the adoption of green supply chain management (GSCM) practices and their impact on sustainable performance are relevant topics that can provide insights for other industries and countries. To ensure a representative sample, 99 firms were selected using a non-probability purposive sampling technique. Individual respondents from each company were selected from various relevant

departments, such as operations, purchasing, plant management, quality control, supply chain, and logistics. For the structural equation model (SEM) analysis, a sample size of 177 respondent was suggested. This was based on a 0.3 effect size, a 0.05 probability, a 0.8 statistical power level, eight latent variables, and 32 observed variables (Soper, 2022). However, to minimize bias and subjectivity when assessing multiple interrelated green supply chain management (GSCM) practices and their outcomes, the study aimed to gather responses from five respondents per bottled water manufacturing firm. Consequently, 495 questionnaires were distributed to managers across the participating companies. Through consistent follow-up efforts, 323 complete and usable responses were collected, resulting in a response rate of 65%.

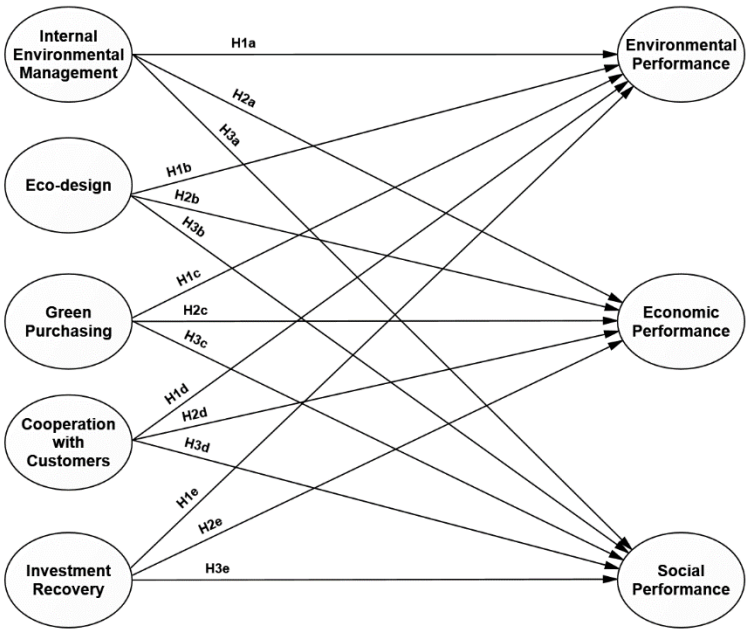

Figure 1. Conceptual framework and hypotheses

3.2 Measurement scale

The firm's GSCM practices were measured using a set of twenty-one items adapted from Zhu et al. (2008), to ensure consistency with established measurement scales widely accepted and used in the literature. Similarly, environmental and economic performance was adapted from Zhu et al. (2008), and social performance was measured using five items adapted from Paulraj (2011). The adaptation process involved careful consideration of the original items and making minor adjustments to the wording or context of some items to ensure their appropriateness for Ethiopian bottled water manufacturing industry context. All constructs were measured using at least three items on a five-point Likert scale (1 = not at all, 2 = to a small extent, 3 = to a moderate extent, 4 = to a great extent, and 5 = to a very great extent).

3.3 Questionnaire validation tests and quality checks

An initial questionnaire draft was refined through pre-testing with academics and practitioners in supply chain management, ensuring accuracy, content validity, and alignment with the study context. A pilot test with 50 potential respondents further improved the questionnaire by aligning it with the specific context of the study. KMO and Bartlett's test confirmed the suitability of the data for factor analysis. Exploratory factor analysis (EFA) identified a clear underlying structure, revealing eight latent factors accounting for 62.12% of the total variance. Five items were excluded due to low factor loadings or cross-loadings. All eight latent constructs demonstrated good reliability, with Cronbach's alpha coefficients ranging from 0.777 to 0.962. Our results further suggest that common method bias is unlikely to have significantly influenced our findings. Overall, the results of the validation tests and quality checks (see Appendix A for detailed technical information) support the sound psychometric properties of the research instrument.

4. Data Analysis

The study used structural equation modelling (SEM) to simultaneously test and estimate statistical relationships among multiple latent constructs as well as the hypotheses put forth in the model (Dash & Paul, 2021; Sarstedt et al., 2022). This study used covariance-based structural equation modelling (CB-SEM), which is more appropriate for theory testing and confirmation of latent construct relationships (Hair Jr. et al., 2017), more robust to SEM assumption violations

(Kline, 2016), and more widely used in studies of GSCM practices (Dash & Paul, 2021). Data analysis was performed using SPSS version 26 and AMOS 24.

4.1 Measurement Model

Confirmatory factor analysis confirmed the well-defined structure of our measurement model, revealing distinct and reliable constructs. For each construct, strong internal consistency (CR and MaxR (H) > 0.7) and convergent validity (AVE > 0.5) were confirmed (see Table 2 of Appendix B for full results). Furthermore, discriminant validity tests ensured the constructs were distinct, with all HTMT values falling below the 0.85 cut-off (refer to Table 3 in Appendix B). The model had a great fit to the data, and it went beyond the recommended criteria for several fit indices (see Table 4 in Appendix B for details). This robust and well-fitting measurement model lays a strong foundation for the exploration of our research hypotheses using the structural equation model.

4.2 Structural model

We used structural equation model (SEM) analyses to find out how statistically significant the links were between GSCM practices, environmental management, economic performance, and social performance. The significance level accepted for this study was set at $p < 0.05$, indicating statistical significance. The results of our analysis, as shown in Table 5 and Figure 2, indicate a significant impact that all five GSCM practices have on environmental performance. Additionally, these practices also have an impact on at least one other performance dimensions like economic or social performance. We found that internal environmental management has an influence on both environmental performance (β =.230 p =.001) and social performance (β =.150 p =.019), supporting hypotheses H_{1a} and H_{3a}. However, it did not have an impact on economic performance (β =.004, p =.950), which refutes hypothesis H_{2a}. Furthermore, our findings reveal that companies' cooperation with customers significantly improve both environmental performance (β =.138, p =.034) and social performance (β =.161, p =.012), providing support for hypotheses H_{1d} and H_{3d}. However, we did not find a significant relationship between companies' cooperation with customers and economic performance; thus, hypothesis H_{2d} was not supported.

The findings of the study indicate that investment recovery had an influence on both environmental performance (β =.169, p =.012) and economic performance (β =.199, p =.005). However, there was no impact observed on social performance (β =.017, p =.794). As a result, these outcomes support hypotheses H_{1e} and H_{2e} while contradicting H_{3e}. Moreover, eco-design and green purchasing

also had significant positive impacts on environmental performance (β =.139, p =.031, and β =.138, p =.020, respectively), but no significant impact on economic (β =.059, p =.366, and β =.058, p =.336, respectively), or social performance (β =-.073, p =.239, and β =.020, p =.725, respectively). Therefore, hypotheses H_{1b} and H_{1c} are supported, while hypotheses H_{2b}, H_{2c}, H_{3b}, and H_{3c} are not supported.

Hypothesized Relationship			Estimate	S.E.	C.R.	P-values
H1c	***Environmental performance***	***<--- Green purchasing***	***.138***	***.044***	***2.319***	***.020***
H2c	Economic performance	<--- Green purchasing	.058	.040	.962	.336
H3c	Social performance	<--- Green purchasing	.020	.043	.352	.725
H1a	***Environmental performance***	***<--- Internal environmental mgmt.***	***.230***	***.048***	***3.388***	***
H2a	Economic performance	<--- Internal environmental mgmt.	-.004	.042	-.063	.950
H3a	***Social performance***	***<--- Internal environmental mgmt.***	***.150***	***.047***	***2.354***	***.019***
H1d	***Environmental performance***	***<--- Cooperation with customers***	***.138***	***.070***	***2.115***	***.034***
H2d	Economic performance	<--- Cooperation with customers	.048	.064	.733	.464
H3d	***Social performance***	***<--- Cooperation with customers***	***.161***	***.070***	***2.522***	***.012***
H1e	***Environmental performance***	***<--- Investment recovery***	***.169***	***.059***	***2.511***	***.012***
H2e	***Economic performance***	***<--- Investment recovery***	***.199***	***.056***	***2.820***	***.005***
H3e	Social performance	<--- Investment recovery	.017	.058	.261	.794
H3b	Social performance	<--- Eco-design	-.073	.062	-1.179	.239
H2b	Economic performance	<--- Eco-design	.059	.058	.904	.366
H1b	***Environmental performance***	***<--- Eco-design***	***.139***	***.063***	***2.151***	***.031***

Table 5. Path estimates for structural model

5 Discussion and Conclusions

This study sheds light on the relationship between GSCM practices and sustainable performance in the context of bottled water manufacturing companies in Ethiopia. The findings indicate that all five GSCM practices have a significant positive effect on environmental performance, which corroborates previous research (Sahoo & Vijayvargy, 2020; Samad et al., 2021; Sarwar et al., 2021). This result supports the theory of Resource-Based View (RBV) which suggests that firms can improve their environmental performance by leveraging their unique internal resources and capabilities related to environmental sustainability. However, except investment recovery practices, none of the GSCM practices have a significant effect on economic performance. This result is inconsistent with some previous studies suggesting that GSCM practices lead to better economic performance (Ahmad et al., 2022; Altaf et al., 2020; Rehman Khan & Yu, 2021). However, a few other researchers have also found a mixed

or non-relationship between GSCM practices and economic performance (Agyabeng-Mensah et al., 2020; Fang & Zhang, 2018; Pinto, 2020; Saeed & Kersten, 2019). These results contradict the RBV theory, which posits that firms' internal unique resources sustain performance (Hart, 1995). The findings of this study indicate that some GSCM practices do not directly determine economic performance (Sahoo and Vijayvargy, 2020). Possible reasons for the inconsistent results may be attributed to different contextual factors, such as the size of the company, market conditions, the regulatory environment, and the characteristics of the industry in which the company operates. For example, according to Saeed & Kersten (2019), the impact of GSCM practices on economic performance varies based on the development level of the country in which the firm operates and the size of the firm, with stronger impact for firms in developed countries and larger firms than for firms in developing countries and smaller firms.

The SEM analysis also showed that only two GSCM practices - cooperation with customers and internal environmental management - have a positive effect on social performance. This corroborates previous research that found GSCM practices can lead to better social performance (Abdullah et al., 2020; Cankaya & Sezen, 2019; Geng et al., 2017). These findings illustrate the potential of GSCM practices to improve customer satisfaction, invest in social projects, enhance relations with community stakeholders, provide employee training and education, and improve employee health and safety. The present study provides additional insights into the positive effects of investment recovery practices on environmental and economic performance. This finding is consistent with prior research (Cankaya & Sezen, 2019; Fang & Zhang, 2018). The findings indicate that investments targeted towards enhancing the environment have the potential to generate economic benefits, hence supporting the case for adopting green practices in business supply chains. Nevertheless, it is important to note that the lack of a significant influence on social performance stands in contrast to findings from prior research (Abdullah et al., 2020; Younis et al., 2016). Further investigation is warranted to explore the complex relationship between investment recovery and social performance.

The implementation of eco-design and green purchasing practices has no significant impact on economic or social performance, which is inconsistent with previous research (Abdullah et al., 2020; Ahmad et al., 2022). Eco-design and green purchasing practices, which often require cooperation and coordination among suppliers and partners in the supply chain may not directly translate into economic and social performance if suppliers are difficult to identify, engage with, or manage. In conclusion, in response to (Liu et al., 2020), who called for

more real-world research on GSCM in developing economies, this study uses all three parts of the triple bottom line framework to measure its effectiveness, similar to Jia et al. (2020), Lis et al. (2020), and Panigrahi et al. (2019). Similar to previous studies, our results indicate that most of the GSCM practices examined had a positive impact on environmental performance (Assumpção et al., 2023; G. Das et al., 2023; Holling & Backhaus, 2023), but their effects on economic and social performance were modest (Das et al., 2023; Vanalle et al., 2017). This suggests that companies in the bottled water manufacturing industry in Ethiopia should adopt a comprehensive approach to sustainability, considering various GSCM practices and their potential impacts on different performance dimensions. It is also essential to consider the specific context and challenges faced by the industry in implementing GSCM practices.

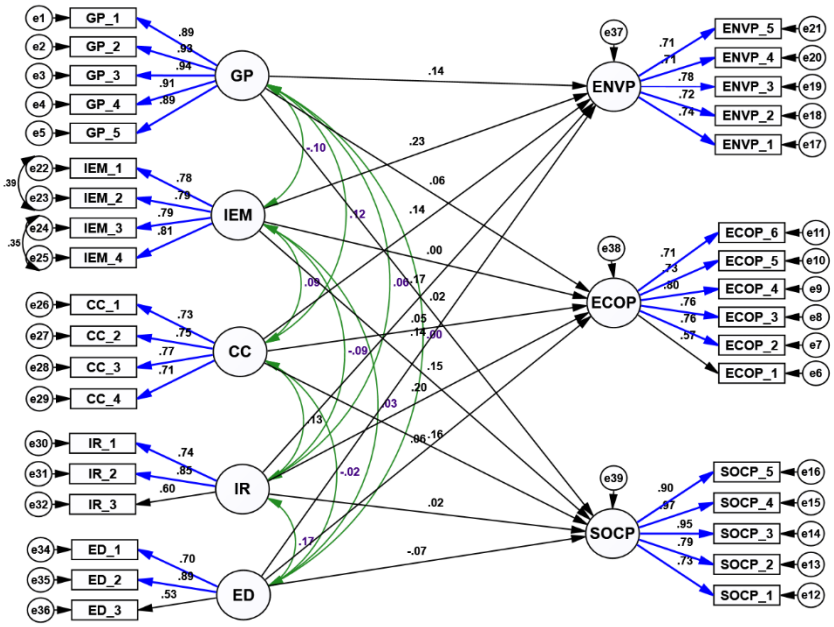

Figure 2. Structural model

5.1 Theoretical implications

The current study makes a significant contribution to the existing literature on GSCM practices and sustainable performance by providing empirical evidence in the context of bottled water manufacturing companies in Ethiopia. First, our study partly supports RBV by showing a link between GSCM practices and competitive advantage through environmental performance. However, the modest effects seen on economic and social dimensions suggest that GSCM's contribution to sustainability might depend on various contextual factors and need specific practices designed to deal with local problems (Nureen et al., 2022). Second, it advances our understanding of how specific GSCM practices can result in a range of positive outcomes, with varying degrees of impact across different performance dimensions. This suggests that for manufacturing organizations, GSCM is a potentially strategic tool for enhancing environmental, economic, and social performance (Awan et al., 2022), although further research is needed to determine the optimal configurations and contexts for its maximum effectiveness. Third, the research findings highlight the importance of considering the specific context in which GSCM practices are implemented and the types of GSCM practices used. This aligns with existing research indicating that factors like industry characteristics, governmental regulations, and consumer demand can influence the efficacy of GSCM practices (Zhu et al., 2008). This suggests that firms need to strategically select and adapt their GSCM practices to their specific circumstances.

5.2 Practical implications

Our findings offer important practical insights for managers of bottled water manufacturing companies in Ethiopia and other similar industries that are considering implementing GSCM practices. First, the practical implications of our study should be considered in light of the modest effects observed in our results, particularly in relation to economic and social performance. Hence, managers can leverage GSCM for its environmental benefits while integrating it with business strategy for its longer-term economic and social performance. Second, firms should implement a holistic GSCM approach that encompasses the whole supply chain, from sourcing raw materials to product disposal, to optimize the benefits of GSCM practices (Ghosh et al., 2022b; Raman et al., 2023; Zhaolei et al., 2023). Using this approach can help businesses become more profitable, enhance their reputation, and lessen their environmental impact. Third, firms should measure and track the implementation of GSCM practices to identify areas for improvement and assess

progress made (Assumpcao et al., 2023; Nureen et al., 2023). By doing so, firms can identify areas where they can reduce their environmental footprint and improve their sustainability performance. Furthermore, by investing in environmental training and education, firms can enhance their employees' understanding of GSCM practices and their importance in achieving environmental, economic, and social performance goals (Nureen et al., 2023; Murad & Zou, 2023).

5.3 Limitations and future research directions

Despite its contributions, this study has several limitations that should be considered. First, we focused solely on the bottled water industry in Ethiopia and relied on self-reported data that may limit the generalizability of our findings to other sectors or countries. Future research should explore other industries and countries, use objective measures or multiple data sources, and employ qualitative methods to enhance the robustness and depth of the findings. Second, this study was cross-sectional, which limits its ability to establish causal relationships between GSCM practices and sustainable performance. Longitudinal or experimental studies could provide further insights into this relationship. Third, future studies should explore additional factors and mechanisms through which GSCM practices influence sustainable performance and explore additional factors that may mediate or moderate these relationships. Fourth, the economic and social impacts of GSCM, beyond environmental benefits, may depend heavily on industry, firm specifics, and context. More research is needed to unlock the mechanisms for optimizing economic and social performance across diverse organizational contexts.

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Authors

Geda Jebel Ababulgu (*corresponding author*) gedak@wollegauniversity.edu.et
PhD scholar, College of Business & Economics, Department of Management, Wollega University, Nekemte, Ethiopia. ORCID: 0009-0002-8624-3953

Zerihun A. Birbirsa
College of Business & Economics, Department of Management, Jimma University, Jimma, Ethiopia. Email: birbirsa2018@gmail.com

Misganu Getahun Wodajo
College of Business & Economics, Department of Management, Wollega University, Nekemte, Ethiopia. Email: biiftuuf@yahoo.com

Funds

The authors did not receive specific funding for this work.

Competing Interests

The authors hereby state that there are no financial or non-financial competing interests.

Citation

Ababulgu, G.J., Birbirsa, Z.A. & Wodajo, M.G. (2024). Sustainable performance of bottled water firms in Ethiopia. The role of green supply chain management. *Visions for Sustainability*, 21, 8829, 319-341. http://dx.doi.org/10.13135/2384-8677/8829