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Sustainable supply chain management and organizational performance: the mediating role of competitive advantage in Ethiopian manufacturing industry

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Abstract

Purpose This research aims to study the impact of sustainable supply chain management on both competitive advantage and organizational performance in the Ethiopian manufacturing industry.

Design/methodology/approach The objectives are achieved through collecting and analyzing data from 221 Ethiopian manufacturing industries. This research employs a quantitative approach, specifically descriptive and causal research methods. The data are collected by questionnaires administered directly to a sample of 221 respondents who are managers and supervisors in the manufacturing industry. In addition, data analysis was performed using structural equation modeling in the Smart-PLS Software version (SmartPLS 4.0).

Findings The research reveals that SSCM substantially and positively impacts competitive advantage and organizational performance. Furthermore, statistical findings prove the connection between competitive advantage and organizational performance. Moreover, competitive advantage indirectly influences the relationship between SSCM and OP. The results suggest that successfully implementing SSCM can improve competitive advantage and OP.

Originality/value Considering the triple-bottom-line approach and the mediating effects of competitive advantage, this study is the first to analyze the relationship between SSCM and manufacturing performance in Ethiopia. This study adds to the existing literature by providing empirical evidence on the impact of sustainable supply chain management (SSCM) on competitive advantage and organizational performance in the manufacturing industry of emerging markets.

Research limitations/implications The research is based on a cross-sectional study, which may prevent the generalization of findings derived from the current study. The analyzed variable in this study quantified OP, which is widely recognized as a very dynamic concept.

Keywords Sustainable supply chain management (SSCM), Supply chain management (SCM), Sustainability, Competitive advantage (CA), Organizational performance (OP), Manufacturing

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Introduction

In recent decades, there have been significant advancements in supply chain management (SCM) due to its crucial significance in multiple domains. Nevertheless, mounting environmental anxieties regarding waste, increased emissions, and the depletion of resources associated with SCM operations and services have mirrored this rapid expansion [1, 2]. SCM is closely linked to environmental effects due to its involvement in corporate operations and processes that directly impact the environment, such as acquisition, manufacturing, and distribution [3]. Currently, the majority of companies are engaged in some aspect of at least one supply chain, and the way these companies handle supply networks has the potential to mitigate adverse environmental impacts and advance environmental conservation [1, 4, 5]. Therefore, SCM is crucial in environmental protection [6–8].

The demand for environmentally justifiable products and services has been increased by stakeholders, customers, and government leaders as environmental challenges, resource shortages, and degradation of the living environment have all increased [9–11]. The growing expectations of stakeholders, customers, and regulators have prompted companies to modify their conventional supply chains by integrating sustainable inputs and transitioning to sustainable supply chains [12–14]. This enables the provision of products and services that are more environmentally friendly [15–18].

Today, the ongoing environmental sustainability agenda encourages industrial companies all over the world [8, 12]to consider environmental problems and recognize the requirement of environmental management, exhibiting a reasonable approach to sustainability [19, 20]. An increasing number of manufacturing companies have begun to implement sustainable practices [8, 21] throughout their supply chains in response to the heightened awareness of environmental concerns over the last few centuries [20, 22]. Numerous manufacturing companies have begun to adopt proactive SSCM practices, aiming to deliver environmentally conscious products and services that consume minimal adverse effects on society and the environment [9, 13, 17, 23–25]. As a consequence, manufacturers are presently adopting a multitude of proactive and boundary-pushing practices, including sustainable procurement [26, 27], sustainable production [28], environment conservation, supplier collaboration, green product design and warehousing, logistics optimization, and reverse logistics [15, 25, 29, 30]. To implement these SSCM practices effectively, all essential supply chain participants, i.e., manufacturers, suppliers, and customers, must work closely together [8, 21, 22, 26].

Recent interest in the SSCM domain has been substantial, as evidenced by many scholars investigating its operational characteristics [8, 12, 31, 32]. A literature review was conducted by Rajeev et al. [3] regarding supply chain sustainability. According to their analysis, a limited number of studies have examined all three facets of sustainability. According to the survey, advanced economies are the primary focus of research on sustainable supply chain management [6, 33, 34]. Emerging markets present additional avenues for research [13, 15, 32]. Developing countries' emphasis on sustainable development has generated academic curiosity regarding sustainable supply chain management (SSCM). The literature on the relationship between supply chain sustainability and firm performance was reviewed by Govindan et al. [35]. In contrast to service industries, a stronger correlation was observed between sustainability and business performance in the manufacturing sector. Islam et al. [36] evaluated the effect of sustainable procurement (SP) on the performance of an organization. The authors identified a noteworthy correlation between the implementation of integrated strategic planning processes and the financial prosperity of the entity. The influence of sustainable supply chain management (SSCM) on logistics organizations is investigated by Baah and Jin [37]. Sustainable supply chain management (SSCM) improves organizational performance and competitive advantage, as discovered by the authors. A competitive advantage is critical to the prosperity of an organization.

There is insufficient emphasis on offering a thorough perspective of sustainable supply chain management in a dynamic corporate environment [12, 14, 31]. Most research on sustainable supply chain management (SSCM) is concentrated on industrialized nations, with limited attention given to emerging economies in the sub-Saharan region [35, 38, 39]. Every market possesses distinct attributes, particularly when contrasting developed countries and less developed areas [39–41]. Considering this fact, it is not feasible to anticipate that a strategy successful in a developed area will be effective in less developed or underdeveloped regions such as sub-Saharan Africa, specifically Ethiopia, which the United Nations categorizes as a least-developed country (LDC) and the World Bank as a low-income country [42].

Therefore, it is recommended to investigate the correlation between sustainable supply chain management and organizational performance, in addition to its influence on competitive advantage and the mediating function of competitive advantage [8, 43, 44], with a specific focus on the manufacturing sector in Ethiopia. The correlation between sustainable supply chain management and organizational performance

in developed nations has been the subject of abundant research. Nevertheless, this field is relatively understudied in developing and emerging nations [3, 15, 17, 20, 27]. A representative sample of SSCM and organizational performance outcomes from Ethiopia, a developing/least-developed nation, will contribute to the global display of these metrics.

This study is distinctive as it focuses on sub-Saharan Africa, namely Ethiopia, a rising economy with the second-largest population in the continent [45]. The authors could not find any empirical studies on the impact of sustainable supply chain management (SSCM) on organizational performance in the Ethiopian manufacturing industry. Prioritizing these regions is essential since findings from studies conducted in affluent countries may not be universally applicable to developing or least developed countries [39, 41]. Understanding the operational framework of developing economies, especially sustainable supply chain management (SSCM) and organizational performance, is essential due to their potential growth [8, 43, 46]. This study employs quantitative methodologies, primarily focusing on causal and descriptive approaches. Examining the impact of sustainable supply chain management (SSCM) on organizational performance and the mediating role of competitive advantage in Ethiopian manufacturing enterprises. This is done by structural equation modeling (SEM) utilizing SmartPls 4.0, a newly improved tool that is not commonly seen in the literature.

Literature review

Sustainable supply chain management (SSCM)

SCM plays a critical role in global economies, necessitating a thorough examination highlighting its members' interdependencies [6, 47]. As a result, businesses that have effectively managed their supply chains have learned how to react to and recover from possible international threats [3, 48]. Because of this, SCM has moved on to increasingly complicated situations, pursuing economic gains and sustainable development in its operations [6, 49].

As a result, researchers, academia, and managers have increased interest in SSCM [50]. In addition, SSCM methods are becoming a common corporate trend in the manufacturing industry for long-term development [40]. The necessity for enterprises to attain sustainability and advance SC performance has prompted the development of a sustainable supply chain, which takes a three-dimensional approach to operations (economic, social, and environmental).

The definition of SSCM, which included topics on coordination, efficiency, and effectiveness, was presented by Ahi and Searcy [51], who defined it as: "The creation of coordinated supply chains through the voluntary integration of economic, environmental, and social considerations with material, information, and capital flows connected with the acquisition, production, and distribution of products or services are managed efficiently and effectively through major inter-organizational business systems in order to meet stakeholder requirements and improve the organization's profitability, competitiveness, and resilience over the short and long term," [51]. According to a study by Pereira et al. [13], emerging economy suppliers are crucial to SSCM because they proactively use positive feedback loops to overcome obstacles through their mechanisms for collaboration and take advantage of genuine sustainability outcomes as incentives to support additional sustainability initiatives. The authors also show that suppliers pay special attention to the institutional and cultural aspects of sustainability, and they offer an analytical framework that explains this focus and helps close the institutional gap between buyers and their international suppliers. Khalid and Seuring [52] emphasized the consequence of SSCM practices in the growth of emerging markets and verified the unique organizational obstacles faced by these markets. Gold et al. [53] examined how supply chain management supports multinational corporations' sustainable objectives in developing nations. Jia et al. [38] aimed to address this deficiency in operations management research by examining the practices of SSCM in the context of global supply chains supported by developing countries. In their research, Moktadir et al. [40] found some obstacles that stand in the way of implementing environmentally responsible procedures within the leather processing industry in Bangladesh. The researchers investigated the interrelationships between these obstacles to facilitate sustainable supply chain development. The notion of sustainable development is gaining significance in the business community, and the economic impact of developing nations is growing [23, 54]. Multinational firms are expending significant efforts to build links with developing nations, and the concept of sustainable development is gaining prominence.

Competitive advantage (CA)

Competitive advantage (CA) refers to implementing a unique strategy that other organizations do not already utilize. This approach allows for reduced costs, the exploitation of business possibilities, and the elimination of competitive problems [9, 55]. Attracting and keeping clients consistently is nearly impossible without a distinct competitive advantage. Furthermore, without a consistent customer base, the business cannot produce continuous revenue [56, 57]. Kenyon and Sen [58] Put

that the company would inevitably face failure without a distinct competitive advantage that sets it apart from its competitors. The quality of the product or service is crucial in securing a competitive edge. The principle of competitive advantage suggests that organizations should consistently prioritize manufacturing superior products that can be delivered at competitive prices [37]. A company's competitive advantages generate enhanced value for the firm and its shareholders due to specific characteristics or circumstances, such as cost advantage and differentiation advantage. Rivals face increasing difficulty in neutralizing a competitive advantage as their durability increases. Most organizations demonstrate a significant correlation between firms' competitive advantage and performance, and these advantages play a crucial role in the firm's success.

Organizational performance (OP)

Organizational performance refers to evaluating a company's achievements throughout a specific timeframe, which has yielded advantageous outcomes [15]. The objective of evaluating the achievements is to get vital information regarding the proficient and successful utilization of organizational resources [59, 60]. Financial performance refers to quantitatively assessing a company's strategies and activities regarding monetary outcomes [9]. Return on assets and return on investment are metrics that can be employed to evaluate a company's financial performance. Organizational performance measures the degree to which an operation accomplishes its objectives and fulfills client requirements [30]. Performance measures the degree to which a company achieves its financial, market, and organizational objectives. Organizational performance refers to the efficiency of an entity in achieving its financial and market-driven objectives [15].

The relationship between SSCM and OP

The indicators of SSCM play a crucial role and significantly influence a company's success [61, 93]. The methods used to create products, manage supplier relationships, produce and distribute, plan and control, buy, and ensure the quality of information are some of the elements that affect efficient SSCM [30]. The notion that SSCM practices positively impact an organization's performance is supported by previous studies [15, 25, 30, 37, 60]. Companies that adopt SSCM are more likely to achieve better market and financial results because they may cut costs and attract environmentally concerned customers [46, 62, 92]. Numerous scholars claim that supply chain and organizational performance will be enhanced by organizations that apply and control the following concepts: ethical purchasing, sustainable supplier partnerships, environmentally friendly product design, resilient distribution, and logistics optimization, among others [15, 20, 29]. Thus, SSCM practices are proven to predict organizational performance.

H1 SSCM practices significantly and positively affect organizational performance in the Ethiopian manufacturing industry.

The relationship between SSCM and CA

Some experts suggest that a sustainable supply chain will result in more incredible long-term performance through enhanced environmental risk management [8, 29] and the achievement and development of competencies for incessant environmental enhancement [63], resulting in improved business reputation [61]. Additionally, a company can earn a positive reputation by maintaining its supply chain partners through engaging in sustainable logistics operations [37], green product design [64], and reducing waste [65] and energy consumption in the supply chain [66]. Specific SSCM indicators, for instance, supplier collaboration [22], good communication, and customer connections [15], impact competitive advantage indicators like pricing, product innovation, quality, time to market, and delivery reliability [15, 30, 67]. This shows that using a good SSCM can boost a firm's competitive advantage [68]. The subsequent hypothesis is formulated based on the summary mentioned above.

H2 SSCM practices significantly and positively affect competitive advantage in the Ethiopian manufacturing industry.

The relationship between CA and OP

As stated in the study by Li et al. [69], having a competitive advantage will enhance organizational success. Competitiveness's direct and beneficial impact on organizational performance is supported by Das and Hassan [29]. CA is determined by a firm's capability to attract clients, develop a positive image for itself and its products, and enhance client fulfillment and perceived value [15, 20]. Compared to its competitors, having a competitive advantage often means having all/or any of these features: reduced costs/price [70], enhanced quality, increased dependability, and expedited delivery time [65]. Because of these attributes, the organization's overall performance will increase [55]. Firms have the potential to leverage certain advantages that can be regarded as strengths in order to ensure satisfactory performance and generate the desired values—all while maximizing

earnings [8, 71], maintaining a high level of competence, and remaining competitive in the market—through the use of sustainable competitive advantage [8, 30]. The research cited above illustrates the favorable effect of competitive advantage on organizational performance and how it allows a company to outperform its competitors. Furthermore, competitive advantage mediates SSCM and OP connections [15, 29, 30, 37]. From this standpoint, the following hypothesis can be proposed:

H3 Competitive advantage significantly and positively affects organizational performance in the Ethiopian manufacturing industry.

H4 Competitive advantage significantly mediates between SSCM and organizational performance in the Ethiopian manufacturing industry.

Data and methodology

This study investigated the relationship between the exogenous variable of sustainable supply chain management, the intervening variable of competitive advantage, and the endogenous variable of organizational performance. In addition, the research aimed to examine the connection between the endogenous factors (organizational performance) and the intervening variable (competitive advantage), expecting the intervening variable to serve as a mediator and produce new research discoveries [30]. The study utilized a quantitative research paradigm, which employs methodologies to examine the relationships among important factors. The questionnaire findings are analyzed and organized using statistical methodologies and primary data from dispersed surveys.

Variable operational definition

The study's research variables are converted into indicators to amplify the focus of the examination. Furthermore, questionnaires were developed as study instruments to gather primary data for each variable. The study has identified three variables: sustainable supply chain management as an exogenous variable, competitive advantage as a mediating variable, and organizational performance as an endogenous variable.

Sustainable supply chain management variables (SSCM)

Sustainable supply chain management variables adapted from previous research [15, 25, 29, 30] consist of five indicators: environment conservation (SSCM1), supplier collaboration (SSCM2), green product design ensured with green warehousing (SSCM3), logistics optimization (SSCM4), and reuse of materials (SSCM5).

Competitive advantage variables (CA)

The indicators of competitive advantage adapted from previous research [29, 30, 69, 72] are selling price (CA1), superior quality and on-time delivery (CA2), new products and innovations (CA3), product reliability and durability (CA4), and fast product development (i.e., time-to-market) (CA5).

Organizational performance variables (OP)

Organizational performance indicators adapted from previous research [29, 69, 72] consist of growth in sales and profit (OP1), increased market share (OP2), profit margin on sales (OP3), growth in ROI (OP4), operational efficiency and cost-saving (OP5).

Scale development

The survey instrument consisted of two parts: demographic and endogenous structure aspects. The participants' age, sex, marital status, experience, profession, and industry type were encoded in the first section of the questionnaire. Furthermore, the second part of the research incorporated three endogenous variables: sustainable supply chain management (SSCM), competitive advantage (CA), and organizational performance (OP). The survey was formulated by drawing upon prior research. The measurements for the variables under investigation were derived from prior research and adjusted as necessary to align with the specific setting of the current study [15, 25, 29, 30, 69, 72]. The initial section of the survey comprises a nominal and ordinal scale. Hence, the subsequent section of the survey incorporates a five-point Likert scale, spanning from "strongly disagree" (1) to "strongly agree" (5). The survey constructs are presented in Table 1.

Sample design and data collection

The main objective of the present study was to ascertain the impact of SSCM and CA on the performance of an organization. Consequently, using the multistage sampling method, the manufacturing companies that have been in the industry for more than five years have been taken as sample respondents. The survey was delivered to supply chain managers and supervisors at the four industry groups (food and beverages, textile, rubber and plastic products, and chemicals and chemical products manufacturing industries). These four industry groups were chosen because they are the major industries in the country that contribute meaningfully to economic development and GDP, and they cover

Table 1 Survey development

Construct Measurement	Survey Item	Source
sustainable supply chain management (SSCM)	- Environment conservation - Supplier collaboration - Green product design ensured with green warehousing - Logistics optimization - Reuse of materials	Adapted from Mukhsin et al. [30], Das and Hassan [29], Kot [25], Attia [15]
Competitive Advantage (CA)	- Selling price - Superior quality and on time and on-time delivery - New Products and Innovations - Product reliability and durability - Fast product development (i.e., time-to-market)	Adapted from Li et al., [69], Banerjee and Mishra [72], Mukhsin and Suryanto, [30], Das and Hassan [29]
Organizational Performance (OP)	- Growth in sales and Profit - Increase market share - Profit margin on sales - Growth in ROI - Operational efficiency & cost saving	Adapted from Li et al., [69], Banerjee et al. [72], Das and Hassan [29]

Source: Own manuscript (2024)

50% of large manufacturing industries in Ethiopia [73]. There are 578 manufacturing firms in these four industry groups in Ethiopia, as stated by the Central Statistical Agency of Ethiopia in 2018 [73]. Before distribution, the questionnaire conducted pre-testing and revisions to minimize errors and clarify the inquiries. A pilot survey was conducted on a small group of potential respondents (25) located around Bahir Dar city. The instrument was edited and prepared for final data collection based on the pilot survey result. To ensure a rational response rate, the survey was distributed by the researcher himself with the support of assistant data collectors and some government

Table 2 Demographic profiles of respondents

Respondents demographic profile	Variables	Responses	Percentage (%)
Educational qualification	Certificate	0	0.00
	TVET/College Diploma	33	14.90
	First Degree	167	75.60
	Masters and Above	21	9.50
Work experience	Less than One year	0	0.00
	1–5 years	89	40.30
	6–10 years	88	39.80
	Above 10 years	44	19.90
Department	Production	90	40.70
	Supply Chain/Purchasing	88	39.80
	Management/Supervisor	43	19.50
Position	General Manager/CEO	33	14.90
	Deputy Manager/CEO	69	31.20
	Functional level Manager	97	43.90
	Team leader/Supervisor	22	10.00
Industry type/group	Food and Beverage	106	48.00
	Rubber and Plastic Products	56	25.30
	Chemicals and Chemical Products	30	13.60
	Textile	29	13.10

Source: Survey data (Processed using SPSS 26.)

officials (i.e., Ministry of Trade and Investment employees) to each selected respondent using contact address received from MTI & CSA and follow-up was done using repeated phone calls to remind them on the appointed date. Two hundred twenty-one questionnaires out of a sample of three hundred respondents were valid, completed, and returned, representing a response rate of 73.67%. The investigation was conducted using SmartPLS 4.0 software, which employed PLS-SEM methodology. The demographic profiles of the participants are illustrated in Table 2.

Results and discussion

Partial least square structural equation model

Partial least squares (PLS) path modeling is a popular variance-based structural equation modeling (SEM) technique extensively applied in business and social sciences [37, 61, 74]. The choice for PLS arises from its ability to attain higher statistical power even with small sample sizes and its dearth of reliance on distributional assumptions [30, 75, 76]. PLS path models consist of two sets of linear equations (See Fig. 1): the measurement and structural models. The measurement model explains the connections between an underlying variable and its observable indicators, while the structural model describes the connections between the underlying variables [77]. The assessment of the PLS path model consists of three sequential processes, as outlined by Henseler et al. [77]: firstly, the examination of the entire model,secondly, the examination of the measurement model; and thirdly, the examination of the structural model.

Analysis of measurement model

The measurement model employed in this investigation is predicated on the research conducted by [78, 79]. The researchers employed the measurement model to examine the dependability and accuracy of the constructs [29, 77]. The reliability is evaluated using Cronbach's alpha and composite reliability. Conversely, the validity assessment is performed by assessing the convergent and discriminant validity, as illustrated in Table 3.

Convergent validity and discriminant validity

Cronbach's alpha is considered a reasonable measure of reliability. The results indicated that Cronbach's coefficient exceeds 0.70 for all constructs, confirming the reliability of every component [75, 80]. Moreover, "composite reliability" is considered reliable when the standard value exceeds 0.7, as stated in [19, 74]. The outer loading parameters were examined to assess the similarities between latent constructs and reflecting variables in the outer model. Magno et al. [78] reported that external load levels of roughly 0.70 have been maintained. The discriminant validity assessment confirms that a reflective concept demonstrates more robust associations with its indicators compared to any other construct in the PLS path model [81].

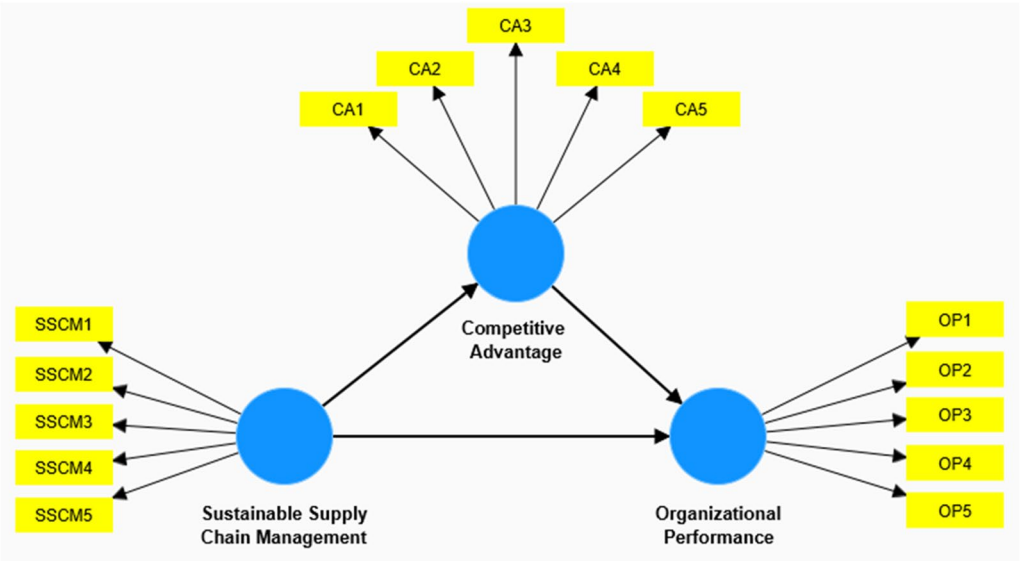

Fig. 1 Research model path diagram. Source: Survey data (Processed using Smart-PLS 4.0)

Table 3 Reliability and validity

Constructs	Indicators	Factor loadings	(α)	AVE	Cr	VIF
Sustainable supply chain	SSCM1	0.791	0.890	0.619	0.890	2.034
Management (SSCM)	SSCM2	0.777				2.014
	SSCM3	0.791				2.311
	SSCM4	0.770				2.387
	SSCM5	0.804				2.113
Competitive advantage (CA)	CA1	0.845	0.899	0.641	0.899	2.309
	CA2	0.827				2.469
	CA3	0.808				2.399
	CA4	0.727				2.244
	CA5	0.792				2.322
Organizational performance (OP)	OP1	0.763	0.899	0.641	0.899	1.821
	OP2	0.771				2.529
	OP3	0.794				2.539
	OP4	0.843				2.392
	OP5	0.831				2.284

Source: Survey data (Processed using Smart-PLS 4.0)

α = Cronbach's alpha value, Cr = Composite reliability, AVE = Average variance extracted, VIF = Variance inflation factors

Table 4 Fornell–Larcker criterion

	CA	OP	SSCM
CA	0.807		
OP	0.749	0.801	
SSCM	0.784	0.718	0.787

Source: Survey data (Processed using Smart-PLS 4.0)

Assessment of structural model (measurement model)

The average variance extracted (AVE) has been utilized to estimate convergent validity. The convergent validity of all constructs was robust, as indicated by the average variance extracted (AVE) values ranging from 0.614 to 0.650. These values surpass the required threshold of 0.50, as Fornell and Larcker (1981) suggested. In addition, the study used variance inflation factors (VIF) to assess the presence of multicollinearity [76]. The multicollinearity test assesses the degree of intercorrelations between the independent constructs in the structural model. The VIF (variance inflation factor) threshold value of <3, as suggested by [81], indicates that collinearity is not a significant issue. Table 3 demonstrates no multicollinearity issue, as none of the VIF values exceed 3. Discriminant validity was assessed using the Fornell–Larcker criteria, which states that each latent construct should have a square root of average variance extracted (AVE) higher than its correlations with other latent factors, as Cheung et al. [82] proposed. In addition, Hair et al. [81] have suggested that the off-diagonal values of latent variable correlations should be smaller than the diagonal values (Table 4).

Coefficient of determination (R^2)

Furthermore, the bootstrapping approach has been employed to assess the importance of the proposed research hypothesis for a path model. This method generates fresh samples of the exact sizes as the original

Table 5 Path analysis to test hypothesis

Hypothesis	Path	Beta Coefficient	Standard deviation	*T* statistics	*p*-value	Status
H1	SSCM– > OP	0.335	0.072	4.630	0.000	Supported
H2	SSCM – > CA	0.702	0.040	17.72	0.000	Supported
H3	CA – > OP	0.440	0.063	6.948	0.000	Supported
H4	SSCM – > CA – > OP	0.310	0.050	6.132	0.000	Supported

Source: Survey data (Processed using Smart-PLS 4.0)

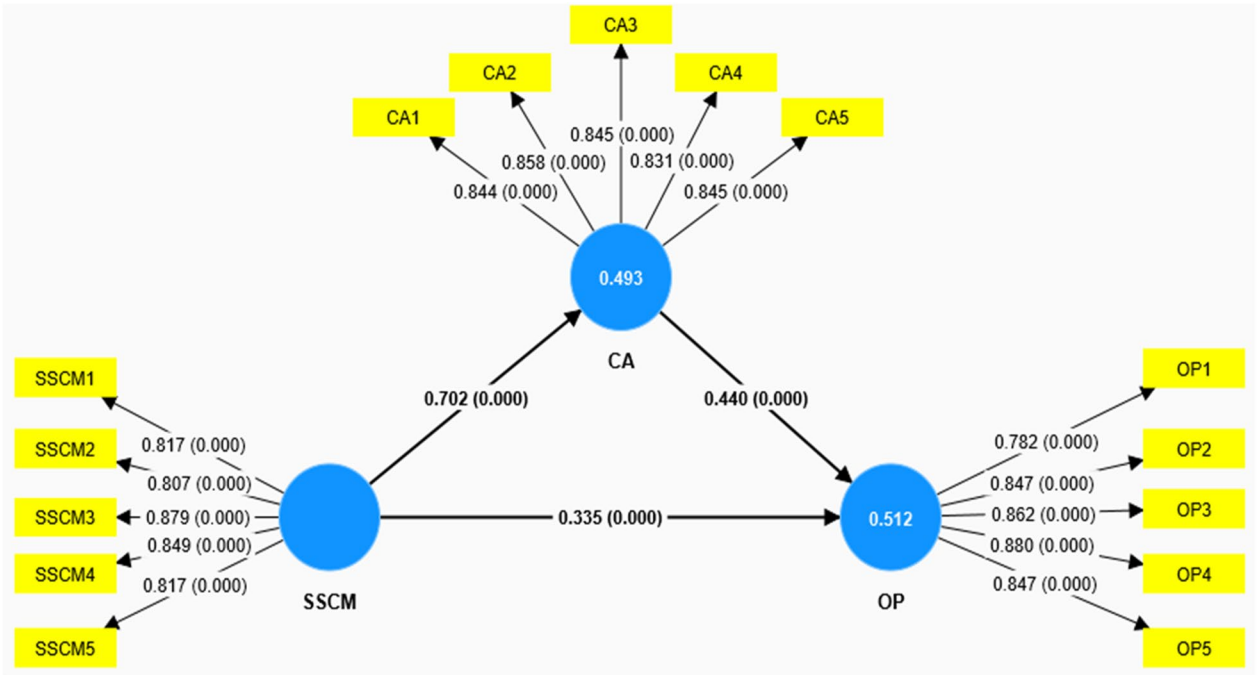

Fig. 2 Inner model. Source: Survey data (Processed using Smart-PLS 4.0)

data arrays by randomly resampling the original dataset. The significance of the standardized path (β-values) and p-values was evaluated to establish their importance, as presented in Table 5. The R^2 value is the probabilistic measure of the conceptual framework's strength for endogenous variables [82]. The coefficient of determination (R^2 values) for SSCM and CA was 51.2%, indicating that these factors collectively account for 51.8% of the total variation in OP. Figure 2 displays the PLS path model along with the related path coefficients.

Hypotheses testing—path coefficient

Hypothesis testing quantifies the level of support for a hypothesis initially specified by examining the probability value (p-value) and the t-statistical value (t-count) compared to the t-table. Given an alpha level of 5%, the p-value is found to be less than 0.05, and the t-table value is more than 1.96 [30, 43, 74, 81]. This suggests that the hypothesis is accepted because the t-statistic is higher than the t-table value, and the p-value is less than 0.05. The opposite is also true. The hypothesis testing in this work involved comparing t-table values with t-statistical values derived from bootstrapping analysis using the SmartPLS 4.0 tool. The bootstrap test was employed to mitigate the potential for inaccuracies in the data utilized for the research, and the results are displayed in Fig. 2 and Table 5.

The results indicate that there is a strong and positive correlation between SSCM and OP ($\beta = 0.335$, $p < 0.01$), as well as CA ($\beta = 0.702$, $p < 0.01$). Thus, H1 and H2 are substantiated. In addition, the relationship between the CA and the OP demonstrates a high positive correlation ($\beta = 0.440$, $p < 0.01$), confirming the support for H3. Furthermore, the indirect relationship between SSCM and OP through CA (i.e., mediation) effect demonstrates ($\beta = 0.310$, $p < 0.01$). Hence, H4 is confirmed. See Fig. 2 and Table 5.

Discussion

The research findings indicate that SSCM and competitive advantage significantly influence OP. This suggests that SSCM and CA play a statistically significant role in determining organizational performance. Furthermore, there is a strong correlation between SSCM and CA. The results of the hypothesis will be discussed in the following manner:

- Based on H1, the findings indicate that sustainable supply chain management (SCM) significantly and positively impacts operational performance

(OP), as evidenced by a coefficient of 0.335, a t count of 4.630, and a p-value of 0.000 at $t = 1.96$. The findings of this study confirm the earlier research conducted by Fantazy and Tipu [83], which asserts that a sustainable supply chain refers to a company's thoughtful initiatives to attain organizational objectives by effectively managing connections between consumers and vendors and business procedures among different organizations. Using sustainable supply chain practices has positively impacted corporate performance, as Das (2018) and Mukhsin and Suryanto [30] indicated. An empirical study has revealed that implementing effective supply chain management can enhance a company's competitive advantage and overall performance [13, 29, 61]. Furthermore, supply chain management (SCM) significantly impacts firm performance [8, 15, 31, 37].

- In summary, the study emphasizes the critical significance of Sustainable Supply Chain Management (SSCM) in enhancing financial outcomes and operational effectiveness. Sustainable supply chain practices can give businesses a competitive advantage and contribute to long-term success. Companies can simultaneously improve their performance and address environmental and social concerns by integrating Sustainable Supply Chain Management (SSCM) into their overarching strategic framework.
- For H2, there is a strong correlation between SSCM and CA. The relationship between sustainable supply chain management and competitive advantage was positive, with a coefficient of 0.702, a t-count of 17.72, and a p-value of 0.000 at $t = 1.96$. Previous research findings demonstrate significant positive correlations between sustainable supply chain activities and competitive advantage [69, 84, 85]. These findings align with the research conducted by Sun et al. (2022), which concluded that sustainable supply chain management (SCM) has a positive impact on competitive advantage. A sustainable supply chain integrates SCM and sustainability principles, and it necessitates that all firm operations contribute to enhancing the sustainability of their supply chain [1]. In addition, Attia [15] and Mukhsin and Suryanto [30] also discovered a favorable correlation between the notion and competitive advantage, which aligns with our current research findings. Previous empirical research, including studies by Baah and Jin [37] and Mugoni et al. [8], has consistently found a positive association between supply chain management (SCM) and competitive advantage (CA). These studies have also explored the impact of SCM on other variables, such as organizational performance.
- The researchers generally stress how crucial the SSCM is from a strategic standpoint. By adopting sustainable practices, businesses can gain a competitive edge in the market, protect the environment, and earn financially. Supply chain management practices that consider ethical and environmental considerations can benefit a company's bottom line and long-term viability.
- According to hypothesis H3, it is concluded that CA has a considerable impact on OP. The results indicated a strong and positive relationship between competitive advantage and company performance, with a coefficient of 0.440, a t count = 6.948, and a (p-value of 0.000) at $t = 1.96$. Based on the findings of Baah and Jin [37], there is a direct correlation between competitive advantage and firm success, indicating that competitive advantage has a favorable impact on a company's overall performance [30]. This indicates the capacity of a company to possess a more significant competitive edge, typically resulting in a substantial enhancement in its performance [15, 30]. Furthermore, a competitive advantage is often established when a firm possesses an economic value that sets it apart from its competitors [86]. Thus, this finding reinforces that organizational performance is closely linked to competitive advantage (Choi and Luo 2019), aligning with prior research highlighting that competitive advantage is closely linked to organizational performance [8].
- In summary, the researchers emphasize that gaining a competitive advantage involves more than just outperforming competitors; it involves proactively leveraging unique talents to enhance overall organizational performance. Businesses can attain long-term prosperity by excelling in critical domains like cost, efficiency, delivery, and innovation.
- Based on hypothesis H4, it is ultimately determined that due to the positive nature of both direct and indirect pathways, there is a complementary form of partial mediation. As shown in Table 5, a coefficient of 0.310 for sustainable supply chain management (SSCM) elements on organizational performance (OP) through competitive advantage (CA). This suggests that Sustainable Supply Chain Management (SSCM) indirectly improves organizational performance (OP) via competitive advantage (CA). The growing application of sustainable supply chain management (SCM) increases organizational performance (OP) by giving a competitive edge. The SSCM estimate coefficient test assessed the competitive advantage (CA) using bootstrap or

resampling. Bootstrapping yielded a coefficient of 0.310, a *t*-value of 6.132, and a standard deviation 0.050. Since the *p*-value is 0.000, <0.05, we can confirm that sustainable supply chain management (SCM) indirectly affects organizational performance (CP) through competitive advantage. The studies conducted by Attia [15], Baah and Jin [37], and Mukhsin and Suryanto [30] provide evidence of the impact of sustainable supply chain management (SSCM) on organizational performance (OP) through the mediating role of competitive advantage (CA). Therefore, competitive advantage (CA) acted as a partial mediator in the connection between sustainable supply chain management (SSCM) and organizational performance (OP).

- Overall, the researchers propose that sustainable supply chain management (SSCM) has a twofold impact on organizational performance (OP), operating through direct and indirect paths. Hence, competitive advantage (CA) partially mediates this relationship. Organizations that acknowledge and exploit these relationships can establish an ongoing competitive edge while attaining superior overall performance.

Robustness checks

To enhance the robustness and dependability of the findings, a series of supplementary investigations were performed on the data [87, 88]. This study examines two facets of robustness check: (1) the potential for nonlinearity in the effects and (2) the existence of endogeneity.

Nonlinearity

This study follows the procedure for examining possible nonlinearities in the interactions between the structural models [87, 88]. The interaction terms are used to describe the quadratic effects between the variables. The bootstrapping analysis, which involved 5000 samples and did not reveal any sign changes, suggests that neither of the nonlinear effects observed in Table 6 is statistically

Table 6 Assessment of nonlinear effects

Nonlinear relationship	Coefficient	*P* values
Sustainable Supply Chain Management ----- > Organizational Performance	−0.037	0.478
Sustainable Supply Chain Management ----- > Competitive Advantage	−0.046	0.309
Competitive Advantage ----- > Organizational Performance	−0.006	0.868

Source: Survey data (Processed using Smart-PLS 4.0)

Table 7 Assessment of endogeneity test using the Gaussian copula approach

Test	Construct	Coefficient	*p*-value
Gaussian Copula of model 1 (endogenous variables, CA—> OP)	CA—> OP	0.499	0.007
	SSCM—> CA	0.702	0.000
	SSCM—> OP	0.332	0.000
	^{C}CA—> OP	-0.056	0.878
Gaussian Copula of model 2 (endogenous variables, SSCM—> OP)	CA—> OP	0.437	0.000
	SSCM—> CA	0.702	0.000
	SSCM—> OP	0.425	0.017
	^{C}SSCM—> OP	-0.091	0.594
Gaussian Copula of model 3 (endogenous variables, SSCM—> CA)	CA—> OP	0.44	0.000
	SSCM—> CA	0.866	0.000
	SSCM—> OP	0.335	0.000
	^{C}SSCM—> CA	-0.17	0.31
Gaussian Copula of model 4 (endogenous variables, SSCM, CA)	CA—> OP	0.455	0.042
	SSCM—> CA	0.702	0.000
	SSCM—> OP	0.416	0.042
	^{C}SSCM—> OP	-0.083	0.635
	^{C}CA—> OP	-0.018	0.927

Source: Survey data (Processed using Smart-PLS 4.0)

significant. Therefore, the nonlinearity does not exist in the current model. Consequently, the robustness of the linear effects model can be inferred.

Endogeneity

Since our study involves formal hypothesis testing, it is necessary to consider the endogeneity risk that could result from omitting certain variables from the PLS path model [89]. Park and Gupta's [90] Gaussian copula approach is used following the guidelines provided by Huit et al. [91]. The scores for the lower-order structures from the combined sample served as the process's input. As indicated in Table 7, both the Gaussian copulas are found to be insignificant. The calculated path coefficient for the probable endogeneity of the SSCM components is -0.091; however, the p-value for this value is 0.594, which indicates that it is not statistically significant. Similarly, the Gaussian copula estimate for the competitive advantage (CA) aspects is 0.056, meaning it is not statistically significant (p-value = 0.878). The association between the SSCM aspects and −0.083 (p-value = 0.635), while considering the predictor constructions of the (OP) aspects, is insignificant. On the other hand, there is a 0.018 connection (p-value = 0.927) between the CA aspects. As a result, the lack of endogeneity may be inferred, improving the PLS-SEM results' reliability [91].

Conclusions and recommendations

The data analysis results in hypothesis testing lead to the following conclusions. Sustainable supply chain management (SSCM) positively correlates with organizational performance (OP). This demonstrates that implementing sustainable supply chain management (SSCM) strategies, such as environmental conservation, supplier collaboration, green product design, efficient warehousing, logistics optimization, and material reuse, can improve manufacturing organizations' performance (OP). Furthermore, implementing sustainable supply chain management (SCM) benefits competitive advantage (CA), enabling the firm to achieve low prices, reliable delivery, continual innovation, and short time to market. This allows the company to compete with other companies effectively. Furthermore, a positive correlation exists between competitive advantage (CA) and organizational performance (OP). One firm can outperform another by achieving higher market share, increased sales and profits relative to competitors, improved return on investment, and enhanced operational efficiency and cost savings. This leads to an overall improvement in the company's performance. This research offers vital insights for company managers and specialists on applying SSCM in developing economies. The findings demonstrate that implementing sustainable supply chain management (SSCM) through effective supplier collaboration can significantly improve competitive advantage and organizational performance. Furthermore, achieving CA has been proven to have a significant positive effect on OP. Hence, if CA can guarantee lower pricing, superior performance, more productivity, or faster delivery times than its competitors, it will undeniably and substantially impact organizational performance.

Above all, the researchers generally argue that adopting a comprehensive and sustainable strategy for managing the supply chain, known as sustainable supply chain management (SSCM), and leveraging a competitive advantage (CA) can significantly enhance an organization's prospects for long-term success. By integrating sustainability into their supply chain strategy, organizations can achieve a competitive edge, improve their overall performance, and contribute to creating a more sustainable future concurrently.

Academic and managerial implications

The research findings have significant implications for academics and practical application. By carefully adopting sustainable practices, organizations can gain a competitive edge and significantly contribute to society and the environment. Researchers and practitioners should persist in investigating these links to facilitate significant transformation in supply chain management and organizational performance, specifically in emerging markets. Managers should utilize these valuable insights to gain a competitive edge, enhance their overall performance, and positively contribute to the environment and society.

Policy implications

Government and regulatory authorities should establish a conducive atmosphere that supports sustainable supply chain development, encourages innovation advancement, and ensures a harmonious equilibrium between economic, environmental, and social objectives. Policymakers have a crucial influence on developing a conducive environment for sustainable supply chain practices and the success of organizations in creating a more sustainable future.

Limitations and future research direction

This study's findings are restricted to the manufacturing sector in Ethiopia, as the sample was exclusively selected from manufacturing companies within the country. Another notable drawback of this research is the utilization of a cross-sectional study. It may prevent the generalization of findings derived from the current study.

The analyzed variable in this study quantified OP, which is widely recognized as a very dynamic concept.

Future researchers can broaden generalizations by employing interviews and longitudinal studies. Nevertheless, it is essential to consider that OP may be influenced by additional variables that might be explored in future research. Furthermore, considering their practical reality, future studies would include additional investigations to evaluate SSCM's economic, environmental, and social performance.

Abbreviations

CA	Competitive advantage
CSA	Central Statistical Agency
GDP	Gross Domestic Product
MTI	Ministry of Trade and Investment
OP	Organizational performance
PLS	Partial least square
SCM	Supply chain management
SEM	Structural equation modeling
SSCM	Sustainable supply chain management

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Availability of data and materials
The data and materials used in this study are available upon reasonable request. Researchers interested in accessing the raw data or specific materials should contact the corresponding author.

Declarations

Ethics approval and consent to participate
The study protocol was reviewed and approved by the Departmental Review Board (DRB) at Punjabi University Patiala. All participants provided informed consent before participating in the study.

Consent for publication
Written consent was obtained from all participants to publish their data, including any relevant images or case details.

Competing interests
The authors declare no competing interests related to this research. Financial, professional, or personal relationships that could influence the interpretation of the results or bias the study have been disclosed.

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Publisher's note

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