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# Cultural Drivers of Sustainability Performance in Emerging Economies: Understanding the Effect of Supply Chain Learning

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## ABSTRACT

Sustainability performance in low-income emerging economies hinges on a powerful duo: organizational culture and supply chain learning. But how do they work together—and which cultural values truly drive impact? This insightful study cracks the code, analyzing data from 308 manufacturing firms in Ghana's low-income context through structural equation modeling (SEM) and necessary condition analysis (NCA). The findings shatter assumptions: while developmental, group, and hierarchical cultures directly boost sustainability performance, rational culture—though influential—is not a prerequisite. Even more critical? Only internal and supplier learning act as mediating forces, amplifying sustainability gains. The study's insights further show that sustainability-driven cultural values only unlock their full potential when paired with robust supply chain learning. Flexibility-focused cultures (developmental, group) and control-focused cultures (mainly hierarchical) both play pivotal—but distinct—roles. Our dual-method approach does not just confirm supply chain learning as the missing link between culture and sustainbility performance; it reveals how to strategically align culture and learning for maximum impact. For practitioners in resource-scarce settings, there is a need to merge adaptive and structured cultural values with cross-supply chain learning to overcome barriers and fast-track sustainability wins. This can serve as a roadmap for turning constraints into competitive advantage.

## 1 | Introduction

Manufacturing firms in emerging economies (EEs) face increasing pressure to align operational strategies with sustainability principles driven by regulatory, consumer, and competitive imperatives for environmental stewardship, social responsibility, and long-term economic resilience (Nsiah-Sarfo et al. 2023). Despite growing scholarly attention to sustainability, most empirical research has concentrated on developed economies, leaving EEs critically underrepresented in the literature. Agyemang et al. (2022) highlight a paucity of studies examining the contextual relevance and implementation of sustainability in EEs, a gap often attributed to divergent institutional, cultural, and market dynamics between developed and emerging contexts. Supply chain activities (including sourcing, extraction, production, and distribution) remain key drivers of environmental degradation, resource depletion, energy and water overconsumption, and social inequities (Afum et al. 2021; Agyabeng-Mensah et al. 2021; Nsiah-Sarfo et al. 2023). These challenges disproportionately

impact EEs, in which institutional voids and competing priorities exacerbate sustainability trade-offs, thus underscoring the urgency of context-specific research.

In low-income EEs like Ghana, companies and individuals often prioritize immediate survival—such as meeting basic needs and sustaining operations—over long-term environmental and social concerns, leading to fragmented and minimal adoption of sustainability strategies (Agyabeng-Mensah et al. 2021; Nsiah-Sarfo et al. 2023). Compounded by challenges such as income inequality, rapid urbanization, deteriorating working conditions, and resource scarcity, manufacturing firms frequently prioritize short-term profits over long-term sustainability practices. This issue is further exacerbated by a lack of stakeholder pressure, which is considered critical to sustainability implementation (Asamoah et al. 2025). Scholars argue that firms in these contexts can initiate sustainability transitions by fostering an organizational culture (OC) aligned with sustainable principles (Sarkis et al. 2011; Zhu et al. 2017; Wijethilake et al. 2023). OC is critical as it shapes internal capabilities that enable or constrain firms' ability to adopt and integrate sustainability, influencing decision-making, communication, and learning processes across supply chains (Packalén 2010; Wijethilake et al. 2023; Jaganjac et al. 2024). Rizzi et al. (2023) identify OC as fundamental to successful organizational practices and behavioral outcomes that enhance competitiveness, foster innovation, and advance green practice implementation. Empirical and theoretical studies underscore the pivotal role of culture in embedding sustainability into organizational behavior and practices (Miska et al. 2018), particularly in EEs where cultural and structural barriers are pronounced (Wanasika et al. 2011). However, research examining how OC drives sustainability implementation in low-income EEs manufacturing sectors remains limited, highlighting the need for deeper empirical exploration.

OC is a critical driver of sustainable supply chain management (Hassini et al. 2012; Wijethilake et al. 2023) such that a firm without a sustainability-oriented culture risks failure, as OC forms the foundation of organizational practices (Osei et al. 2023, 2024). However, research on how OC influences sustainability performance (SP) in EEs, particularly in low-income contexts such as Ghana, remains scarce. In such settings, cultural traits such as rigid hierarchies, bad working conditions, self-interest, and centralized authority (Wanasika et al. 2011) stifle knowledge sharing and innovation, hampering sustainability efforts. Additionally, firms in such settings often struggle to align their OC with sustainability goals, as pressing economic challenges and deeply ingrained cultural norms can make it a low priority. For example, in many low-income contexts, short-term financial survival takes precedence over long-term environmental or social commitments, making it difficult for leadership to foster a culture that values sustainability. Additionally, resistance to change—whether due to traditional business practices or skepticism about the tangible benefits of sustainability—further complicates efforts to embed it as a core organizational value. However, few studies have explored how OC—particularly sustainability-supportive OC values—influences sustainability implementation in manufacturing firms within low-income EEs. Moreover, extant literature has not extensively examined what constitutes sustainability-supportive OC in these contexts, underscoring a critical research gap.

OC measurement has been approached through various frameworks in the scholarly literature, with the Competing Values Framework (CVF) developed by Quinn and Rohrbaugh (1981) emerging as a prominent contemporary model. Prajogo and McDermott (2005), Cameron and Quinn (2006), and Dubey et al. (2019) confirm the efficacy of the CVF, describing it as a comprehensive tool for holistically evaluating cultural systems within organizations. This framework examines critical dimensions, such as incentive structures, internal and external orientations, organizational belief systems, and core values that govern operational practices. The CVF enables a nuanced analysis of cultural dynamics that influence organizational behavior, positioning it as a robust methodological approach for understanding how OC shapes firm-level strategies and outcomes.

The CVF categorizes OC into four distinct types (group, developmental, rational and hierarchical) by mapping internal–external and flexibility–control dichotomies (Cameron and Sine 1999; Cameron and Quinn 2006). Group culture, characterized by internal flexibility, emphasizes collaboration and teamwork, enhancing relational capabilities that are essential for knowledge absorption and sharing with external partners (Cameron and Quinn 2006; Linnenluecke and Griffiths 2010). Developmental culture, which combines external orientation with flexibility, promotes adaptability and continuous improvement, which is critical for innovation and learning across supply chains (Braunscheidel et al. 2010; Cao et al. 2015). Rational culture, which is externally oriented yet control-focused, prioritizes efficiency, goal attainment, and incentive-driven behaviors (Cameron and Quinn 2006; Cao et al. 2015). Hierarchical culture, prevalent in many EEs, such as Ghana, emphasizes internal orientation, control, stability, and centralized decision-making (Cameron and Quinn 2006). While conducive to structured operations, this culture often constrains innovation, change, and adaptability unless balanced with market-oriented developmental and group cultural values that foster risk-taking and learning (Braunscheidel et al. 2010; Rizzi et al. 2023). These distinctions highlight the interplay between cultural orientations and organizational capabilities, particularly in EEs, where hierarchical dominance may hinder sustainability transitions unless synergized with adaptive cultural traits.

Prajogo and McDermott (2005) posit that, while all cultural types under the CVF can coexist within a firm, one or two typically dominate. Leveraging the values embedded in these cultural types, particularly those conducive to sustainability, is vital for firms with complex OC in EEs, such as Ghana. However, empirical evidence on how these cultural values influence sustainability outcomes among manufacturing firms in EEs is limited. Strict cultural norms prevalent in firms in Ghana and other similar economies often stifle creativity and innovation (Ogbeibu et al. 2018, 2020), impeding the adoption of environmental and social practices. Conversely, studies like Wijethilake et al. (2023) highlight the potential of CVF-aligned cultural values to advance sustainability implementation, though empirical validation is scarce. However,

the extant literature (e.g., Osei et al. 2023, 2024) has largely focused on developed economies. This underscores the need to examine how CVF-derived cultural values enable firms in EEs such as Ghana to overcome sustainability challenges and enhance SP. This study contends that the sustainability-supportive cultural values inherent in the CVF are critical for implementing sustainability practices and achieving superior SP in EEs. To address these gaps, we explore the following research question in the context of EEs:

RQ1. Are group, developmental, hierarchical, and rational cultures significant for SP?

Supply chain learning (SCL) has become vital for manufacturing firms worldwide to improve SP (Bessant et al. 2003; Pereira et al. 2021), though its implementation in EEs requires special consideration due to these contexts' unique institutional and resource constraints. Studies by Gong et al. (2018), Huo et al. (2016, 2020), and Silvestre et al. (2023) posited that SCL (encompassing internal learning and learning with customers and suppliers) enables firms to acquire, disseminate, and integrate the knowledge, skills, and resources necessary to address sustainability challenges. Huo et al. (2020) conceptualize SCL as a cross-boundary organizational capability, while Gong et al. (2018) emphasize its role in fostering transparency, problem identification, and collaborative solutions within supply chains. Within supply chains, fostering transparency, problem identification, and collaborative solutions relies critically on coordinated learning among organizational members. Son et al. (2024) demonstrate this drives innovativeness, enabling creative sustainable solutions. This is particularly salient for low-income EEs such as Ghana, where SCL can act as a conduit for transferring sustainability-related knowledge from advanced economies and building competencies for innovative, context-specific SP strategies. Despite these insights, empirical research investigating the mechanisms through which intra- and inter-organizational SCL drives SP implementation in EEs' contexts remains limited. The nascent state of this discourse highlights a critical gap, warranting further exploration of SCL's efficacy in bridging sustainability divides within low-income EEs' supply chains, such as Ghana.

In EEs, OC can critically shape SCL (Pereira et al. 2021). Developmental and group cultures could encourage innovation and foster knowledge sharing, while rational culture could drive actionable improvements. Hierarchical culture, in turn, may provide structure and process discipline. However, research remains limited on which specific values—such as openness to change, error tolerance, or compliance—best support SCL in these resource-constrained contexts. This gap presents critical challenges for both theory and practice. Based on this, this study aims to answer the following questions:

RQ2. Do developmental, group, hierarchical, and rational cultures impact SCL especially in low-income EEs?

RQ3. To what extent does SCL (internal, customer, and supplier learning) impact sustainability implementation and SP in low-income EEs?

Silvestre et al. (2023) highlighted SCL's critical role in sustainability implementation, positioning it as an enabler for strategic outcomes. Like supply chain integration, SCL provides access to knowledge, resources, and information that are vital for improving performance. Gong et al. (2018) and Shen et al. (2019) frame SCL as a knowledge conduit and performance enhancer in collaborative contexts; however, its mediating role lacks empirical validation. Osei et al. (2023) emphasize sustainability-oriented cultural values as a precursor to supply chain integration but note their insufficiency without enabling mechanisms to translate values into outcomes. This suggests that SCL could mediate the link between cultural values (e.g., CVF) and SP. In low-income EEs, such as Ghana, while CVF-aligned values are foundational, SCL is pivotal for achieving higher SP. Despite this conceptual link, empirical evidence on SCL's mediating role between cultural antecedents and SP remains scarce, particularly in low-income EEs, such as Ghana, where institutional barriers heighten reliance on learning mechanisms for sustainability outcomes.

The growing focus on SP reflects a theoretical shift from identifying normative "should have" factors to prioritizing empirically validated "must have" determinants. This evolution is critical for organizations in EEs as it replaces prescriptive ideals with actionable frameworks to operationalize sustainability. Identifying essential enablers helps firms in resource-constrained settings to move from symbolic adoption to meaningful sustainability actions. This is especially important in EEs where institutional gaps demand evidence-based strategies to support both practice and scholarship. Against this background, this study attempts to answer the following questions in the context of EEs:

RQ4. To what extent does SCL mediate the relationship between group, developmental, rational, and hierarchical cultures and SP?

RQ5. Which dimensions of OC (under the CVF) and SCL are necessary conditions for SP?

To address these gaps, we employed a quantitative survey of Ghana's manufacturing sector, analyzed using Structural Equation Modeling (SEM) and Necessary Condition Analysis (NCA). This study contributes to the sustainability literature in the emerging economic context in several ways. First, it extends the CVF-SP literature by empirically using cultural types under the CVF to identify what constitutes a sustainability-oriented culture and assess its impact on SP and SCL in a low-income emerging economy setting. Second, it offers the emerging economic perspective of SCL's dual role as a driver and mediator of SP. Third, it pioneers the integration of sufficiency (SEM) and necessity (NCA) techniques in sustainability research on EEs, resolving methodological limitations in causal inference. Finally, it demonstrates how CVF-aligned cultural values and SCL synergistically enhance SP in EEs, providing actionable pathways for firms to navigate institutional and resource constraints.

The next section reviews sustainability and SP in EEs, CVF, and SCL, and finally reveals four hypotheses. This is followed by an analysis of the methodology and results using SEM and NCA. Subsequently, a discussion of the findings and conclusions is presented.

## 2 | Literature Review and Development of Hypotheses

### 2.1 | Sustainability Performance (SP) and Sustainability in Emerging Economies

The Brundtland Report, provided by the World Commission on Economic Development (WCED), defined sustainability as 'meeting development needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987, 43). Assessing the sustainability of firms has become possible through the triple bottom line (TBL) developed by Elkington (1998). TBL, manifesting in the form of environmental, social, and economic performance, has become the standard for measuring the SP of firms. In addition, it provides a redefining means of measuring SP. Environmental performance comprises activities and initiatives that mitigate negative impacts on the environment. In the extant literature, environmental performance has been assessed using indicators such as reduction in pollution, energy and water consumption, solid waste, toxic and hazardous materials, and recycling ability (Bhattacharya et al. 2019). Social performance encompasses various actions, activities, and efforts to protect society, including the community and employees (Das 2018).

In terms of measurement, several indicators, such as corruption risk, maintenance of human rights, supplier labor practices, job satisfaction, education and training of employees, creation of an enabling work environment, upholding diversity and equal opportunity, health and safety, community-centered projects, etc. (Gimenez et al. 2012; Das 2018; Bhattacharya et al. 2019) have been widely used in the literature. Economic performance comprises activities and efforts to maximize profits and reduce costs. To measure economic performance, indicators such as return on assets, operational costs, training costs, production costs, profitability, inventory costs, return on sales, material costs, and supply chain costs (Fahimnia et al. 2015; Helleno et al. 2017) have been adopted and used.

While sustainability has gained significant attention in academic research, existing studies have predominantly focused on developed economies, leaving EEs relatively underexplored. Agyemang et al. (2022) emphasize the scarcity of research examining sustainability's role and relevance in EEs. Scholars attribute this disparity to varying contextual factors: Malik and Abdallah (2019) argue that developed economies benefit from stronger customer and societal expectations, government support, and sustainability incentives, which drive firms to adopt sustainable practices more proactively. In contrast, Zhu et al. (2017) and Wang et al. (2019) identify challenges specific to EEs, including slow economic development, demographic constraints, socio-cultural barriers, rigid regulations, and insufficient governmental incentives. Mahmood et al. (2019) further highlight systemic obstacles such as limited awareness, inadequate skills, stakeholder pressures, resource shortages, managerial resistance, and an underdeveloped OC for sustainability. Compounding these issues, policies in EEs often prioritize economic growth and poverty alleviation over environmental or social sustainability (Wang et al. 2019). Together, these factors create a complex landscape that hinders the integration of sustainability practices into EEs, underscoring the need for context-specific research and interventions.

Although EEs rely heavily on manufacturing to drive economic growth, supply chain activities present significant environmental and social challenges. According to the United Nations Environment Programme (UNEP 2022), the sector's dependence on natural resources contributes to environmental degradation and resource depletion and accounts for over 70% of total greenhouse gas (GHG) emissions, posing serious threats to human well-being and ecosystem quality. This underscores the urgency for research exploring how differences in cultural and policy frameworks and SCL can accelerate sustainable practices in these regions (Malik and Abdallah 2019). Despite growing efforts by governments and stakeholders to address these challenges, gaps persist in identifying the actionable pathways for firms to adopt sustainability. Researchers caution against generalizing findings from developed economies, as contextual differences demand tailored approaches (Razak et al. 2024). Compounding this, Baliga et al. (2019) noted that small- and medium-scale manufacturers in EEs prioritize profitability over sustainability, further complicating implementation. Given these barriers, focused research on embedding sustainability within supply chains is critical for aligning economic progress with environmental and social responsibility in emerging markets.

EEs such as Rwanda, Nigeria, Ghana, and India are partnering with European governments and organizations to bolster sustainability (Agyemang et al. 2019). However, they face persistent issues, such as child labor, plastic pollution, manufacturing emissions, deforestation, land degradation, climate impacts, and waste mismanagement. For example, Ghana, heavily reliant on natural resources (mining, timber, oil, and gas) for growth, contends with high carbon emissions driven by upstream manufacturing and resource extraction such as agribusinesses, wood processing, energy, transport, fuel combustion, and mineral exploration, among others (Ali et al. 2021). The mining sector, a key GDP contributor, causes severe environmental harm, destroying land, water bodies, and public health (Kusi-Sarpong et al. 2019; Peprah et al. 2016). Similarly, shifting from raw cocoa and fruit exports to processing risks higher emissions and resource strains. According to Agyabeng-Mensah et al. (2021), the significant dependence of Ghana's logistical sector on vehicular transportation frequently contributes to elevated levels of environmental pollution. Despite these challenges, the environmental and social footprints of manufacturing firms remain critically understudied across low-income EEs—particularly in Sub-Saharan Africa, where countries like Ghana face persistent research gaps despite their growing industrial sectors. Scholars underscore the urgent need for empirical research on sustainability adoption in low-income EEs—including Ghana and similar contexts—to identify key drivers of governmental and corporate action, as well as accelerators for sustainable practice implementation (Afum et al. 2021; Salandri et al. 2022; Opoku 2025). Such research could guide scalable strategies for EEs to balance development with environmental and social responsibility.

Mani et al. (2020) underscored the need for enhanced social performance in EEs' manufacturing sectors, urging further research

into these dimensions. Manufacturing activities in such economies often harm the environment and society, necessitating sustainable practices (Le and Ferasso 2022). According to Ehrgott et al. (2013), improving environmental practices could be a game changer for EEs in enhancing their SP. Studies such as Zhu and Sarkis et al. (2010) and Sarkis et al. (2010, 2011) and identified drivers such as technology, AI, digitization, supply–demand dynamics, eco-design adoption, export markets, innovation, certifications, environmental management systems, stakeholder pressures, and internal capabilities as critical to sustainability implementation. Recent research (Miska et al. 2018; Wijethilake et al. 2023; Osei et al. 2023) emphasizes that robust sustainability implementation requires a supportive OC, with empirical evidence linking OC to improved SP. However, while factors such as technology and stakeholder pressures have been well explored, the role of culture remains understudied, particularly in EEs. Given the economic constraints of EEs, OC offers a cost-effective foundation for sustainability adoption, as strategies fail without cultural alignment (Kucharska and Kowalczyk 2019). For instance, Wijethilake et al. (2023) demonstrated OC's role in driving sustainability innovations, life cycle assessments, and community engagement in Sri Lankan firms. However, research on leveraging OC for sustainability in broader EEs remains scarce, highlighting a critical gap in context-specific empirical insights.

Razak et al. (2024) expressed the dominance of local customs and culture in the supply chain practices of firms in Sub-Saharan Africa. House (2004) and Hofstede (1983) characterized the culture of countries in sub-Saharan Africa as constituting a high level of power distance, collectivism, masculinity, a high level of uncertainty, and respect for hierarchical authority and status, which could mar the implementation of sustainability practices. According to Razak et al. (2024), these affect firms' relationships in their supply chains and their ability to implement supply chain practices, demonstrating the need to empirically research how Ghanaian manufacturing firms can structure their culture to integrate sustainability, which could potentially enable the implementation of sustainability practices. In this study, we argue that manufacturing firms in Ghana and other similar EEs struggling to implement sustainability can develop soft approaches to implementing sustainability by first adjusting and adopting an OC that accommodates sustainability. Such a culture is likely to alter internal processes and how firms relate to and even learn from their supply chain partners in the quest to implement sustainability.

### 2.2 | Organizational Culture (OC) and the Competing Value Framework (CVF)

OC constitutes one of the critical factors for organizational performance, as it underpins and provides the foundation for implementing change initiatives, such as sustainability (Cameron and Quinn 2006). According to their study, every organization inherently possesses a culture, and this culture embodies the organization's identity. Consequently, any strategy or initiative that is not aligned with the organization's cultural values is likely to fail (Cadden et al. 2020; Osei et al. 2023). In this study, OC is defined using Schein's (1988, 7) framework, which describes it as "a pattern of basic assumptions—invented, discovered, or developed by a group—as it learns to cope with problems of external adaptation and internal integration. These assumptions have proven effective enough to be considered valid and are therefore taught to new members as the correct way to perceive, think, and feel in relation to these challenges." Based on this definition, OC serves as the foundation for all organizational phenomena, shapes employee identity, and establishes guidelines for adopting new processes or strategies (Cameron and Quinn 2006). Thus, processes or supply chain strategies that lack alignment with supportive cultural values are bound to fail.

As manufacturing firms increasingly adopt sustainability initiatives, embedding supportive cultural values is essential for successful implementation. In essence, sustainability requires an OC to align with its principles. While multiple OC frameworks exist—including Hofstede's (1983) cultural dimensions, the Organizational Culture Profile (OCP) (O'Reilly III et al. 1991), and the CVF (Quinn and Rohrbaugh 1981; Denison and Spreitzer 1991)—this study adopts the CVF. Prajogo and McDermott (2005) assert that the CVF provides an ideal typology for measuring OC, although real-world organizations often blend multiple cultures with varying degrees of dominance. Validated CVF scales allow cultural dimensions to coexist independently; for example, strong internal and external orientations can overlap (McDermott and Stock 1999). The CVF's dominance in supply chain research stems from its capacity to analyze (1) internal/external orientations, (2) human resource (HR) practices, (3) incentives, (4) authority structures, and (5) value systems (Cameron and Quinn 2006; Dubey et al. 2019). This framework facilitates value comparisons across organizations (Dubey et al. 2019), identifies strategy-supportive cultural traits such as sustainability alignment (Osei et al. 2023), and clarifies how firms adopt strategies, manage supply chain relationships, and shape employee mindsets (Linnenluecke and Griffiths 2010). Recent studies leverage the CVF to explore innovation, digitization, green HR practices, and supply chain performance (Maheshwari et al. 2024; Kumar et al. 2024).

The CVF categorizes cultures along two axes: flexibility vs. control and internal vs. external orientation (see Figure 1), resulting in four cultural types: *group*, *developmental, rational*, and *hierarchical*. Developmental and group cultures prioritize flexibility. Developmental culture is externally oriented, emphasizing innovation, growth, and adaptability to external trends, while group culture focuses internally on collaboration, morale, and cohesion. By contrast, rational and hierarchical cultures emphasize the use of control. Hierarchical culture centers on internal stability through strict processes and authority, whereas rational culture targets external competitiveness by using incentives and performance-driven goals to align employees with organizational objectives (Cameron and Quinn 2006; Cao et al. 2015). Rizzi et al. (2023) and Tran et al. (2025) demonstrate that, unlike hierarchical culture, group, developmental, and rational cultures support the implementation of quality techniques, drive innovation, and enable robust quality infrastructure practices.

Recent empirical evidence suggests that sustainability-supportive cultural values—inherent across all CVF types—can effectively drive sustainability practice implementation, though their relative influence may vary by context. While Osei et al. (2023) found rational culture less conducive to sustainability

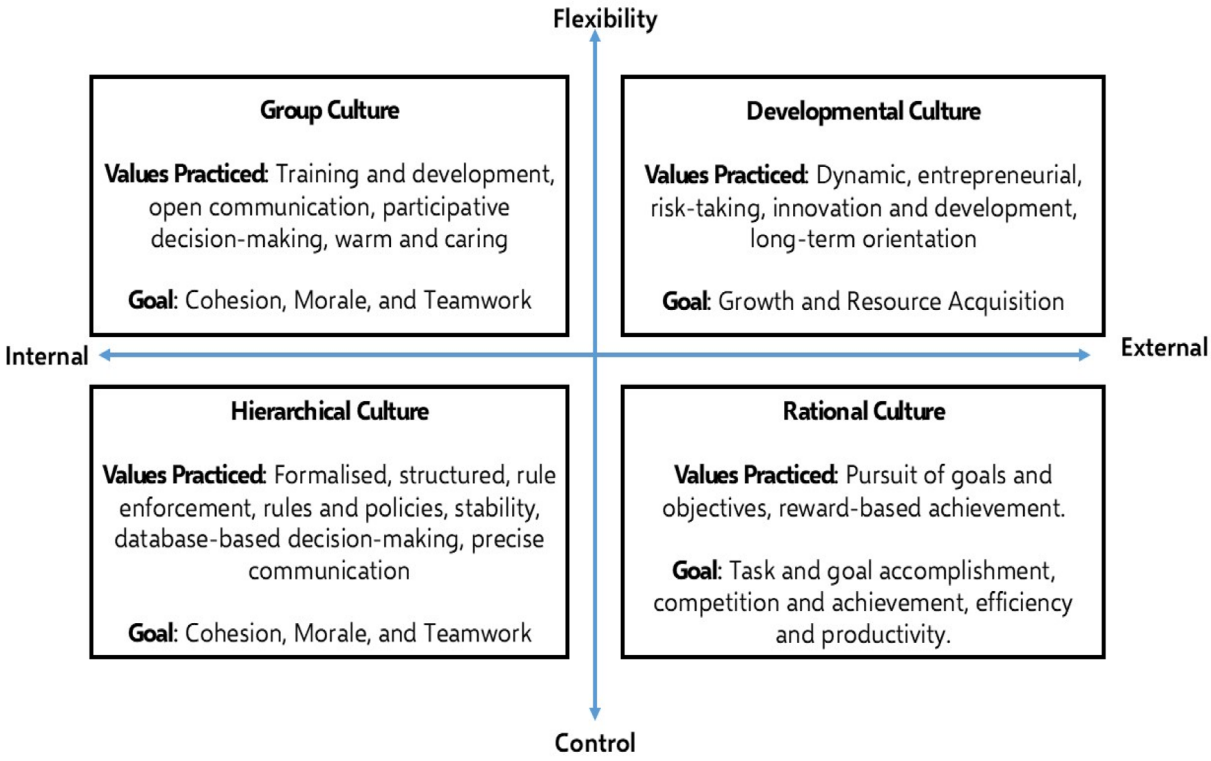


**FIGURE 1** | Competing values framework (Cameron and Quinn 2005).

adoption in food manufacturing firms, Wijethilake et al. (2023) demonstrated that all CVF cultural types (including rational) supported implementation in South Asian textile firms. These findings collectively indicate that each cultural archetype contains values suitable for sustainability implementation, with their effectiveness contingent on industry-specific and regional factors. Thus, the cultural values inherent in CVF's cultural types are vital for addressing barriers to sustainability implementation. However, firms in EEs, particularly in sub-Saharan Africa, often demonstrate OC shaped by rigid hierarchies, collectivism, and strong respect for authority (Wanasika et al. 2011) which often aligns with hierarchical culture. These cultural traits, including the tendency to prioritize social or personal interests over organizational objectives, may hinder change (Rizzi et al. 2023), creativity, innovation, and teamwork, essential for advancing sustainability. For instance, Ghanaian firms emphasize paternalism and ethnic loyalty, in contrast to Western individualism (Wanasika et al. 2011), which risks misaligning leadership decisions with sustainability imperatives. This means that, to enable sustainability adoption, OC in EEs must be systematically assessed and realigned to foster values like collaboration, adaptability, and external orientation—elements necessary for sustainability transitioning.

Leveraging the cultural types under the CVF, we argue that firms in EEs, particularly in Ghana with complex national OC contexts, can adopt an incremental approach to sustainability implementation. Recent studies have focused on developed economies, with limited attention to EEs. However, Wijethilake et al. (2023) have hinted at the possibility of cultural values in the CVF, enabling the implementation of sustainability in low-income economies. Their research demonstrated a positive impact of CVF's cultural types on sustainability in Sri Lankan firms. However, further research is needed to examine how CVF's cultural dimensions can guide sustainability implementation in EEs, especially firms in Ghana, where OC and leadership complexities pose unique challenges.

### 2.3 | Supply Chain Learning (SCL)

SCL is a critical dynamic capability that involves collaborative knowledge exchange among focal firms, customers, and suppliers (Ojha et al. 2018; Huo et al. 2021). Defined as the process of acquiring, assimilating, and exploiting knowledge across internal functions and external partners (Huo et al. 2021, 1413), SCL typically originates internally before extending to customer and supplier networks. In other words, SCL can be categorized into three dimensions: internal, customer, and supplier learning. Internal learning focuses on accumulating and disseminating operational, strategic, and market-related knowledge within organizational boundaries (Huo et al. 2021). Customer learning emphasizes acquiring and utilizing data on market trends, demand, and consumer preferences (Huo et al. 2020, 2021), whereas supplier learning involves absorbing supply-based insights, such as material innovations or logistical strategies (Huo et al. 2021).

The effectiveness of SCL hinges on robust internal learning systems, enabling firms to acquire, analyze, and exploit knowledge from partners (Huo et al. 2021). Strong internal frameworks foster research and development capabilities to assimilate insights from customers and suppliers, whereas SCL success relies on mutual trust, long-term collaboration, and shared risks/rewards (Huo et al. 2021). Manufacturing firms leverage SCL to interpret supply chain knowledge systematically, refine operations to

gain a competitive advantage, and build agile and resilient supply chains. Critically, SCL drives sustainable practices, facilitating eco-design, carbon footprint tracking, social responsibility, and responsive supply networks (Huo et al. 2020, 2021; Zhou et al. 2024).

Customers and suppliers can co-develop knowledge and sustainability solutions across the value chain (Huo et al. 2021), and focal firms often guide suppliers to adopt sustainable practices and ensure compliance (Formentini and Taticchi 2016). This makes SCL pivotal for advancing sustainability strategies, fostering innovation, and addressing supply chain challenges (Silvestre et al. 2023; Sun et al. 2024; Haq and Cao 2025). For firms in Ghana and other EEs, SCL provides a vital pathway for accessing knowledge, resources, and collaborative capacity for sustainability implementation. By partnering with suppliers and customers, including those in developed economies, firms gain insight into navigating complex environments and implementing sustainable practices (Liu et al. 2023). However, empirical studies on SCL's role in enhancing SP are limited (Silvestre et al. 2023). While the majority of SCL research focuses on Chinese industries, further exploration of the role of SCL is needed in EEs, particularly sub-Saharan Africa (e.g., Ghana), to understand how firms can effectively harness SCL for sustainability. Amid Ghana's current economic challenges and dual push to boost exports while promoting local consumption, environmental and social pressures are likely to intensify. To address this, firms can leverage SCL to access critical resources, innovative ideas, sustainable materials, and actionable insights, enabling them to effectively integrate sustainability practices across their supply chains. Research confirms that OC positively influences both internal and external integration (Braunscheidel et al. 2010; Linnenluecke and Griffiths 2010; Osei et al. 2024).

The effectiveness of external learning depends on the success of internal learning; however, internal learning hinges on supportive OC. Given that internal integration lays the foundation for successful external integration and considering SCL's role in advancing sustainability practices, cultivating cultural values that foster internal and external learning could equip firms with the knowledge, resources, information, and collaborative capacity needed to achieve superior SP. We posit that the cultural typologies and values embedded in the CVF can empower manufacturing firms in EEs, specifically Ghana, and those firms struggling to adopt sustainability practices to leverage SCL for enhanced SP. However, despite this potential, there remains a notable gap in research examining the interplay between CVF values, SCL, and SP and how CVF values and SCL interact to drive high SP in firms in EEs, particularly Ghanaian manufacturing firms.

## 3 | Development of Hypothesis

### 3.1 | Cultural Types (Under the CVF) and Sustainability Performance

Cameron and Quinn (2006) and Rizzi et al. (2023) emphasize that OC plays a decisive role in strategy implementation, asserting that even the most well-designed sustainability initiatives will fail without a supportive cultural foundation. Prior research, such as Linnenluecke and Griffiths (2010), Dyck et al. (2019), and Osei et al. (2024), has applied the CVF to identify the specific cultural traits that enable successful sustainability integration, particularly in developed economies. Rizzi et al. (2023) However, EEs, especially those in sub-Saharan Africa (e.g., Ghana), face distinct institutional, economic, and operational barriers that complicate sustainability adoption. To address this gap, we argue that firms in these contexts can use the types of culture under the CVF to assess their existing cultural values, identify misalignments, and strategically cultivate the mindsets and behaviors needed to embed sustainability into supply chain operations. By doing so, organizations can foster gradual but meaningful progress toward sustainability, ensuring both smoother implementation and long-term resilience in challenging business environments.

Group culture, characterized by an internal orientation toward human relations, prioritizes collaboration and collective goal attainment (Osei et al. 2023; Rizzi et al. 2023). Organizations dominated by group cultural values invest in nurturing interpersonal cohesion, fostering equitable opportunities, and enhancing staff capabilities through targeted training, diversity initiatives, and health and safety protocols (Dunphy 2003; Berger et al. 2007). Such values may attenuate paradigmatic rigidity and hierarchical power structures prevalent in EEs, particularly in sub-Saharan African contexts (Wanasika et al. 2011), such as Ghana, by fostering collaborative teams both internally and across supply chains. These teams can generate innovative, profit-oriented solutions while embedding sustainability practices (Osei et al. 2023). Group culture, through its emphasis on collective skills development and shared ethical frameworks, can directly address certain systemic challenges in Ghana's manufacturing sector—including workforce inequality, labor exploitation, and workplace mental health neglect (Cezarino et al. 2022). Group culture—leveraging teamwork across functions and supply chains—helps overcome these systemic challenges by transforming individual struggles into shared responsibility. Cross-functional teams mitigate workforce inequality through inclusive collaboration and accountability. Supply chain partnerships address labor exploitation via transparent standards and collective bargaining power. Team-based support systems reduce mental health neglect by distributing workloads and normalizing well-being practices through peer networks.

By institutionalizing participatory decision-making and peer-learning structures, this cultural archetype creates mechanisms to both identify and remediate these persistent issues through collaborative action. Thus, this cultural paradigm can position Ghanaian firms to mitigate human rights violations and enhance SP through ideational synergy and capacity building, although empirical validation remains underexplored. This study hypothesizes that, in firms across Ghana:

**H1a.** *Group culture exerts a positive impact on sustainability performance (SP).*

Developmental culture, characterized by external orientation and organizational flexibility, prioritizes learning, adaptation, and sustainable growth. Organizations embracing this culture emphasize training, innovation, and environmental stewardship, aligning their practices with societal and ecological well-being (Linnenluecke and Griffiths 2010). Within the CVF, a

developmental culture embodies values that significantly shape social, economic, and environmental practices (Osei et al. 2023, 2024; Rizzi et al. 2023). Firms with a strong developmental ethos proactively seek ways to minimize environmental harm and address challenges such as pollution, carbon emissions, and resource depletion (Sharma and Ruud 2003; Osei et al. 2023, 2024). For businesses in low-income economies, such as Ghana, this culture can foster sustainability-focused education, green innovation, and eco-conscious practices, enhancing both environmental and social performance. By investing in research and sustainable product development, these firms can meet evolving customer demands while improving economic outcomes, although the empirical validation of this dual benefit remains limited.

As posited by Glover et al. (2014), the temporal lag inherent in sustainability outcomes necessitates a long-term orientation, rendering organizations with a dominant developmental culture—characterized by strategic foresight and adaptability—distinctively capable of internalizing and capitalizing on sustainability initiatives. Consequently, the integration of developmental cultural values into the OC of firms in Ghana may catalyze endogenous processes such as institutional learning, skill development, and ideational creativity, which constitute foundational mechanisms for effective sustainability implementation. The inherent flexibility of developmental culture may further attenuate entrenched malpractices, including modern-day slavery and child labor, by displacing rigid operational paradigms with adaptive, ethically aligned frameworks, which are critical in Ghana and other similar EEs. Additionally, this cultural orientation may engender social entrepreneurship, advancing equitable opportunity structures, workplace equilibrium, and societal welfare, thereby amplifying social performance metrics (Berger et al. 2007). Despite these, empirical validation of the nexus between developmental culture and sustainability adoption in EEs, and particularly in Ghana, remains nascent. Considering this gap, we hypothesize that in the manufacturing firms in Ghana:

**H1b.** *Developmental culture can exert a positive impact on sustainability performance (SP).*

Rational culture, oriented toward external control and efficiency, prioritizes strategic deployment of remuneration systems, goal alignment, and resource optimization to shape employee behavior and achieve organizational objectives (Cameron and Quinn 2006; Cao et al. 2015). Firms dominated by rational cultural values diverge from developmental or group paradigms by emphasizing incentive-driven control mechanisms to operationalize strategic imperatives, including sustainability (Pagell and Wu 2009). Empirical evidence corroborates the salience of rewards in galvanizing employee commitment to sustainability adoption, with incentive structures acting as behavioral catalysts for policy adherence and practice implementation (Merriman et al. 2016; Wijethilake et al. 2023). In the context of EEs, like Ghana, rational culture may leverage compensation frameworks to enhance employees' innovative capacities and skill refinement, critical for advancing SP. This cultural orientation could institutionalize sustainability practices—carbon mitigation, resource efficiency, and equity initiatives—through performance-linked incentives, while strategically aligned incentives may enhance operational productivity, fostering concurrent economic gains.

However, the efficacy of rational culture in advancing sustainability remains contested in scholarly discourse. While Osei et al. (2023) critique its utility, positing that incentive structures are non-essential for achieving high SP in sustainability-driven contexts, Zeb et al. (2021) further underscore its limited role in fostering organizational innovativeness. This theoretical contention contrasts with studies such as Gong et al. (2024), which advocate for the salience of incentive systems in aligning employee behavior with sustainability objectives. Empirical contradictions persist: Osei et al. (2024) identified a negative correlation between rational culture and sustainability adoption among UK food manufacturers, echoing earlier findings in UK and Greek contexts (Osei et al. 2023). Such incongruities suggest contextual contingencies in rational culture's influence, particularly in EEs where structural constraints—including financial scarcity and low economic growth—may impede firms' capacity to leverage remuneration for sustainability adoption (Cezarino et al. 2022). In low-income economies like Ghana, resource-constrained firms are unlikely to prioritize incentive-driven strategies to implement sustainability, raising critical questions about the universal applicability of rational cultural frameworks. Given these gaps, we hypothesize that in the manufacturing firms in Ghana:

**H1c.** *Rational culture exerts a negative impact on Sustainability performance (SP).*

Hierarchical culture, defined by rigidity, centralized authority, and constrained autonomy (Cameron and Quinn 2006; Cao et al. 2015), prioritizes procedural adherence over individual agency, often stifling creativity and undermining SP (Linnenluecke and Griffiths 2010). Paradoxically, organizations leveraging hierarchical frameworks may operationalize sustainability through centralized control mechanisms, ensuring compliance across internal and supply chain stakeholders (Formentini and Taticchi 2016). In the context of EEs, such as Ghana, where formalized organizational structures dominate, hierarchical rigidity could enforce standardized sustainability protocols, mitigating deviations from established environmental and social policies. However, excessive proceduralism risks ossifying innovation, critical for adaptive sustainability practices. The dualistic potential of hierarchical culture—enabling compliance yet inhibiting creativity—remains underexamined empirically, particularly in resource-constrained settings. We hypothesize that, across the manufacturing firms in Ghana:

**H1d.** *Hierarchical culture has a positive impact on sustainability performance (SP).*

### 3.2 | Cultural Types (Under the CVF) and Supply Chain Learning

In the contemporary sustainability paradigm, SCL is positioned as a critical conduit for organizational knowledge transfer and sustainability adoption. Firms with robust interfirm knowledge assimilation systems exhibit enhanced capacity to propagate sustainability practices across supply chain networks (Ojha et al. 2018), offering resource-constrained firms in EEs, such

as Ghana, a pathway to leverage external expertise, particularly from developed-economy partners. However, SCL efficacy remains contingent upon a supportive OC, as structural impediments (e.g., financial fragility, operational inefficiencies, and tacit knowledge deficits) endemic to EEs necessitate cultural frameworks that incentivize collaborative learning (Bessant et al. 2003; Huo et al. 2021). Son et al. (2024) augmented this argument by highlighting learning's impact on firm innovation and performance. This learning, however, arises from organizational climate—the collective perceptions of members at a given time. Ultimately shaped by OC, organizational climate critically enables knowledge gathering *within* organizations and *across* supply chains. Meaning, a culture aligned with SCL principles may enable firms to ameliorate deficits in sustainability-related tacit knowledge, augment operational and supply chain performance, and institutionalize cross-border best practices. Yet, empirical gaps persist regarding OC's impact on SCL, particularly within EEs, underscoring the urgency of contextualized research.

SCL thrives in environments characterized by creativity, innovation, and collaborative long-term orientation (Huo et al. 2021; Gong et al. 2018, 2024)—attributes intrinsic to group and developmental cultural paradigms. These cultural types facilitate supply chain integration and ideational accumulation, enabling firms to address operational challenges while enhancing both organizational and sustainability outcomes (Osei et al. 2023; Wijethilake et al. 2023). For firms in Ghana and similar EEs, where sustainability adoption remains nascent, such cultures may foster transnational collaboration, allowing firms to assimilate sustainability practices via cross-border knowledge transfer with global partners. By institutionalizing teamwork and continuous training, Ghanaian firms can operationalize SCL mechanisms, leveraging collective expertise to refine SP. For instance, cross-functional teams engaging suppliers and customers in iterative ideational exchanges may catalyze context-specific solutions to sustainability barriers. Yet, the interplay between cultural antecedents, SCL efficacy, and SP in resource-constrained EEs remains underexplored, warranting deeper empirical scrutiny. Based on this, we hypothesize that in firms in Ghana:

**H2a.** *Group culture has a positive impact on SCL (Internal Learning, Customer Learning, Supplier Learning).*

**H2b.** *Developmental culture has a positive impact on SCL (Internal Learning, Customer Learning, Supplier Learning).*

The instrumental role of incentives in shaping behavioral compliance with organizational tasks is well-documented (Charness and Grieco 2019), yet their efficacy is contingent on contextual factors. While incentivized reward systems may align employee actions with strategic objectives (Eckartz et al. 2012), their utility diminishes in environments marked by structural constraints, such as low-income economies where governmental supportive frameworks are absent. In such contexts—exemplified by Ghana—rational cultural reliance on remuneration may prove insufficient to motivate behavioral shifts toward SCL adoption, leading firms instead to prioritize hierarchical control mechanisms. Furthermore, SCL's dependence on flexibility and open communication (Huo et al. 2020) conflicts with the rigid authority structures and procedural formalism endemic to hierarchical culture. Hierarchical cultural characterized by centralized decision-making and inflexible protocols may impede the adaptability and collaborative ethos necessary for effective SCL. Empirical research expounding on this in EEs is lacking. Consequently, we contend that rational and hierarchical cultural orientations are incongruent with the dynamic, participative environments required to operationalize SCL in resource-constrained EEs. Based on this, this research hypothesizes that in firms in Ghana:

**H2c.** *Rational culture has a negative effect on SCL (Internal Learning, Customer Learning, Supplier Learning).*

**H2d.** *Hierarchical culture has a negative effect on SCL (Internal Learning, Customer Learning, Supplier Learning).*

### 3.3 | Types of Culture (Under the CVF), Supply Chain Learning and Sustainability Performance

Contemporary organizational strategies for embedding sustainability within supply chains emphasize diverse yet complementary approaches, ranging from strategic alignment and leadership commitment to eco-innovative product development (Formentini and Taticchi 2016; Huq et al. 2016; Cormack et al. 2021). These initiatives are intrinsically linked to SCL, underscoring its indispensability as a cross-cutting mechanism for advancing SP, irrespective of an organization's dominant OC. Functioning as a structural conduit, SCL integrates tacit and explicit knowledge from internal stakeholders and supply chain partners, embedding these insights into organizational decision-making to optimize performance (Silvestre et al. 2020; Cormack et al. 2021). Despite the organizational climate's central role in innovation performance, members across firms and their supply chains require significant learning to realize this potential (Son et al. 2024). Empirical studies affirm that SCL enhances firm performance through mediated pathways such as innovation and collaborative capability (Yang et al. 2019), while also accelerating the exploitation and exploration of strategic sustainability values (Silvestre et al. 2020). This implies that even firms with sustainability-oriented cultural frameworks require robust SCL systems to translate cultural alignment into measurable SP outcomes. Despite these insights, empirical gaps persist regarding SCL's mediating role between CVF cultural typologies—group, developmental, rational, hierarchical—and SP, particularly in delineating how composite SCL constructs bridge cultural antecedents and sustainability outcomes, especially in the context of EEs.

We posit that firms in Ghana and other similar EEs can harness the intrinsic attributes of developmental and group cultures, such as creativity, continuous learning, long-term orientation, and collaborative flexibility, to establish foundational cultural frameworks conducive to sustainability implementation. These cultural paradigms enable the institutionalization of innovation and adaptive capacity, which are critical for addressing sustainability challenges (Osei et al. 2023; Wijethilake et al. 2023). However, the full realization of SP necessitates the synergistic integration of internal and external SCL mechanisms, which

amplify the diffusion of sustainability practices across organizational and supply chain boundaries (Silvestre et al. 2020; Cormack et al. 2021). While rational and hierarchical cultural values, characterized by rigid incentive structures and procedural formalism, are suboptimal for standalone sustainability adoption in resource-constrained EE contexts, their efficacy may be contingent upon complementary SCL systems that mitigate structural inertia (Huo et al. 2020; Charness and Grieco 2019). Despite theoretical propositions, the mediating role of SCL (internal learning, customer learning, supplier learning) in bridging cultural antecedents and SP remains empirically underexplored, particularly in the context of EEs. Based on this, we hypothesize that in the Ghanaian manufacturing firms:

**H3a.** *SCL mediates the relationship between Group Culture and SP.*

**H3b.** *SCL mediates the relationship between Developmental Culture and SP.*

**H3c.** *SCL mediates the relationship between Rational Culture and SP.*

**H3d.** *SCL mediates the relationship between Hierarchical Culture and SP.*

### 3.4 | Supply Chain Learning and Sustainability Performance

Drawing on the principles of SCL established by Seuring and Müller (2008), Gong et al. (2018), and Cormack et al. (2021), focal manufacturing firms in Ghana and their supply chain members can enhance SP by systematically managing information, resources, and environmental, social, and economic objectives. SCL enables collaborative efforts to align stakeholder sustainability demands, mitigate carbon emissions, conduct effective life cycle assessment, and prioritize societal safety through environmentally sustainable product and process innovation. As Senge (2007) and Silvestre et al. (2020) emphasized, learning is a pivotal mechanism for fostering organizational transitions toward sustainability, enabling supply chain partners to co-develop integrated practices that advance SP. Cormack et al. (2021) further underscore the role of SCL in operationalizing sustainability strategies and addressing implementation barriers, particularly in contexts where sustainability adoption remains nascent. For Ghanaian manufacturing firms, SCL facilitates the acquisition of critical sustainability knowledge from internal stakeholders, suppliers, and customers, thereby bridging gaps in sustainability capabilities. Given the documented challenges of sustainability integration in EEs, including Ghana, SCL offers a structured framework to institutionalize sustainability practices across supply chains, leveraging collective learning to meet evolving stakeholder expectations. Based on this, we hypothesize that in the manufacturing firms in Ghana:

**H4a.** *Internal learning has a positive impact on SP.*

**H4b.** *Customer learning has a positive impact on SP.*

**H4c.** *Supplier learning has a positive impact on SP.*

### 3.5 | Conceptual Framework

Figure 2 shows the linkages between the various variables in the study. H1a–H1d highlight the relationship between the cultural types under the CVF and SP, H2a–H2d show the relationship between the cultural types under the CVF and SCL, H3a–H3d show the mediation role of SCL (both individual and composite) on the relationship between cultural types (CVF) and SP, and H4a–H4c indicate the relationship between SCL and SP.

### 3.6 | Research Methodology

#### 3.6.1 | Research Design

The study aimed to investigate the impact of cultural types (under the CVF) and SCL on SP, cultural types (under the CVF) on SCL as well as to examine the mediating role of SCL in the relationship between cultural types (under the CVF) and SP in a low-income economy context. A quantitative research approach was employed, utilizing survey data collected from firms within the manufacturing industry in Ghana, West Africa. While Ghana is certainly not the *only* understudied context in Sub-Saharan Africa (SSA), it possesses a combination of representative Emerging Economy/SSA challenges, strategic regional importance, a critical focus on globally relevant yet under-researched agri-food supply chains facing intense sustainability pressures, and practical research feasibility. This makes it an exceptionally suitable and insightful context for generating valuable, in-depth empirical findings on our specific research questions regarding sustainability-oriented culture and supply chain integration, contributing knowledge with significant implications for similar economies across the region.

To analyze the data and test the hypothesized relationships, SEM and NCA were applied. SEM was used to assess the structural relationships between OC, SCL, and SP, while NCA identified critical thresholds or necessary conditions required for OC to enhance SP. This dual approach ensured a comprehensive understanding of both the sufficiency (via SEM) and necessity (via NCA) of relationships between the variables.

#### 3.6.2 | Sampling and Data Collection

Data were collected through a mixed-mode approach, combining Qualtrics surveys and in-person questionnaires, to address challenges related to digital access and literacy among respondents. The study focused on small, medium, and large manufacturing firms in Ghana, sourced from the Association of Ghana Industries (AGI) database. This database encompasses 22 subsectors, comprising SMEs in agri-business, food and beverage, pharmaceuticals, textiles, and energy, ensuring a representative cross section of Ghana's industrial landscape. The AGI database contains approximately 1200 firms, with a concentration in the Greater Accra and Ashanti regions. A convenience sampling approach based on their proximity to the researchers' location, accessibility, availability of firms and potential respondents, and willingness to participate

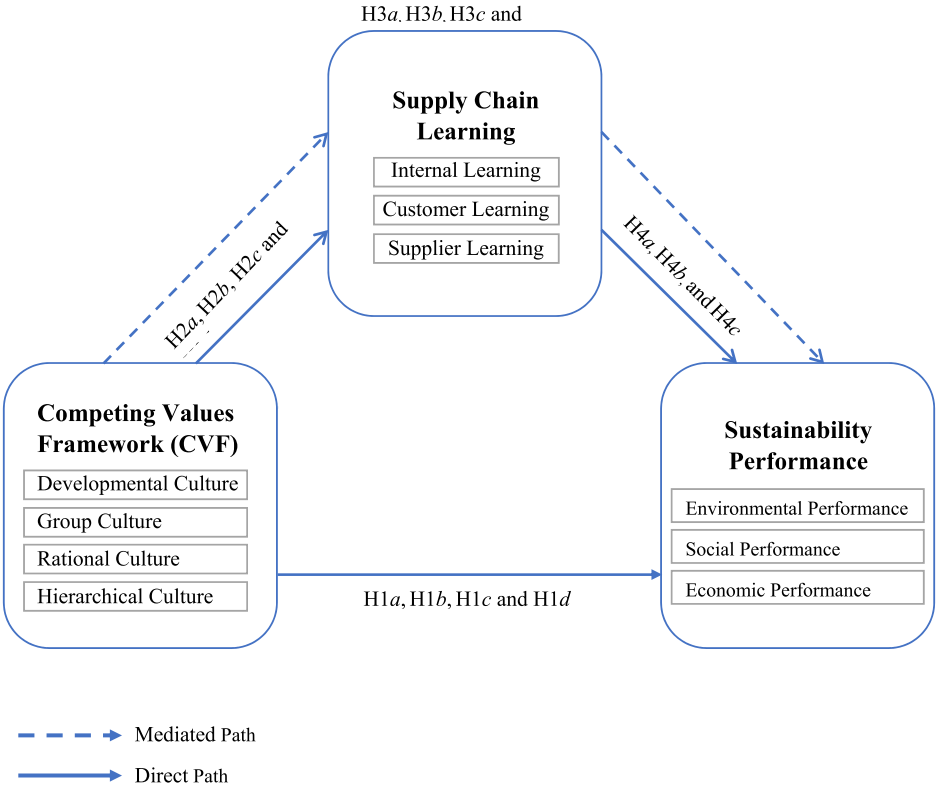


**FIGURE 2** | Conceptual framework.

during the study period was used to select firms from the Greater Accra and Kumasi regions (the two major highly industrialized cities in Ghana). A total of 450 firms (those with valid telephone numbers, email addresses and websites) were selected. A web-based survey instrument was administered via the Qualtrics platform; however, after two months of suboptimal response rates attributable to technological barriers and low digital engagement, a supplementary data collection protocol was implemented. Field assistants were deployed for in-person questionnaire administration to mitigate nonresponse bias and enhance data completeness. This adaptive mixed-method approach strengthened methodological rigor while addressing contextual challenges inherent in data acquisition within emerging economy settings.

Data collection was conducted over a three to four-month period, with validated responses systematically entered into SPSS for analysis. The process yielded a total of 344 responses (66 via Qualtrics and 277 through in-person questionnaire distribution). Of these, 36 responses (16 digital, 20 physical) were excluded from analysis due to incomplete or inconsistent entries. Following the integration of datasets from both collection modes into a unified SPSS database, 308 valid responses were retained, corresponding to a 68.4% response rate. To assess potential non-response bias across firm size categories (small, medium, large), an extrapolation technique, as recommended by Armstrong and Overton (1977), was implemented. The data were stratified into three subsets according to firm size classifications, and independent sample t-tests were performed (see Appendices 3–5). The statistical analysis revealed no significant inter-group differences ($p > 0.05$) across all constructs under investigation, suggesting homogeneity in responses irrespective of firm size.

#### 3.6.3 | Operationalization, Measurement of Variables, and Instrument Development

The instrument was originally developed in English, as it is the official language in Ghana. The questionnaire was initially pretested by 5 academic experts. We further conducted a pilot test with 10 business owners on an MBA program to confirm the reliability and internal consistency (using Cronbach's Alpha) before launching the official survey on Qualtrics.

The study operationalized its constructs using a 7-point Likert scale (1 = "Weak Agreement" to 7 = "Strong Agreement") across a four-section questionnaire (Table 1). The first section measured environmental, social, and economic performance; the second assessed SCL across internal, customer, and supplier dimensions; and the third evaluated OC typologies (group, developmental, rational, hierarchical). The final section captured demographic and firmographic data, with firm size included as a control variable to account for organizational scale effects, as larger firms are more likely to adopt sustainability practices (Gualandris and Kalchschmidt 2016). All measurement items, aligned with prior literature to ensure methodological rigor and comparability, are detailed in Appendix A.

### 3.7 | Analysis

The proposed relationships were analyzed using partial least squares structural equation modeling (PLS-SEM). This method was selected due to its robustness in estimating complex models (Hair et al. 2017) and prioritizes prediction and causal explanation in statistical modeling (Richter et al. 2020). While PLS-SEM

**TABLE 1** | Demographic characteristics.

| Description | Frequency | Percent | Mean | SD |
|---|---|---|---|---|
| What is the Number of Employees available at the company? | | | 2.46 | 1.005 |
| 6–29 Employees | 154 | 50.0 | | |
| 30–99 Employees | 83 | 27.0 | | |
| 100 or More Employees | 45 | 14.6 | | |
| Non-response | 26 | 8.4 | | |
| Total | 308 | 100.0 | | |
| Estimated years of working relationship with major customers? | | | 3.05 | 1.147 |
| < 1 year | 16 | 5.2 | | |
| 1 to < 5 years | 90 | 29.2 | | |
| 5 to < 10 years | 82 | 26.6 | | |
| 10 to < 15 years | 55 | 17.9 | | |
| 15 years or more | 41 | 13.3 | | |
| Non-response | 24 | 7.8 | | |
| Total | 308 | 100.0 | | |
| Estimated years of working relationship with major suppliers? | | | 3.13 | 1.189 |
| < 1 year | 17 | 5.5 | | |
| 1 to < 5 years | 85 | 27.6 | | |
| 5 to < 10 years | 67 | 21.8 | | |
| 10 to < 15 years | 66 | 21.4 | | |
| 15 years or more | 45 | 14.6 | | |
| Non-response | 28 | 9.1 | | |
| Total | 308 | 100.0 | | |
| Which manufacturing sector is your firm? | | | 4.21 | 3.017 |
| Food/Beverage/water | 91 | 29.6 | | |
| Textile | 21 | 6.8 | | |
| Water | 20 | 6.5 | | |
| Rubber and plastics | 30 | 9.7 | | |
| Aluminum/Metal processing | 29 | 9.4 | | |
| Pharmaceuticals | 25 | 8.1 | | |
| Mineral processing | 10 | 3.2 | | |
| Technological | 15 | 4.9 | | |
| Timber/wood processing | 31 | 10.1 | | |
| Electronics/Electricals | 12 | 3.9 | | |
| Non-response | 24 | 7.8 | | |
| Total | 308 | 100.0 | | |
| Does the firm prepare and release reports on the economic, social and environmental performance? | | | 1.51 | 0.501 |
| Yes | 137 | 44.5 | | |
| No | 141 | 45.8 | | |

(Continues)

**TABLE 1** | (Continued)

| Description | Frequency | Percent | Mean | SD |
|---|---|---|---|---|
| Non-response | 30 | 9.7 | | |
| Total | 308 | 100.0 | | |
| How long has the firm been in operation? | | | 3.96 | 2.032 |
| < 1 year | 3 | 1.0 | | |
| 1 to < 5 years | 30 | 9.7 | | |
| 5 to < 10 years | 27 | 8.8 | | |
| 10 to < 15 years | 28 | 9.1 | | |
| 15 years or more | 52 | 16.8 | | |
| Non-response | 168 | 54.6 | | |
| Total | 308 | 100.0 | | |

is robust to non-normality, Pesämaa et al. (2021) emphasize that small sample sizes and extreme non-normality may still affect estimate stability. To mitigate this, the sample size was deemed sufficient ($n = 308$), and normality was assessed (see Table 2) to ensure methodological rigor.

The significance of each correlation coefficient reflects whether the observed correlation is statistically significant. Typically, significance is determined by applying a threshold level (e.g., $^{**}p < 0.05$). While developmental culture exhibited a stronger association with the variables, particularly with SP indicators, hierarchical culture demonstrated weaker correlations. Furthermore, both supplier and internal learning displayed stronger correlations with SP indicators compared to customer learning. All observed correlations were significant at $^{**}p < 0.01$, indicating that the relationships are not attributable to random chance.

### 3.8 | Measurement Model

The PLS-SEM combines exploratory procedures to assess the reliability, validity, and unidimensionality of the multi-item scales of each of the latent variables. The AVE scores, factor loadings, composite reliability, and Fornell and Larcker (1981) (see Table 3). The discriminant validity using the Heterotrait-Monotrait Ratio (HTMT) (Henseler et al. 2016) was applied to assess reliability and validity. For reflective measurement, factor loadings are first examined. The factor loadings (attached in Appendix A) were between 0.60 and 0.708, whereas AVE ranged between 0.50 and 0.70 (see Table 3), demonstrating no issues with convergent validity (Fornell and Larcker 1981). Only one item measuring social performance with a factor loading of 0.467 was deleted (see Appendix A).

Internal consistency (reliability) was examined using composite reliability, based on Jöreskog's (1971) approach. Composite reliability values ranged from 0.821 to 0.923, indicating a high level of internal consistency and reliability, consistent with the threshold recommended by the HTMT approach proposed by Henseler et al. (2016). HTMT values were below 0.9, suggesting the presence of discriminant validity (see Table 4). Additionally, an examination of the full collinearity variance inflation factors (FCVIFS) using Kock's recommendation showed values less than 3.3 (see Appendix B) for all the constructs (Kock 2015). Hence, we found no issues with multicollinearity.

### 3.9 | Structural Model

The structural analysis entailed testing the significance of path relationships using a bootstrapping procedure. Structural model coefficients, representing relationships between constructs, were derived through estimating a series of regression-based equations. To reduce the number of path relationships and achieve model parsimony, environmental, social, and economic variables were consolidated into a third-order construct (i.e., SP) using the repeated indicator approach (Sarstedt et al. 2019; see Figure 3). Prior to evaluating the significance of the path model, predictor variables were assessed for multicollinearity. As shown in Table 5, all variance inflation factor (VIF) values were well below 5, with the maximum being 3.284. This further confirms that multicollinearity is not a significant concern in the model.

Hypothesis H1a, which examined the positive relationship between group culture and SP, was confirmed with the robust results ($\beta = 0.525$, $t$-value $= 13.862$, $p < 0.001$), indicating that H1a is supported by the study. Similarly, Hypothesis H1b, which investigated the positive relationship between developmental culture and SP, was supported, with the results ($\beta = 0.597$, $t$-value $= 13.862$, $p < 0.001$); the hypothesis was confirmed. Hypothesis H1c, which assessed the relationship between rational culture and SP, yielded results ($\beta = 0.498$, $t$-value $= 9.692$, $p < 0.001$), which confirmed a positive and supported relationship, thereby supporting H1c. Finally, Hypothesis H1d, which evaluated the relationship between hierarchical culture and SP, was confirmed with the results ($\beta = 0.304$, $t$-value $= 7.021$, $p < 0.001$), showing a strong and supported positive relationship, thereby confirming H1d.

**TABLE 2** | Latent variable, descriptive and normality tests.

| Inter-item correlations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **ENV** | **SOC** | **ECP** | **IL** | **SL** | **CL** | **DC** | **GC** | **RC** | **HC** |
| SOC | 0.481** | | | | | | | | | |
| ECP | 0.403** | 0.590** | | | | | | | | |
| IL | 0.314** | 0.554** | 0.490** | | | | | | | |
| SL | 0.317** | 0.581** | 0.489** | 0.724** | | | | | | |
| CL | 0.184** | 0.488** | 0.367** | 0.661** | 0.620** | | | | | |
| DC | 0.264** | 0.560** | 0.455** | 0.637** | 0.621** | 0.604** | | | | |
| GC | 0.182** | 0.473** | 0.455** | 0.664** | 0.642** | 0.634** | 0.785** | | | |
| RC | 0.137* | 0.368** | 0.439** | 0.422** | 0.420** | 0.453** | 0.596** | 0.538** | | |
| HC | 0.192** | 0.167** | 0.190** | 0.192** | 0.192** | 0.209** | 0.184** | 0.248** | 0.312** | |
| Mean | 4.619 | 5.419 | 5.347 | 5.504 | 5.427 | 5.601 | 5.445 | 5.584 | 5.290 | 4.795 |
| Standard deviation | 1.26 | 1.01 | 1.05 | 1.08 | 1.05 | 0.99 | 1.03 | 1.03 | 1.13 | 1.40 |

Abbreviations: CL, customer learning; DC, development culture; ECP, economic performance; ENV, environmental performance; GC, group culture; HC, hierarchical culture; IL, internal learning; RC, rational culture; SOC, social performance; SL, supplier learning.
**$p < 0.01$ level (2-tailed), *$p < 0.05$.

**TABLE 3** | Construct reliability and validity.

| Constructs | Cronbach's alpha | rho_A | Composite reliability | Average variance extracted (AVE) |
|---|---|---|---|---|
| Customer learning | 0.891 | 0.894 | 0.920 | 0.698 |
| Development culture | 0.889 | 0.892 | 0.915 | 0.643 |
| Economic performance | 0.821 | 0.834 | 0.876 | 0.588 |
| Environmental performance | 0.781 | 0.796 | 0.847 | 0.527 |
| Group culture | 0.873 | 0.874 | 0.908 | 0.664 |
| Hierarchical culture | 0.789 | 1.035 | 0.821 | 0.536 |
| Internal learning | 0.916 | 0.918 | 0.937 | 0.748 |
| Rational culture | 0.880 | 0.885 | 0.912 | 0.675 |
| Social performance | 0.804 | 0.846 | 0.866 | 0.573 |
| Supplier learning | 0.895 | 0.896 | 0.923 | 0.704 |

*H2* assessed the relationship between group, developmental, rational, and hierarchical cultures and SCL (internal, customer and supplier learning). Group, developmental, rational, and hierarchical cultures all had a supported and positive relationship with internal, customer, and supplier learning, thereby confirming *Hypotheses H2a–H2d* (see Table 6). It must be noted that, though all the cultural types under the CVF, thus, group, developmental, group, rational and hierarchical cultures had a positive and significant effect on SCL, the effects of both developmental and group culture were the strongest.

H4 assessed the relationship between internal, customer, and supplier learning and SP. With the results ($\beta = 0.113$, $p > 0.005$), customer learning had a positive but unsupported relationship with SP; hence, H4a was not supported. H4b, which depicts the relationship between internal learning and SP, was supported with results ($\beta = 0.313$, $t$-value = 3.755, $p < 0.001$). The results ($\beta = 0.291$, $t$-value = 3.988, $p < 0.001$) supported H4c, which explains the relationship between supplier learning and SP.

### 3.10 | Analysis of Mediation

A mediation analysis was conducted through the bootstrapping procedure. In the assessment of the presence of mediation, a comparison is made between the total effect (values without the mediator), the direct effect, and the indirect effect (values after the mediator is introduced). Mediation is said to occur if the direct effect of the exogenous constructs (cultural types under the CVF) on SP shrinks or becomes insignificant ($p < 0.05$) after the proposed mediator (SCL) is introduced. The results confirmed that the effect of the cultural types

**TABLE 4** | Discriminant validity.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Customer learning | | | | | | | | | |
| Development culture | 0.681 | | | | | | | | |
| Economic performance | 0.429 | 0.531 | | | | | | | |
| Environmental performance | 0.226 | 0.318 | 0.502 | | | | | | |
| Group culture | 0.718 | 0.891 | 0.536 | 0.226 | | | | | |
| Hierarchical culture | 0.291 | 0.268 | 0.263 | 0.289 | 0.349 | | | | |
| Internal learning | 0.732 | 0.706 | 0.566 | 0.372 | 0.743 | 0.261 | | | |
| Rational culture | 0.511 | 0.675 | 0.521 | 0.170 | 0.615 | 0.407 | 0.471 | | |
| Social performance | 0.584 | 0.669 | 0.726 | 0.602 | 0.574 | 0.247 | 0.654 | 0.442 | |
| Supplier learning | 0.695 | 0.696 | 0.567 | 0.379 | 0.726 | 0.274 | 0.800 | 0.470 | 0.690 |

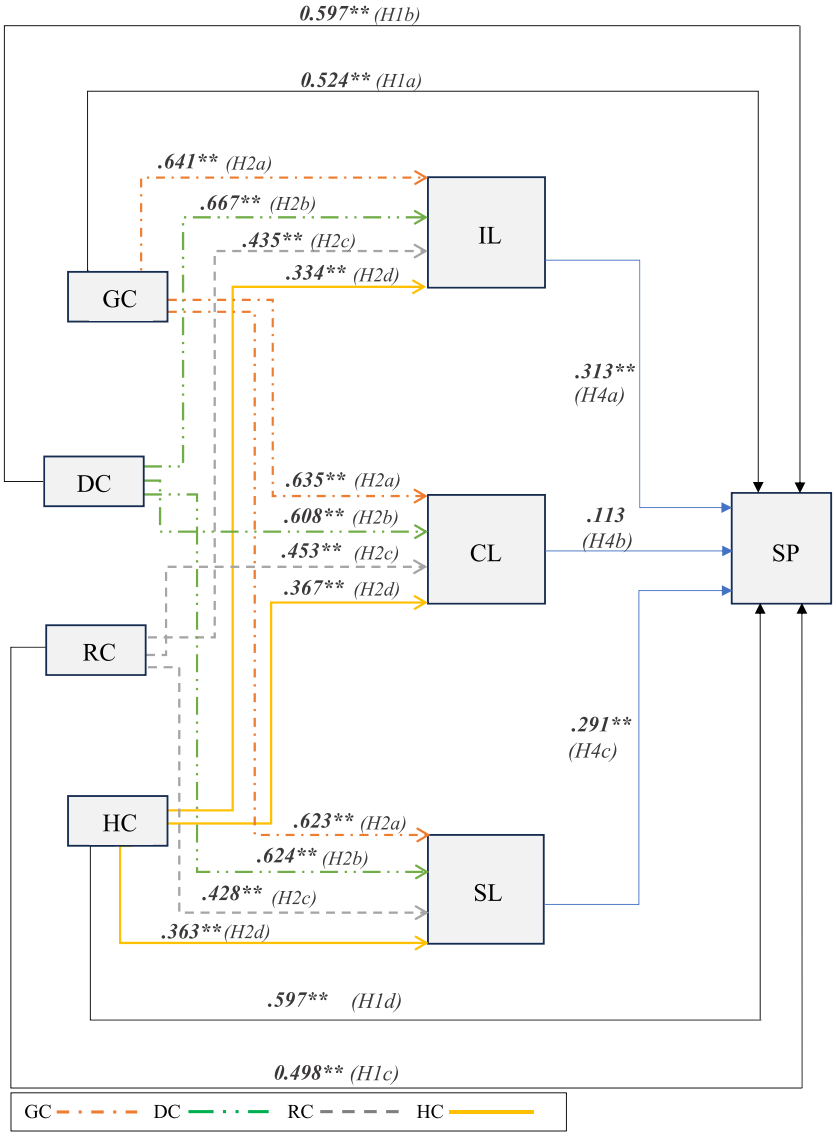


**FIGURE 3** | Structural model. **$p < 0.05$ (supported).

**TABLE 5** | Multicollinearity diagnostics (structural VIFs).

| | Customer learning | Economic performance | Environmental performance | Internal learning | Social performance | Supplier learning |
|---|---|---|---|---|---|---|
| Customer learning | | 2.147 | 2.147 | | 2.147 | |
| Development culture | 2.967 | 3.209 | 3.209 | 2.967 | 3.209 | 2.967 |
| Group culture | 2.820 | 3.284 | 3.284 | 2.820 | 3.284 | 2.820 |
| Hierarchical culture | 1.296 | 1.311 | 1.311 | 1.296 | 1.311 | 1.296 |
| Internal learning | | 2.723 | 2.723 | | 2.723 | |
| Rational culture | 1.697 | 1.708 | 1.708 | 1.697 | 1.708 | 1.697 |
| Supplier learning | | 2.474 | 2.474 | | 2.474 | |

**TABLE 6** | Significant testing for structural model.

| Hypotheses | Path coefficient | Standard deviation (STDEV) | *t*-values | *p* values | Biased corrected 95% CI | Conclusion |
|---|---|---|---|---|---|---|
| H1a: GC→SP | 0.524 | 0.048 | 10.935 | 0.000 | [0.416, 0.605] | Supported |
| H1b: DC→SP | 0.597 | 0.043 | 13.862 | 0.000 | [0.497, 0.674] | Supported |
| H1c: RC→SP | 0.498 | 0.051 | 9.692 | 0.000 | [0.380, 0.587] | Supported |
| H1d: HC→SP | 0.304 | 0.043 | 7.021 | 0.000 | [0.205, 0.369] | Supported |
| H2a: GC→CL | 0.635 | 0.042 | 15.144 | 0.000 | [0.541, 0.707] | Supported |
| H2a: GC→IL | 0.667 | 0.039 | 17.283 | 0.000 | [0.579, 0.734] | Supported |
| H2a: GC→SL | 0.643 | 0.037 | 17.172 | 0.000 | [0.559, 0.708] | Supported |
| H2b: DC→CL | 0.608 | 0.042 | 14.315 | 0.000 | [0.514, 0.683] | Supported |
| H2b: DC→IL | 0.641 | 0.045 | 14.275 | 0.000 | [0.541, 0.717] | Supported |
| H2b: DC→SL | 0.624 | 0.041 | 15.367 | 0.000 | [0.532, 0.695] | Supported |
| H2c:RC→CL | 0.453 | 0.060 | 7.549 | 0.000 | [0.325, 0.563] | Supported |
| H2c: RC→IL | 0.435 | 0.060 | 7.187 | 0.000 | [0.307, 0.545] | Supported |
| H2c: RC→SL | 0.428 | 0.061 | 6.987 | 0.000 | [0.298, 0.540] | Supported |
| H2d: HC→CL | 0.367 | 0.049 | 7.471 | 0.000 | [0.258, 0.451] | Supported |
| H2d: HC→IL | 0.334 | 0.054 | 6.161 | 0.000 | [0.218, 0.429] | Supported |
| H2d: HC→SL | 0.363 | 0.055 | 6.637 | 0.000 | [0.236, 0.457] | Supported |
| H4a: CL→SP | 0.113 | 0.065 | 1.729 | 0.084 | [−0.015, 0.238] | Not Supported |
| H4b: IL→SP | 0.313 | 0.083 | 3.755 | 0.000 | [0.156, 0.485] | Supported |
| H4c: SL→SP | 0.291 | 0.073 | 3.988 | 0.000 | [0.142, 0.429] | Supported |

Abbreviations: CL, customer learning; DC, development culture; GC, group culture; HC, hierarchical culture; IL, internal learning; RC, rational culture; SL, supplier learning; SP, sustainability performance.

on SP is partly transmitted by the sub-dimensions of SCL: customer learning, internal learning, and supplier learning. From the analyses (see Table 8), the results supported hypotheses *H3a–3d* as SCL was found to mediate the relationship between group, developmental, rational, and hierarchical cultures, and SP (see Table 8).

### 3.11 | Assessment of Model Fit

We evaluated predictive relevance using the Stone-Geisser criterion ($Q^2$) to determine whether the data points in the reflective measurement model of the endogenous construct could be accurately predicted (Akter et al. 2017). This was accomplished

**TABLE 7** | Predictive and model fit indices.

| | $R^2$ adjusted | $Q^2$ | Model fit indices | |
|---|---|---|---|---|
| Sustainability performance | 0.460 | 0.241 | SRMR | 0.084 |
| Customer learning | 0.442 | 0.304 | d_ULS | 6.603 |
| Internal learning | 0.482 | 0.352 | d_G | 1.522 |
| Supplier learning | 0.456 | 0.314 | Chi-Square | 2536.187 |
| | | | NFI | 0.740 |
| | | | Rms Theta | 0.122 |

through the blindfolding technique, which systematically omits portions of the data to assess prediction accuracy. Henseler et al. (2009) established the following thresholds for $Q^2$: values between 0.02 and 0.15 indicate a weak effect, 0.15 to 0.35 signify a moderate effect, and values exceeding 0.35 reflect a strong effect. As shown in Table 7, the proposed models demonstrated moderate to high predictive power, aligning with these benchmarks.

Furthermore, the model fit was evaluated using the Normed Fit Index (NFI) and RMS_theta values. Consistent with Henseler et al. (2016), NFI values approaching 1 and RMS_theta values $\leq 0.12$ confirm a robust model fit. Additionally, exact fit criteria (d_ULS and d_G) were non-significant, suggesting no substantial discrepancies between the proposed and implied models (Hu and Bentler 1999; Henseler et al. 2016). Collectively, these results validate the model's strong alignment with the data.

### 3.12 | Necessary Condition Analysis (NCA)

We employed NCA to explore potential necessary conditions and validate findings derived from the PLS-SEM approach. By integrating PLS-SEM and NCA, we examined hypotheses grounded in *sufficiency logic* (e.g., "when X occurs, Y is likely") alongside those rooted in *necessity logic* (e.g., "X must be present for Y to occur") (Richter et al. 2020). When a condition identified as significant in PLS-SEM regression analysis is also confirmed as necessary through NCA, this dual validation strengthens confidence in the condition's critical role. The scatterplots (see Figures 4–10) visually illustrate the hypothesized PLS-SEM relationships and data distribution patterns. These plots also facilitate the identification of necessary conditions by comparing observed data patterns against theoretical expectations (Richter et al. 2022). In NCA, the focus is on the size of the space in the upper-left corner of the scatterplot, where the effect size quantifies the area above the ceiling line, a key indicator of necessity.

Like all other significance testing, for a factor to be described as necessary, a substantial effect size and a small $p$ value ($p < 0.05$) are required to determine if a factor has a meaningful impact on the outcome (Dul 2016). These criteria help to confidently conclude that the factor is indeed necessary for producing the observed results. According to Table 9, based on the recommended thresholds, the effect sizes corresponding to internal learning, supplier learning, development culture, group culture, and hierarchical culture are deemed to be medium, whereas customer learning achieved a large effect size. The NCA's results (see Table 9 and Figures 4–10) indicate that, except for rational culture ($p > 0.05$), all other conditions are necessary for SP.

The bottleneck tables (see Table 10) show the extent to which conditions are necessary for different levels of outcome (necessary condition in degree). The first column of a bottleneck table represents different levels of the outcome, and the next columns represent the corresponding levels of the conditions for each level of the outcome. These levels can be expressed as a percentage of the range, as actual values, or as percentiles. They indicate that higher levels of outcome can only be achieved with higher levels of a condition. By default, the values of the outcome and conditions in the bottleneck table are shown as percentages in the range from 0% to 100% (Dul 2016). For low levels of SP (0%–20%), many conditions are not necessary (NN). Oftentimes, we find that most of the conditions are not necessary (NN) for very low levels of the desired outcome (Richter et al. 2020; Ofori 2024). As firms seek higher levels of SP (30%–100%), the necessary conditions become more critical, especially customer learning and internal learning.

## 4 | Discussion

Incorporating sustainability has become increasingly critical for firms in EEs, particularly in sub-Saharan Africa, such as Ghana, due to the mounting environmental and social challenges associated with their operations. In response, scholars have underscored the need to identify key drivers, such as OC, that accelerate the adoption of sustainability practices and enhance SP (Linnenluecke and Griffiths 2010; Hassini et al. 2012; Wijethilake et al. 2023). This study posits that firms in low-income EEs can more effectively integrate sustainability into strategic planning by fostering sustainability-oriented cultural values. OC, as the foundation of organizational behavior and value creation, serves as a critical enabler of sustainability-driven transformation (Rizzi et al. 2023).

This study, consistent with Osei et al. (2023) and Rizzi et al. (2023), identifies developmental culture as the strongest driver of SP, particularly in low-income EEs such as Ghana. Firms with growth-oriented cultural values exhibit dynamism, entrepreneurialism, risk tolerance, and long-term strategic focus (Cameron and Quinn 2006). By fostering creativity and innovation, Ghanaian firms (and similar firms in other EEs) can effectively implement sustainability initiatives (e.g., carbon reduction, eco-friendly product development) through the accumulation of innovative ideas. These findings align with Osei et al. (2023) and Wijethilake et al. (2023), who underscore the critical role of developmental cultural values in embedding sustainability.

The study further confirms that developmental culture enhances SCL. Meaning, long-term-oriented firms leverage internal and external knowledge, engage in joint learning (e.g., sustainability

**TABLE 8** | Mediation analysis.

| Path modeling | Total effect | Direct effect | *t*-stats | *p* value | Indirect path | Indirect effect | *t*-stats | *p* value | Biased Corrected 95% CI | | Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 2.5% | 97.5% | |
| DC→SP | 0.597 | 0.450 | 7.825 | 0.000 | DC→CL→SP | 0.143 | 3.434 | 0.001 | 0.066 | 0.226 | Supported ($p < 0.05$) |
| | | 0.376 | 5.659 | 0.000 | DC→SL→SP | 0.218 | 4.812 | 0.000 | 0.134 | 0.313 | Supported ($p < 0.05$) |
| | | 0.355 | 5.441 | 0.000 | DC→IL→SP | 0.238 | 4.749 | 0.000 | 0.148 | 0.347 | Supported ($p < 0.05$) |
| | | | | | DC→SCL→SP | 0.319 | 5.571 | 0.000 | 0.214 | 0.437 | Supported ($p < 0.05$) |
| GC→SP | 0.537 | 0.340 | 5.117 | 0.000 | GC→CL→SP | 0.185 | 3.896 | 0.000 | 0.091 | 0.278 | Supported ($p < 0.05$) |
| | | 0.257 | 3.621 | 0.000 | GC→SL→SP | 0.269 | 5.611 | 0.000 | 0.176 | 0.362 | Supported ($p < 0.05$) |
| | | 0.226 | 3.215 | 0.001 | GC→IL→SP | 0.299 | 5.369 | 0.000 | 0.195 | 0.412 | Supported ($p < 0.05$) |
| | | | | | GC→SCL→SP | 0.418 | 6.451 | 0.000 | 0.291 | 0.543 | Supported ($p < 0.05$) |
| RC→SP | 0.498 | 0.337 | 5.683 | 0.000 | RC→CL→SP | 0.158 | 4.315 | 0.000 | 0.090 | 0.235 | Supported ($p < 0.05$) |
| | | 0.305 | 5.410 | 0.000 | RC→SL→SP | 0.191 | 5.181 | 0.000 | 0.123 | 0.266 | Supported ($p < 0.05$) |
| | | 0.294 | 5.051 | 0.000 | RC→IL→SP | 0.202 | 4.839 | 0.000 | 0.126 | 0.289 | Supported ($p < 0.05$) |
| | | | | | RC→SCL→SP | 0.268 | 5.800 | 0.000 | 0.183 | 0.363 | Supported ($p < 0.05$) |
| HC→SP | 0.304 | 0.147 | 2.756 | 0.000 | HC→CL→SP | 0.157 | 4.699 | 0.000 | 0.095 | 0.221 | Supported ($p < 0.05$) |
| | | 0.126 | 2.455 | 0.014 | HC→SL→SP | 0.188 | 4.856 | 0.000 | 0.114 | 0.261 | Supported ($p < 0.05$) |
| | | 0.135 | 2.517 | 0.012 | HC→IL→SP | 0.175 | 4.246 | 0.000 | 0.095 | 0.251 | Supported ($p < 0.05$) |
| | | | | | HC→SCL→SP | 0.224 | 5.614 | 0.000 | 0.143 | 0.300 | Supported ($p < 0.05$) |

**TABLE 9** | NCA Statistical Test and Effect Size.

| Construct | Ceiling zone (CE-FDH) | Ceiling accuracy (%) | Scope | Effect size | Fit (%) | *p* value |
|---|---|---|---|---|---|---|
| Customer learning | 8.579 | 100.0 | 27.811 | 0.308 | 100.0 | 0.000 |
| Internal learning | 7.685 | 100.0 | 28.502 | 0.270 | 100.0 | 0.000 |
| Supplier learning | 5.727 | 100.0 | 25.252 | 0.227 | 100.0 | 0.000 |
| Development culture | 8.326 | 100.0 | 29.894 | 0.279 | 100.0 | 0.000 |
| Group culture | 8.340 | 100.0 | 28.866 | 0.289 | 100.0 | 0.000 |
| Rational culture | 2.010 | 100.0 | 27.468 | 0.073 | 100.0 | 0.694 |
| Hierarchical culture | 3.984 | 100.0 | 27.069 | 0.147 | 100.0 | 0.047 |

*Note:* $0 < d < 0.1$ = small effect, $0.1 \leq d < 0.3$ = medium effect, $0.3 \leq d < 0.5$ = large effect, and $d \geq 0.5$ = very large effect.

**TABLE 10** | Bottleneck Table.

| Sustainable performance | Customer learning | Internal learning | Supplier learning | Development culture | Group culture | Rational culture | Hierarchical culture |
|---|---|---|---|---|---|---|---|
| 0 | NN | NN | NN | NN | NN | NN | NN |
| 10 | 17.7 | 14.0 | NN | NN | NN | NN | NN |
| 20 | 22.2 | 14.0 | NN | NN | NN | NN | NN |
| 30 | 22.2 | 14.0 | 6.2 | NN | NN | NN | 10.1 |
| 40 | 22.2 | 14.0 | 10.6 | 25.4 | 27.9 | 9.4 | 12.2 |
| 50 | 22.2 | 14.0 | 10.6 | 37.8 | 27.9 | 9.4 | 16.7 |
| 60 | 22.2 | 14.0 | 10.6 | 37.8 | 27.9 | 9.4 | 16.7 |
| 70 | 32.4 | 33.6 | 22.0 | 37.8 | 41.7 | 9.4 | 23.2 |
| 80 | 32.4 | 53.6 | 48.6 | 38.9 | 41.7 | 9.4 | 23.2 |
| 90 | 48.7 | 69.9 | 84.6 | 51.2 | 79.5 | 9.4 | 25.0 |
| 100 | 100.0 | 97.0 | 100.0 | 100.0 | 100.0 | 96.3 | 63.2 |

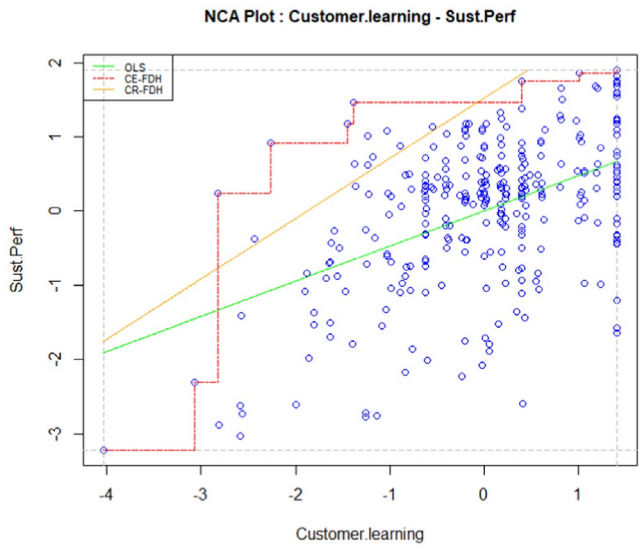


**FIGURE 4** | NCA plot between customer learning and sustainability performance.

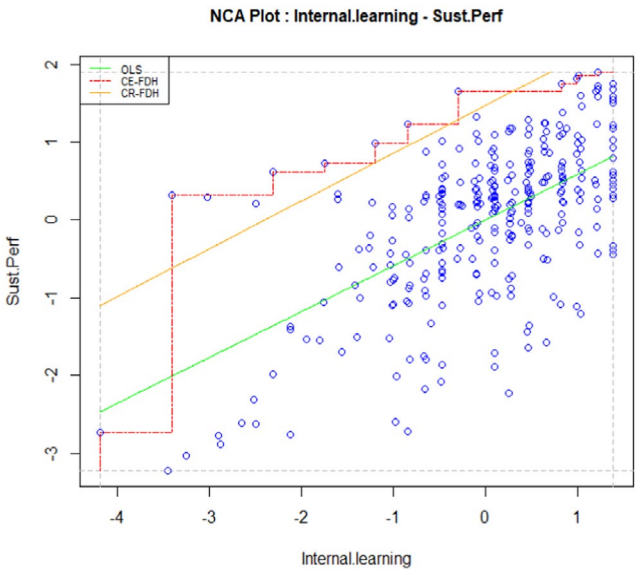


**FIGURE 5** | NCA plot between internal learning and sustainability performance.

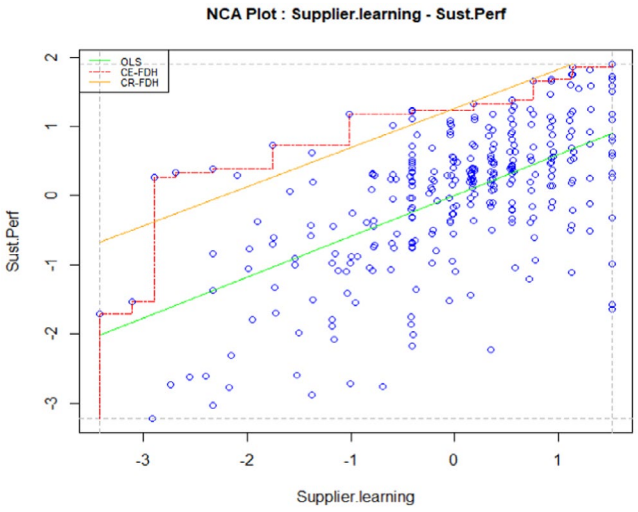


**FIGURE 6** | NCA plot between Supplier learning and sustainability performance.

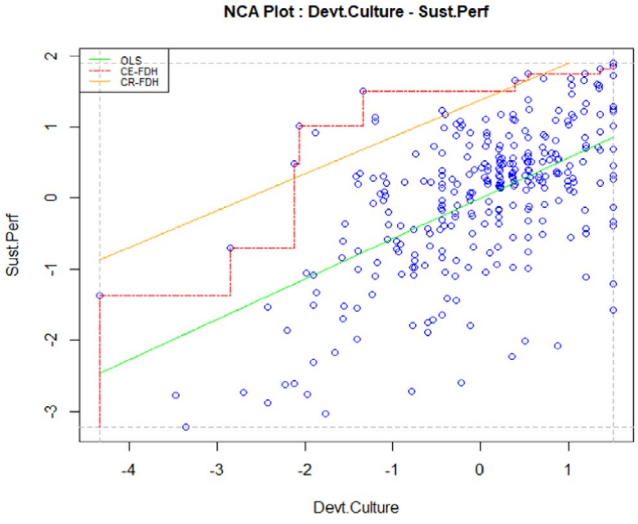


**FIGURE 7** | NCA plot between Development culture and sustainability performance.

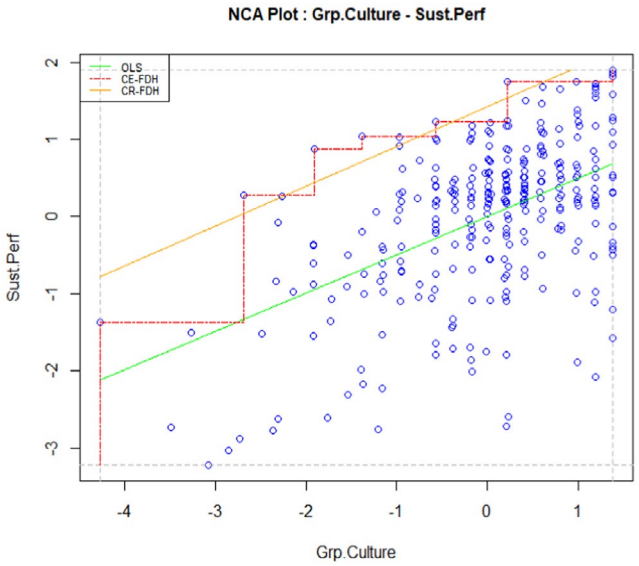


**FIGURE 8** | NCA plot between customer learning and sustainability performance.

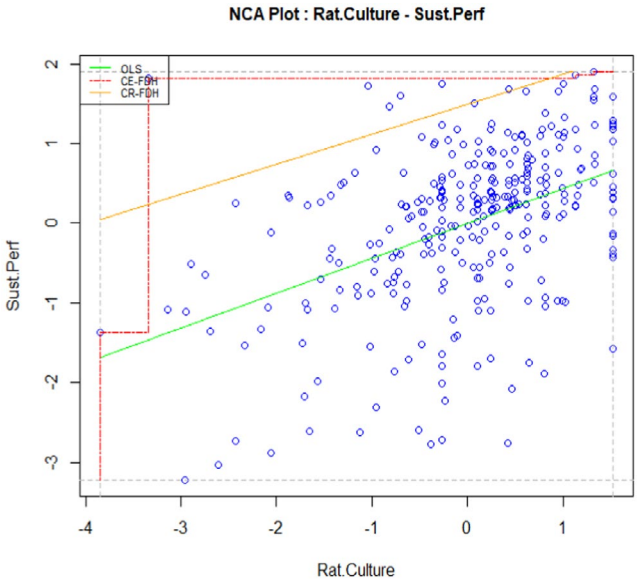


**FIGURE 9** | NCA plot between customer learning and sustainability performance.

workshops with suppliers and customers), and prioritize collaborative strategies to achieve higher SP. Notably, the creativity, innovation, long-term orientation, and external focus inherent in this culture can be harnessed by firms in Ghana and other low-income EEs to cultivate requisite knowledge from employees and supply chain partners. Such knowledge can be instrumental in integrating sustainability into supply chains, aligning with extant literature that highlights SCL's pivotal role in enhancing corporate sustainability.

Group culture, which emphasizes teamwork and relationships, positively influences SP, supporting claims that collaboration underpins sustainable practices (Dunphy 2003; Linnenluecke and Griffiths 2010; Osei et al. 2023; Wijethilake et al. 2023). Like developmental culture, it fosters continuous learning, co-creation, and adaptability. Osei et al. (2023) highlight its role in forming intra- and inter-organizational sustainability teams that regularly strategize to improve SP. In Ghana and similar EEs, embracing group cultural values can help reshape employee mindsets toward sustainability while enhancing access to critical knowledge and skills through SCL. Joint learning initiatives further promote openness and knowledge exchange across organizational boundaries. Nonetheless, while group culture provides a strong foundation, achieving higher SP also requires complementary strategies such as SCL (Osei et al. 2023).

Rational culture, which leverages incentives to motivate employees, positively influences sustainability implementation and SP (Linnenluecke and Griffiths 2010; Wijethilake et al. 2023). While Merriman et al. (2016) and Wijethilake et al. (2023) emphasize incentives as critical drivers of sustainability adoption, Osei et al. (2024) argue that stakeholder pressures for

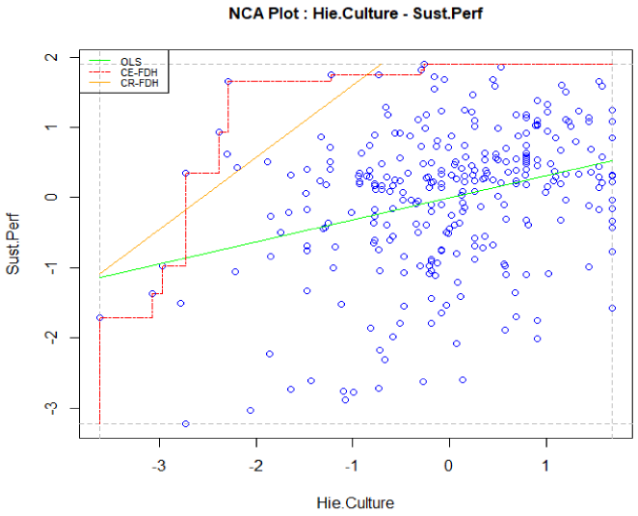


**FIGURE 10** | NCA plot between customer learning and sustainability performance.

sustainability now render such incentives redundant. However, this study reveals a positive link between rational culture and sustainability outcomes, suggesting that incentive packages enhance employee commitment, foster learning from internal and supply chain partners, and promote agility in adopting innovative sustainability practices. By prioritizing transparency and objective evaluation, rational culture ensures sustainability practices are monitored, measured, and refined.

For firms in Ghana and similar EEs, where resource constraints and stakeholder pressures coexist, rational culture offers a pragmatic pathway to sustainability integration. Incentivizing employees can counterbalance institutional voids (e.g., weak regulatory enforcement) by aligning individual goals with organizational sustainability targets. Additionally, fostering transparency through rational cultural values builds trust with global partners, obtains valuable information through SCL, enabling firms to meet international sustainability standards while addressing local socio-environmental challenges. However, based on the results from the NCA, rational culture is not a precursor for sustainability. Meaning, struggling firms in low-income EEs should dwell on rational culture as a last resort in encouraging sustainability in their firms, as incentives are not particularly critical in this paradigm of sustainability.

Empirical evidence suggests that hierarchical culture, defined by rigidity and command-and-control structures, can positively influence SP. While often criticized for stifling innovation, such cultures promote accountability, regulatory compliance, and procedural discipline, all of which are essential for advancing sustainability goals (Formentini and Taticchi 2016; Osei et al. 2023, 2024). Control-oriented environments help prevent noncompliance and align employees with sustainability objectives, supporting internal cohesion and SCL. However, as noted by (Gong et al. 2022; Osei et al. 2023; Rizzi et al. 2023), hierarchical cultures must be balanced with adaptive strategies like SCL to enhance SP outcomes. In Ghana and similar EEs, hierarchical culture offers dual benefits: codifying sustainability practices in weak regulatory contexts and mitigating risks of informal or illicit activities. When paired with SCL, it enables firms to blend local knowledge and global standards, fostering a compliance–innovation balance critical for long-term sustainability.

Assoratgoon and Kantabutra (2023) theorize OC as a critical enabler of corporate sustainability, structured across three interconnected tiers: (1) foundational assumptions and belief systems, (2) norms and values, and (3) observable artifacts. Aligning with this framework, we posit that these cultural dimensions under the CVF underpin an organization's mission, strategic orientation, and operational structure (Linnenluecke and Griffiths 2010), which materialize through iterative organizational learning processes. For firms in EEs, such as Ghana, this conceptualization positions SCL as a critical enabler of sustainability initiatives, as it facilitates the internalization and execution of cultural values across value chains. Extending this perspective, we argue that corporate sustainability in firms, especially in low-income EEs, is inherently defined by *continuous learning*, *adaptation*, and *transformational alignment of value chains* amid escalating sustainability risks.

For firms in low-income EEs like Ghana, our findings, aligned with (Huo et al. 2021; Silvestre et al. 2020), thus, localized training and peer knowledge sharing enable firms to absorb external sustainability insights despite infrastructural gaps. Hierarchical cultural attributes enforce compliance with sustainability standards, while integrating SCL (Ong et al. 2021) counteracts rigidity via collaborative initiatives (e.g., supplier workshops). Group and developmental cultures, resonant with collectivist African values, amplify SP by institutionalizing SCL as a bridge between cultural intent and actionable outcomes. This approach leverages Ghana's communal ethos, formalizing informal networks into sustainability coalitions (e.g., eco-efficient practices in supplier partnerships). By pairing hierarchical accountability with community-driven learning, firms align global benchmarks with local practices, addressing challenges like erratic regulation while capitalizing on adaptive resilience. SCL's mediating role ensures cultural frameworks translate into scalable, context-sensitive SP gains, transforming systemic constraints into opportunities for sustainable value creation.

## 5 | Contribution to Theory

Recent scholarship (Osei et al. 2023, 2024; Wijethilake et al. 2023) points to a critical gap in empirical research on how the CVF dimensions impact SP, particularly in EEs. This study addresses that gap by examining these relationships in sub-Saharan Africa, a region largely overlooked in prior research. While existing studies report mixed findings and focus primarily on developed contexts, Wijethilake et al. (2023) provide rare evidence from Sri Lanka supporting the relevance of all four CVF cultures for sustainability implementation. In contrast, research from the UK and Greece (Osei et al. 2023, 2024) highlights only developmental, group, and hierarchical cultures as key drivers of SP.

Consistent with Wijethilake et al. (2023), this study affirms the importance of all CVF cultural dimensions in enhancing the social, economic, and environmental performance of Ghanaian manufacturing firms. These findings extend the discourse on the applicability of the CVF in under-researched EEs and

highlight the need for context-specific investigations to reconcile inconsistencies in the existing literature. By employing both PLS-SEM and NCA, this study contributes a dual-method perspective, where SEM identifies the strength and direction of relationships, and NCA reveals boundary conditions and necessity logic. This complementary approach enriches our understanding of the causal and predictive mechanisms underlying SP. NCA results further reveal that all SCL types, internal, customer, and supplier learning, are necessary for enhancing SP in EEs. However, among the CVF cultural types, rational culture is the only one not found to be a necessary precursor, while the remaining types (group, developmental, and hierarchical) are critical.

This study further clarifies the mediating role of SCL, both individually and collectively, in linking CVF cultural dimensions (group, developmental, rational, and hierarchical) to SP in EEs. While Silvestre et al. (2020) theorized SCL's mediating potential in strategic implementation, empirical validation has been lacking. Addressing this gap, our findings show that SCL significantly mediates the relationship between cultural orientations and SP in Ghanaian manufacturing firms. Importantly, the results suggest that even with sustainability-oriented cultures in place, firms in low-income economies require the deliberate integration of SCL internally and across supply chains to achieve high SP. This highlights SCL as a crucial mechanism for translating cultural values into concrete sustainability outcomes, advancing both theoretical understanding and practical insight into contextual mediators of SP implementation.

This study contributes to ongoing empirical debates on the role of SCL in firm performance across EEs (Bessant et al. 2003; Yang et al. 2019; Huo et al. 2021), with a specific focus on its underexplored influence on SP. While prior research recognizes both individual and collective SCL dimensions as enablers of SP (Huo et al. 2021; Gong et al. 2018), findings remain context-dependent. For instance, Gong et al. (2018) highlight the role of collective learning in multi-tier supply chains via resource orchestration, whereas Huo et al. (2021) affirm the effectiveness of individual learning dimensions across environmental, social, and economic outcomes. In contrast, our findings reveal that internal and supplier learning are the primary SCL drivers of SP in Ghanaian firms, diverging from broader claims in the literature. This may reflect contextual limitations, such as a largely local customer base with low sustainability awareness or influence, thereby challenging universal assumptions. These insights refine theoretical understandings of SCL's operational boundaries and emphasize the need for context-sensitive prioritization of learning mechanisms to optimize SP in low-income economies.

This study addresses a critical gap in the growing literature on the influence of CVF's cultural dimensions on supply chain strategies (Cao et al. 2015; Osei et al. 2023; Wijethilake et al. 2023; Bortolotti et al. 2023), which has yet to explore how individual CVF values facilitate internal and external SCL in EEs. By delineating structural linkages between CVF orientations and SCL, this research advances OC and SCL scholarship, showing that developmental, group, rational, and hierarchical cultures are instrumental in creating environments conducive to knowledge co-creation and collaborative problem-solving across supply networks in low-income economies, such as Ghana. The findings empirically validate that these cultural types underpin SCL by fostering shared assumptions and beliefs essential for iterative learning between focal firms, suppliers, and customers. This challenges views of SCL as merely operational or relational, positioning OC as a foundational enabler of multi-tier learning aligned with strategic sustainability goals. The results recalibrate existing theoretical models to better reflect the interaction between cultural antecedents and knowledge dynamics within resource-constrained, under-researched contexts.

## 6 | Practical Contributions

This study offers important managerial implications for manufacturing firms in low-income, resource-constrained EEs. The findings underscore the need to foster sustainability-oriented cultural values, rooted in the CVF, and embed SCL mechanisms to drive SP. Managers are encouraged to institutionalize cultural frameworks that balance flexibility with hierarchical control (Osei et al. 2023; Wijethilake et al. 2023), while promoting sustainability education, innovation incentives, and cross-functional collaboration. Practical steps may include structured training on sustainable practices and co-creation platforms with suppliers to reduce knowledge asymmetries common in EEs. In parallel, policymakers can enhance these efforts by incentivizing SCL through supplier development subsidies or tax relief for firms adopting sustainable supply chain strategies.

Balancing command-and-control structures (e.g., hierarchical accountability) with adaptive learning (e.g., developmental experimentation) allows firms to maintain operational stability while remaining agile in addressing sustainability challenges. This synergy supports the structured integration of innovation into sustainability initiatives, especially in contexts where local customer awareness is limited. By aligning OC with multi-tier SCL strategies, firms can convert cultural capital into competitive sustainability outcomes, offering a replicable approach for emerging economies facing institutional and resource constraints.

This study highlights the need for managers in EEs, particularly in Sub-Saharan Africa, including Ghana, to institutionalize CVF-aligned cultural values through structured mechanisms such as cross-functional and research and development teams (Osei et al. 2023, 2024). These teams can drive the co-development of sustainability initiatives and facilitate multi-stakeholder engagement across the supply chain. At the same time, hierarchical controls, including incentive structures and formal sustainability policies, should be employed to standardize employee behavior and ensure alignment with SP goals (Eckartz et al. 2012). By integrating collaborative learning platforms with governance-based controls, firms can foster creativity while systematically aligning operations with sustainability imperatives, helping to close implementation gaps common in resource-constrained environments.

This study highlights the imperative for coordinated, cross-tier sustainability initiatives in Ghanaian manufacturing firms and analogous EEs, where focal firms must integrate suppliers and customers, particularly institutional buyers interfacing with end-users, into joint training, supplier development programs,

and collaborative learning platforms. Such multi-stakeholder engagement mitigates risks posed by environmentally irresponsible practices among suppliers or buyers, which undermine SP across supply networks (Gualandris and Kalchschmidt 2016; Jia et al. 2023; Mukandwal et al. 2024). Effective collaboration, however, hinges on pre-existing sustainability-oriented cultural values within focal firms, including internal teams capable of designing and governing these initiatives. By institutionalizing shared learning channels such as workshops, co-designed sustainability metrics, and innovation hubs, firms can align disparate supply chain actors with SP objectives, addressing implementation barriers endemic to resource-constrained EEs. These mechanisms not only operationalize CVF cultural frameworks but also transform supply chains into cohesive ecosystems for sustainability innovation, offering a replicable model for EEs grappling with fragmented institutional support.

## 7 | Conclusions, Limitations, and Future Research

This study examined the relationship between OC, based on the CVF, and SCL in shaping SP within Ghanaian manufacturing firms. OC was operationalized through group, developmental, rational, and hierarchical cultural dimensions, while SCL was categorized as internal, customer, and supplier learning. The findings identify both CVF-aligned cultural values and SCL as critical antecedents of SP. Developmental and group cultures showed the strongest influence, fostering sustainability-oriented innovation and collaboration. Although rational and hierarchical cultures were positively linked to SP, their effectiveness depends on purposeful alignment with sustainability objectives. The significant mediating role of SCL highlights the importance of institutionalized mechanisms for cross-tier knowledge sharing and iterative learning. Notably, rational culture did not emerge as a necessary condition for sustainability implementation, particularly in resource-constrained emerging economies. Based on the results, this means sustainability-oriented cultural values for firms in resource-constrained emerging economies like Ghana are primarily those inherent in group, developmental, and hierarchical cultures.

For practitioners, these findings underscore the importance of prioritizing developmental cultural frameworks that promote long-term sustainability, innovation, and group-oriented collaboration, supported by incentive structures aligned with SP goals. At the same time, hierarchical and rational cultural elements should be strategically leveraged to strengthen accountability and procedural discipline in sustainability implementation. To translate these cultural values into measurable outcomes, firms must embed robust SCL mechanisms, such as internal training, supplier development programs, and customer engagement initiatives that enable continuous learning across the supply chain.

While this quantitative study identifies significant relationships between OC, SCL, and SP, its design inherently limits exploration of latent cultural complexities, such as subcultural tensions and informal knowledge networks, which are critical to implementation. To address this, future research should prioritize mixed-methods designs—combining ethnography, network analysis, or narrative inquiry with longitudinal tracking—to uncover how micro-cultural dynamics sustain or undermine SCL and SP over time. A particularly compelling avenue would leverage a subculture-sensitive, multi-model methodology, examining how the cultural dimensions under the CVF and other subcultural practices (e.g., operations vs. sustainability teams) create friction or synergy in SCL and sustainability adoption—a missed but potent hook in this study.

Furthermore, cross-contextual comparisons across socioeconomic regions would significantly advance theory: contrasting findings from EEs (e.g., Brazil, India) with those from developed contexts (e.g., Germany, Japan) could reveal whether cultural antecedents like rational culture function as universal necessities or context-contingent enablers. Such comparisons would test if institutional voids amplified specific cultural dimensions (e.g., Hierarchy as a stabilizer) and expose hidden cultural contingencies in global supply chains. Finally, probing bidirectional relationships—how successful SCL reciprocally reshapes OC (e.g., fostering adhocracy through innovation wins)—would refine models of cultural adaptability in under-researched EEs.

### Author Contributions

All authors have participated fully in (a) conception and design, or collection, analysis, and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content; and (c) approval of the final version.


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### Conflicts of Interest

The authors declare no conflicts of interest.

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**Appendix A**

| Variables | Indicators | Factor loadings |
|---|---|---|
| | Sustainable performance (Sarkis 2006; Vachon and Klassen 2008; Hassini et al. 2012; Kang et al. 2018; Osei et al. 2023) | |
| Environmental performance | Over the past years our firm has been able to... | |
| | a. reduce its water consumption | 0.743 |
| | b. reduce its energy consumption | 0.782 |
| | c. monitor and reduce carbon emissions | 0.678 |
| | d. recycle waste products into usable materials | 0.750 |
| | e. reduce its material extraction and usage from the environment | 0.670 |
| Social performance | Our firm has been able to.... | |
| | a. establish societal projects | 0.467** |
| | b. improve the health and safety conditions of employees | 0.801 |
| | c. ensure consistent training and development of employees | 0.887 |
| | d. ensure equal opportunity for advancement for all employees | 0.814 |
| | e. introduce measures to reduce or avoid employee slavery | 0.748 |
| Economic performance | Our firm has been able to | |
| | a. reduce the cost to increase profit | 0.776 |
| | b. satisfy customers with services and timely delivery | 0.766 |
| | c. control the overall cost of maintaining the supply chain and the operations | 0.838 |
| | d. produce high quality products | 0.831 |
| | e. invest in profitable projects | 0.600 |
| | Supply chain learning (Huo et al. 2021; Gong et al. 2018) | |
| Internal learning | In our company | |
| | a. internal functions communicate a lot of product information with each other | 0.852 |
| | b. internal functions communicate a lot of innovative information with each other | 0.883 |
| | c. internal functions learn a lot of valuable things from each other | 0.885 |
| | d. knowledge communication among internal functions promotes the adoption of new technology | 0.859 |
| | e. internal functions evaluate whether they have applied product knowledge from other functions | 0.844 |
| Supplier learning | Our company.... | |
| | a. acquires substantial production information from our primary supplier | 0.814 |
| | b. Our primary supplier provides us with critical and valuable information for product innovation | 0.830 |
| | c. As a part of product development, our company learns a great deal from our primary supplier | 0.887 |
| | d. Our company applies the knowledge learned from our primary supplier in new technology adoption | 0.832 |
| | e. Our company has systematic checks to ensure that the knowledge from our primary supplier is utilized | 0.831 |

| Variables | Indicators | Factor loadings |
|---|---|---|
| Customer learning | a. Our company acquires substantial production information from our major customer | 0.78 |
| | b. Our primary customer provides us with critical information for product innovation | 0.874 |
| | c. As a part of product development, our company learns a great deal from our major customer | 0.870 |
| | d. Our company applies the knowledge learned from our major customers in new technology adoption. | 0.846 |
| | e. Our company has systematic checks to ensure that the knowledge from our major customers is utilized | 0.804 |
| Organizational culture (Naor et al. 2008; Liu et al. 2009; Cameron and Quinn 2005, 2006; Cao et al. 2015; Yunus and Tadisina 2016; Porter 2019; Organizational Culture Assessment Instrument) | Development culture | |
| | a. Our organization emphasize grow through developing new ideas. Generating new products or service is important | 0.803 |
| | b. The firm is a very dynamic and entrepreneurial place, always encouraging people to initiate and manage change | 0.837 |
| | c. Our commitment to innovation and development is the glue that holds our organization together. | 0.820 |
| | d. Leaders always encourage employees to introduce creative ideas, and the development of new of products/services is key | 0.830 |
| | e. My organization is very production-oriented, and long-term focused | 0.774 |
| | f. my organization emphasizes growth and the acquisition of new resources. | 0.744 |
| | Group culture | |
| | a. Winning in the marketplace, outpacing the competition, and acquiring resources through teamwork is key | 0.775 |
| | b. Much emphasis is placed on task and goal accomplishment | 0.850 |
| | c. Our supervisors focus on empowering employees to use teamwork to attain firm objectives | 0.814 |
| | d. Teams are encouraged to be loyal and maintain mutual trust | 0.819 |
| | e. The company expects the utmost achievement of productivity and efficiency through teamwork | 0.814 |
| | Rational culture | |
| | a. Our firm's incentive system scheme encourages people in the firm to pursue the company's laid-down objectives | 0.831 |
| | b. The incentive scheme is fair in rewarding people who contribute the most of our objectives | 0.818 |
| | c. The incentive scheme enables the firm to maintain full internal control | 0.779 |
| | d. The incentive scheme creates strong competition among the employees to achieve the objectives of the firm | 0.854 |
| | e. The incentive system encourages employees to pursue product and process quality | 0.822 |
| | Hierarchical culture | |
| | a. The firm is a controlled and structured place and formal procedures generally govern what we do | 0.831 |
| | b. Every small matter has to be referred to someone higher up in the organizational structure for a final answer | 0.738 |
| | c. Every decision needs the CEO's approval | 0.704 |
| | d. Little action is taken until a line manager or divisional supervisor approves a decision | 0.642 |

## Appendix B

**Multicollinearity Diagnostics (Structural VIFs)**

| | Customer learning | Economic performance | Environmental performance | Internal learning | Social performance | Supplier learning |
|---|---|---|---|---|---|---|
| Customer learning | | 2.147 | 2.147 | | 2.147 | |
| Development culture | 2.967 | 3.209 | 3.209 | 2.967 | 3.209 | 2.967 |
| Group culture | 2.820 | 3.284 | 3.284 | 2.820 | 3.284 | 2.820 |
| Hierarchical culture | 1.296 | 1.311 | 1.311 | 1.296 | 1.311 | 1.296 |
| Internal learning | | 2.723 | 2.723 | | 2.723 | |
| Rational culture | 1.697 | 1.708 | 1.708 | 1.697 | 1.708 | 1.697 |
| Supplier learning | | 2.474 | 2.474 | | 2.474 | |

## Appendix C

**Group Statistics (Small vs. Medium-Size)**

| | What is the number of employees available at the company? | *N* | Mean | Std. deviation | Std. error mean |
|---|---|---|---|---|---|
| ENVPerf | 6–29 Employees | 151 | 4.5828 | 1.20376 | 0.09796 |
| | 30–99 Employees | 83 | 4.6795 | 1.32810 | 0.14578 |
| SOCPerf | 6–29 Employees | 151 | 5.4225 | 0.93311 | 0.07594 |
| | 30–99 Employees | 83 | 5.6675 | 0.90218 | 0.09903 |
| ECOPerf | 6–29 Employees | 151 | 5.4818 | 0.89797 | 0.07308 |
| | 30–99 Employees | 83 | 5.3253 | 1.12519 | 0.12351 |
| INTLearning | 6–29 Employees | 151 | 5.5722 | 0.89235 | 0.07262 |
| | 30–99 Employees | 83 | 5.5747 | 1.16952 | 0.12837 |
| SUPPLearning | 6–29 Employees | 151 | 5.4109 | 0.94504 | 0.07691 |
| | 30–99 Employees | 83 | 5.6410 | 1.12521 | 0.12351 |
| CUSTLearning | 6–29 Employees | 151 | 5.6172 | 0.87390 | 0.07112 |
| | 30–99 Employees | 83 | 5.6651 | 1.04163 | 0.11433 |
| DEVCulture | 6–29 Employees | 151 | 5.4724 | 0.98984 | 0.08055 |
| | 30–99 Employees | 83 | 5.5622 | 0.97729 | 0.10727 |
| RPCulture | 6–29 Employees | 151 | 5.6172 | 0.93408 | 0.07601 |
| | 30–99 Employees | 83 | 5.6506 | 1.07832 | 0.11836 |
| RATCulture | 6–29 Employees | 151 | 5.4252 | 0.95953 | 0.07809 |
| | 30–99 Employees | 83 | 5.2946 | 1.25616 | 0.13788 |
| HIECulture | 6–29 Employees | 151 | 4.9023 | 1.52123 | 0.12380 |
| | 30–99 Employees | 83 | 4.8614 | 1.26951 | 0.13935 |

**Appendix D**

**Group Statistics Group Statistics (Small vs. Large)**

| | What is the number of employees available at the company? | *N* | Mean | Std. deviation | Std. error mean |
|---|---|---|---|---|---|
| ENVPerf | 6–29 Employees | 151 | 4.5828 | 1.20376 | 0.09796 |
| | 100 or More Employees | 48 | 4.8208 | 1.47849 | 0.21340 |
| SOCPerf | 6–29 Employees | 151 | 5.4225 | 0.93311 | 0.07594 |
| | 100 or More Employees | 48 | 5.2792 | 1.40984 | 0.20349 |
| ECOPerf | 6–29 Employees | 151 | 5.4818 | 0.89797 | 0.07308 |
| | 100 or More Employees | 48 | 5.0625 | 1.42331 | 0.20544 |
| INTLearning | 6–29 Employees | 151 | 5.5722 | 0.89235 | 0.07262 |
| | 100 or More Employees | 48 | 5.3750 | 1.54238 | 0.22262 |
| SUPPLearning | 6–29 Employees | 151 | 5.4109 | 0.94504 | 0.07691 |
| | 100 or More Employees | 48 | 5.3792 | 1.28045 | 0.18482 |
| CUSTLearning | 6–29 Employees | 151 | 5.6172 | 0.87390 | 0.07112 |
| | 100 or More Employees | 48 | 5.5917 | 1.31890 | 0.19037 |
| DEVCulture | 6–29 Employees | 151 | 5.4724 | 0.98984 | 0.08055 |
| | 100 or More Employees | 48 | 5.3403 | 1.34699 | 0.19442 |
| RPCulture | 6–29 Employees | 151 | 5.6172 | 0.93408 | 0.07601 |
| | 100 or More Employees | 48 | 5.4292 | 1.35395 | 0.19543 |
| RATCulture | 6–29 Employees | 151 | 5.4252 | 0.95953 | 0.07809 |
| | 100 or More Employees | 48 | 4.9208 | 1.48165 | 0.21386 |
| HIECulture | 6–29 Employees | 151 | 4.9023 | 1.52123 | 0.12380 |
| | 100 or More Employees | 48 | 4.3021 | 1.27680 | 0.18429 |

**Appendix E**

**Group Statistics (Medium vs. Large)**

| | What is the number of employees available at the company? | *N* | Mean | Std. deviation | Std. error mean |
|---|---|---|---|---|---|
| ENVPerf | 30–99 Employees | 83 | 4.6795 | 1.32810 | 0.14578 |
| | 100 or More Employees | 48 | 4.8208 | 1.47849 | 0.21340 |
| SOCPerf | 30–99 Employees | 83 | 5.6675 | 0.90218 | 0.09903 |
| | 100 or More Employees | 48 | 5.2792 | 1.40984 | 0.20349 |
| ECOPerf | 30–99 Employees | 83 | 5.3253 | 1.12519 | 0.12351 |
| | 100 or More Employees | 48 | 5.0625 | 1.42331 | 0.20544 |
| INTLearning | 30–99 Employees | 83 | 5.5747 | 1.16952 | 0.12837 |
| | 100 or More Employees | 48 | 5.3750 | 1.54238 | 0.22262 |
| SUPPLearning | 30–99 Employees | 83 | 5.6410 | 1.12521 | 0.12351 |
| | 100 or More Employees | 48 | 5.3792 | 1.28045 | 0.18482 |
| CUSTLearning | 30–99 Employees | 83 | 5.6651 | 1.04163 | 0.11433 |
| | 100 or More Employees | 48 | 5.5917 | 1.31890 | 0.19037 |
| DEVCulture | 30–99 Employees | 83 | 5.5622 | 0.97729 | 0.10727 |
| | 100 or More Employees | 48 | 5.3403 | 1.34699 | 0.19442 |

| | What is the number of employees available at the company? | *N* | Mean | Std. deviation | Std. error mean |
|---|---|---|---|---|---|
| GRPCulture | 30–99 Employees | 83 | 5.6506 | 1.07832 | 0.11836 |
| | 100 or More Employees | 48 | 5.4292 | 1.35395 | 0.19543 |
| RATCulture | 30–99 Employees | 83 | 5.2946 | 1.25616 | 0.13788 |
| | 100 or More Employees | 48 | 4.9208 | 1.48165 | 0.21386 |
| HIECulture | 30–99 Employees | 83 | 4.8614 | 1.26951 | 0.13935 |
| | 100 or More Employees | 48 | 4.3021 | 1.27680 | 0.18429 |