

# Circular Economy Entrepreneurship as a Pillar of Circular Supply Chain Sustainability: The Roles of Circular Economy Capability and Net Zero Policy

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## Abstract

The rising global environmental challenges and resource depletion have intensified the need for the reevaluation of traditional supply chain practices. Although much research attention has been given to the circular economy (CE), not much is known about how circular economy entrepreneurship impacts circular supply chain sustainability. Drawing on the practice-based view and using 447 valid cross-sectional data collected through questionnaire survey from supply chain managers of Nigerian manufacturing firms, this examines the influence of circular economy entrepreneurship on circular supply chain sustainability. The mediation role of circular economy capability and the moderation role of net-zero policy were further examined. The proposed relationships were tested using the PROCESS macro. The results show that circular economy entrepreneurship is positively related to circular supply chain sustainability and circular supply chain capability. Circular economy capability is positively related to circular supply chain sustainability and mediates the relationship between circular economy entrepreneurship and circular supply chain sustainability. Net zero moderates circular economy entrepreneurship-circular economy capability link, with the positive relationship stronger among firms high on compliance with zero policy than among firms low on net-zero policy. The indirect link of circular economy entrepreneurship on circular supply chain sustainability through circular economy capability is stronger among firms that are high on compliance with net-zero policy than among firms that are low on net-zero policy. The contributions of this study advance the CE literature, offering new insights that can serve as a reliable reference and provide practical guidance for decision-makers in fostering a sustainable circular supply chain, particularly in emerging economies.

**Keywords** Circular Economy Entrepreneurship · Circular Economy Capability · Net Zero Policy · Circular Supply Chain Sustainability · Manufacturing SMEs.

## 1. Introduction

As sustainable development gains greater attention on the global agenda, there is a growing need for transformative business models that integrate circular economy principles into supply chains. Driven by growing global pressure toward circular economy, firms must adopt sustainable practices not only internally but across their supply chains (Chavez et al., 2023; Rijal et al., 2024). Although emerging studies have explored various organizational strategic approaches and innovations related to circular economy to improve circular supply chain sustainability (e.g., Bag et al., 2025; Zhang & Seuring, 2024), no attention has been given to the specific influence of entrepreneurial actions within this framework on circular supply chain sustainability.

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In both developing and developed economies, initiatives grounded in CE are increasingly gaining attention (Hazen et al., 2021). Central to these initiatives is the transformation of core supply chain management processes, which underpin modern patterns of production and consumption (Hazen et al., 2021). Among different strategies established for economic development, CE has emerged as a concept that enables industries and businesses to achieve dual objectives of profitability and sustainability (e.g., Conca et al., 2025). Recently, circular economy entrepreneurship is attracting increasing attention because the entrepreneurship in CE denotes striving for value creation for the entire system in which the business is a part (Le et al., 2024). This form of entrepreneurship strives to generate value for the broader system with social and ecological value creation central to its purpose (Cullen & De Angelis, 2021). Moreover, at its core, entrepreneurship embodies the ability to identify and exploit business opportunities regardless of existing assets and resources (Sahasranamam et al., 2021).

Circular economy entrepreneurship relates to identifying, assessing, and exploiting entrepreneurial opportunities that are grounded in the principle of circular economy (Cullen & De Angelis, 2021). In recent years, circular economy entrepreneurship has attracted academic interest (Cullen & De Angelis, 2021; Le et al., 2024), and it is an emerging research domain in supply chain sustainability (Bag et al., 2025). Despite recent advances, the literature on circular economy entrepreneurship remains underexplored in terms of its consequences (Baah et al., 2024) and contextual factors (Le et al., 2024). Based on its consequences, emerging empirical studies have focused on technical capability (Rijal et al., 2024), circular economy performance (Baah et al., 2024), and business performance (Mamash et al., 2025), and their different implications for firms. Yet, no attention has been given to circular supply chain sustainability as a consequence of circular economy entrepreneurship. Given this gap in the literature, this study examines the impact of circular economy entrepreneurship on circular supply-chain sustainability.

Emerging studies in the circular economy literature are devoting efforts to investigating the role of circular economy entrepreneurship in achieving circular outcomes (Baah et al., 2023; Le et al., 2023). While these studies have offered valuable insights, no study has considered the role of circular economy capability in the circular economy entrepreneurship-circular supply chain sustainability relationship. Conceptually speaking, circular economy entrepreneurship might be a strategic approach that influences circular supply chain sustainability (Le et al., 2023). Circular economy capability represents organizational abilities and relevant skills (e.g., reduce, reuse, and recycle) integrated into organizational routines and processes to successfully implement circular economy principles (Anderson, 2007; Lombani et al., 2025). A lack of empirical studies on the role of circular economy capability in the context of circular economy entrepreneurship may leave organizations unsure how to achieve circular supply chain sustainability. Moreover, just 2% of sustainability initiatives undertaken by manufacturing firms succeed (Chen & Chen, 2019). The situation reflects the rising sustainability issues in global supply chains, creating sustainability and reputational risks for all supply chain partners (Mirzaei et al., 2023).

Emerging studies on circular economy entrepreneurship and circular outcomes have mainly used the resource-based view (Baah et al., 2023; Le et al., 2023). Theoretically, organizational routines and capabilities are empowered by the practices it applies rather than the tangible assets it possesses (Singh & Mathiyazhagan, 2024). To address this theoretical gap, this study adopts the practice-based view (PBV), which posits that firm capability and desired outcomes emerge from the integration and routinization of everyday practices (Bromiley & Rau, 2014). Circular economy capability can be considered an organizational capability that influences circular supply chain sustainability, as it depicts an organizational ability to retain control of raw materials and products throughout their lifecycle and to reduce waste, reducing an organization's environmental footprint across the supply chain (WEF, 2024). However, circular economy capability is not an inherent characteristic of a firm; it must be deliberately developed, and it emerges from routinized practices to actualize its full potential. From this standpoint, first, organizations must possess routinized circular economy practices before they can effectively leverage and develop circular economy capability. Fortunately, circular economy entrepreneurship, as a key practice, gives organizations the opportunity to improve their circular economy capability. This is because the core premise of circular economy entrepreneurship is that it aids in building different forms of organizational capabilities, particularly in small firms (Baah et al., 2023; Mansidão & Alves, 2024).

Empirical studies of the mechanisms underlying how circular entrepreneurial initiatives translate into operational sustainability in the supply chain are rare. Hence, it is critical to shed light on the underlying circular processes that explain how circular economy entrepreneurship is likely to yield desired improvement

in circular supply chain sustainability (Le et al., 2023; Le et al., 2024). One possible mechanism is circular economy capability (Anderson, 2007).

Furthermore, empirical studies on policy-related contextual factors (i.e., the conditions) under which circular economy entrepreneurship influences its consequences remain limited (Le et al., 2023). Emerging research suggests that contextual factors, such as environmental dynamism, strengthen circular economy entrepreneurship and circular solution processes (Baah et al., 2023). Further, prior studies suggest policies shape sustainability in the supply chains (e.g., Kazancoglu et al., 2021) and government policies are one of the critical factors to implement circular economy (García-Quevedo et al., 2020). Net zero policy aligns with the objectives of CE to reduce waste and boost resource efficiency by reducing gas emissions (Balsalobre-Lorente et al., 2025). However, during transition and infrastructural change in the supply chain, net zero policy may encourage putting pressure on firms to adapt their supply chains and transition to CE to accomplish sustainable development (Garg et al., 2025). Despite this, not much is known regarding the conditions under which circular economy entrepreneurship promotes circular supply chain sustainability. Thus, drawing on the practice-based view, this study proposes an integrated conceptual framework (Figure 1) that explores the influence of circular economy entrepreneurship on circular supply chain sustainability through the indirect role of circular economy capability, using sample data collected from Nigerian manufacturing SMEs. Further, the research examines whether the direct and indirect relationships are reliant on net zero policy.

Taken together, this study aims to make at least four contributions. First, using data collected from various manufacturing SMEs from an emerging economy context, this study aims to advance emerging studies (Baah et al., 2024; Le et al., 2024) by demonstrating how entrepreneurial actions within CE framework influence circular supply chain sustainability. Second, an emerging study demonstrates that circular economy entrepreneurship influences sustainability outcomes (Baah et al., 2024). However, the literature lacks how this process develops. This study introduces circular economy capability as the mechanism that might explain how circular economy entrepreneurship influences circular supply chain sustainability. With this in mind, this research aims to bridge the knowledge-practice gap by providing empirical evidence on the enabling role of circular economy entrepreneurship in enhancing circular economy capability towards circular supply chain sustainability.

Third, this research responds to the call to investigate essential contextual parameters critical to circular economy, entrepreneurship, and sustainability outcomes (Baah et al., 2024). By identifying net zero policy as a new policy-related condition that bridges the relationship between circular economy entrepreneurship, circular economy capability, and circular supply chain sustainability. Accordingly, this study aims to reveal the “black box” of the proposed predictor (circular economy entrepreneurship) on circular economy capability and circular supply chain sustainability are reliant on different levels of net zero policy, a distinct contribution not present in the existing literature. Fourth, this study aims to provide new insights that extend the practice-based view into the circular economy entrepreneurship and circular supply chain sustainability research streams by demonstrating its validity in this new context. Finally, this research aims to provide practical strategies for firms to foster circular economy entrepreneurship and circular economy capability, and to manage net-zero policies for improved circular supply chain sustainability.

The remainder of the article is structured as follows. First, the suitability of the underlying theory. The theoretical framework and the study’s proposed hypotheses are then presented. Next, the study methodology and how the data were discussed. Then, a discussion of the findings and their theoretical and practical implications for policymaking is presented. Finally, the paper concludes with a discussion of its limitations and suggestions for future research.

## 2. Theoretical background

### 2.1. Practice-based view (PBV)

PBV conceptualizes that a firm’s routines and capabilities are determined by the practices and patterns it adopts. In contrast to the resource-based view, PBV emphasizes actual actions and how operational activities are organized and performed, rather than focusing on tangible assets (Bromiley & Rau, 2014). PBV posits that it is adopting distinctive practices, continuously refining and reintegrating them, that yield desired

outcomes (Dubey et al., 2022). Based on this, operations management scholars are beginning to adopt PBV to explain organizational practices and change processes across various areas, such as humanitarian supply chains, digitalization, and sustainability (Abuzawida et al., 2023; Bag, 2025; Bromiley & Rau, 2014; Dubey et al., 2022). PBV was developed as a theoretical framework for understanding how organizational routine changes are driven by the evolution of practices within specific contexts (Bromiley & Rau, 2014).

This study adopts PBV because it is well-suited to this research. Practices are explicitly defined as socially embedded actions or repetitive activities that organizations undertake to accomplish designated objectives (Li et al., 2024). In this research, circular economy entrepreneurship can be considered a practice because it involves not only the systematic adoption of circular economic principles into entrepreneurial actions, but also a fundamental shift in how organizations interact with partner firms (Baah et al., 2024). Further, PBV posits that practices can lead to changes in capabilities, which in turn influence desired outcomes (Bromiley & Rau, 2014). The current research considers circular economy capability as a key capability. Circular economy capability entails the organizational ability to integrate reduce, reuse, and recycle practices to cut environmental harms and boost efficiency (Anderson, 2007) to align with evolving business conditions. This capability is central to understanding how circular economy entrepreneurship impacts circular supply chain sustainability. Moreover, net-zero policy is also positioned as a critical organizational condition that can explain why organizations adopting identical practices may still accomplish different circular supply chain sustainability improvements.

Figure 1 presents the integrated theoretical framework depicting the study's key constructs and their interrelationships.

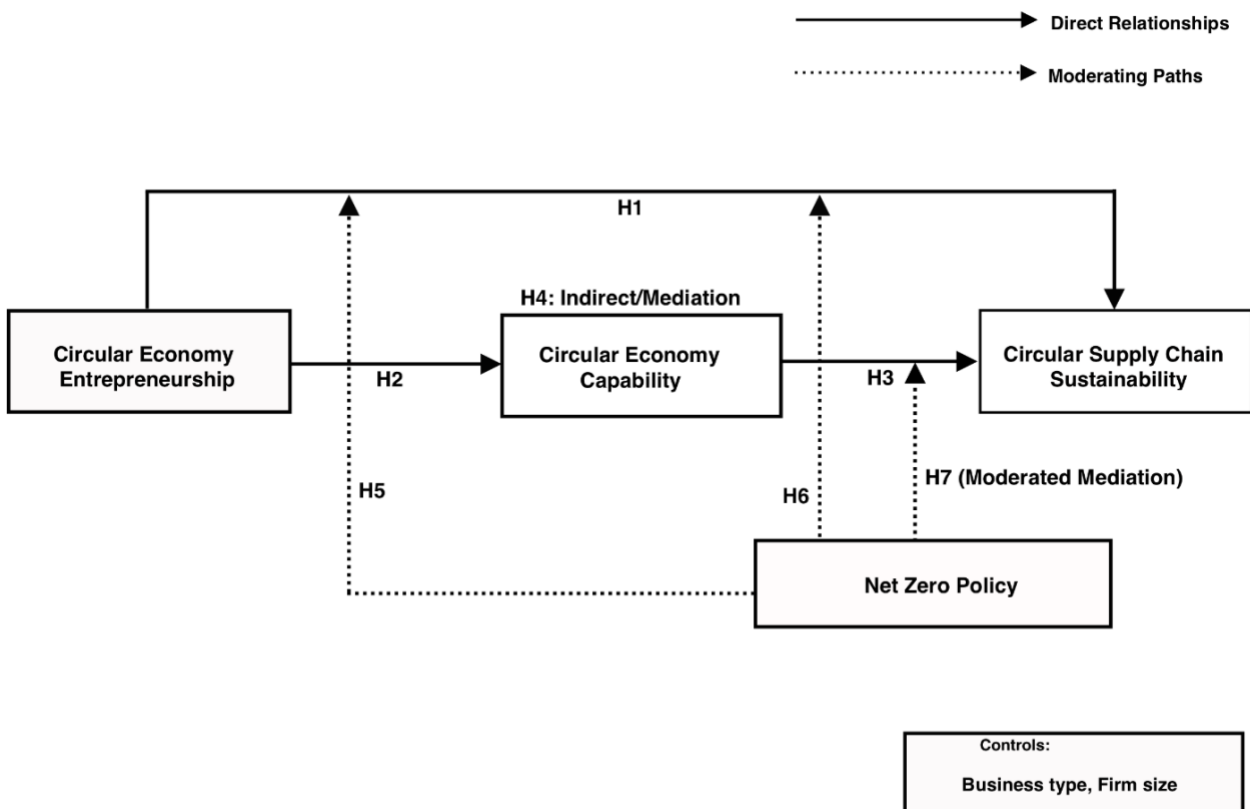


Figure 1. Research framework

## 2.2. Circular economy entrepreneurship

Entrepreneurship, in essence, constitutes a value-creating process that drives economic development (Kim et al., 2021). Circular economy entrepreneurship involves recognizing and exploiting opportunities grounded in circular economic principles (Cullen & De Angelis, 2021). From this standpoint, Le et al. (2024)'s study

highlights that all organizations' operational activities are conducted in a way that integrates social and environmental considerations in pursuit of sustainable development. It goes beyond traditional linear systems to build resilience and profitable enterprises (Cullen & De Angelis, 2021). Accordingly, this approach connects entrepreneurship with the wider CE concept, emphasizing recyclable and reusable designs to minimize waste and improve operational efficiency.

Contrasting with traditional entrepreneurship, circular economy entrepreneurship captures not just business entities' goal of capturing market and generating value, but also the desire to protect the environment and achieve environmental and social values (Reddy, 2020). In addition, from an uncertainty perspective, including major supply chain disruptions, the COVID-19 pandemic, natural disasters, and conflict in some nations, the need for flexibility in how entrepreneurial firms strategize, lead, and govern becomes extremely critical (Ayad et al., 2025; Dhar et al., 2022). In this vein, and in line with the current research's objectives, circular economy entrepreneurship is considered a key practice for transitioning from conventional rigidity, depending on the given context, provided that such flexibility supports sustainable development. In the supply chain management context, circular economy entrepreneurship is essential for embedding the principles of CE into supply chain processes, such as facilitating industrial symbiosis to achieve desired objectives (Le et al., 2023).

### **2.3. Circular supply chain sustainability**

Although there is limited conceptual consensus on the CE framework, particularly regarding sustainability, the supply chain management domain has adopted the circular concept, shifting focus to the nascent field of circular supply chain management (Bag et al., 2025; Lahane et al., 2020). From a sustainability standpoint, CE principles can enhance efforts to integrate long-term development targets into supply chains (Montag, 2023). However, the conceptualization of circular supply chain sustainability remains in its infancy. Despite this, supply chain management scholars highlight that to successfully implement a circular model, the role of sustainable supply chain management is crucial (Bag et al., 2025; Kazancoglu et al., 2021; Van Buren, 2016). A sustainable supply chain is the strategic integration of information, materials, and capital flows across the supply chain to achieve sustainable development (Narimissa et al., 2020). A sustainable supply chain is critical to CE principles because it transforms the entire value chain (Van Buren, 2016). However, a circular supply chain primarily aims to intensify, dematerialize, slow, close, and minimize resource loops (Geissdoerfer et al., 2018). While supply chain sustainability focuses on the realization of long-term sustainable targets in the supply chains (Bag et al., 2025), circular supply chain offers the benefits of redirecting used products as waste by recycling and reusing them in the production of secondary products (Gotschol, 2014).

### **2.4. Circular economy entrepreneurship and circular supply chain sustainability**

Sustainability in entrepreneurship serves as a value-generating process that promotes economic, social, and environmental development (Kim et al., 2021). From the PBV framework, corporate outcomes are not only determined by capabilities or static resources, but more fundamentally by the integration of transferable, observable, and specific practices that become routinized within enterprises (Bromiley & Rau, 2014). Based on this framework, disparities occur because enterprises selectively adopt a series of practices that match with strategic objectives (Dong & Wang, 2022). Circular economy entrepreneurship can be regarded as a useful concept where such practices arise and become institutionalized. Entrepreneurial firms adopting circularity in their operations pursue a regenerative system through specific practices such as refurbishing/reusing, remanufacturing, recycling, and repairing (Geissdoerfer et al., 2017). Such entrepreneurial activities introduce routinized practices that permeate the entire supply chain, redefining the material and energy flow among distributors and suppliers (Le et al., 2023).

Furthermore, circular supply chains require a cohesive integration of upstream and downstream actors, with a focus on lifecycle extension, take-back programs, design for circularity, and collaborative engagement with stakeholders (Batista et al., 2018; Kazancoglu et al., 2020). This study anticipates that circular-economy entrepreneurship will likely impact circular supply chain sustainability. Prior studies suggest that entrepreneurial firms, through demonstrative circular practices and collaborations, may influence their

supply chain partners to adopt circularity-enhancing practices, because shared standards among supply chain members diffuse circular practices (Aarikka-Stenroos et al., 2022; Veleva & Bodkin, 2018). Within the PBV framework, this study argues that entrepreneurial firms, which this study terms as circular economy entrepreneurship, can serve as a catalyst that introduces new routines or practices that challenge linear routines and stimulate supply chain partners to exploit sustainable opportunities and integrate them into their operational routines, specifically in emerging economies where traditional manufacturing enterprises lack the strategic orientation to initiate these transition on their own. Thus, this study posits that:

- H1: Circular economy entrepreneurship has a direct positive relationship with circular supply chain sustainability

## 2.5. Circular economy entrepreneurship and circular economy capability

Transition in business orientation often requires firms to adapt their routine practices (Ul-Durar et al., 2023). Within the PBV framework, capabilities are not inherently owned assets but developed through consistent deployment of integrated practices. In the literature, theoretical explanations suggest that circular entrepreneurship promotes efficiency and system capabilities for the effective conservation and use of natural resources (Cullen & De Angelis, 2021; Baah et al., 2024). Despite this, the exact link between circular economy entrepreneurship and circular economy capability remained unexamined. Moreover, it has been argued that circular economy entrepreneurship is a strategic approach that enables organizations to detect and capitalize on business opportunities within the CE context. Baah et al. (2024) further elaborate that when organizations identify CE opportunities, they activate the procedures needed to develop the technical capability to fully exploit them. Thus, circular economy entrepreneurship has the potential to stimulate innovation and creativity and to support the advancement of technical know-how (Rijal et al., 2024).

Furthermore, circular business practices stimulate operational routines and specialized knowledge that enhance their ability to manage eco-designs and circular flows (De Sousa Jabbour et al., 2019; Scarpellini et al., 2020). Research found that the entrepreneurial adoption of circular principles promotes the development of capabilities (Baah et al., 2024). Research also demonstrated that manufacturing firms integrating CE innovations depend on capabilities such as adaptive learning and experimentation (Bocken et al., 2021; Ul-Durar et al., 2023). In line with the PBV, this study argues that circular economy capability emerges from the repeated adoption of circular practices, and not only from static resource positioning. Based on the above discussion and arguments, this study proposes that:

- H2: Circular economy entrepreneurship has a direct positive relationship with circular economy capability

## 2.6. Circular economy entrepreneurship, circular economy capability, and circular supply chain sustainability

Circular economy capability supports the institutionalization and implementation of practices such as waste recovery, reverse logistics, waste minimization, material flow optimization, and product life cycle management (Anderson, 2007; Ding et al., 2023). In the CE context, developing “3R” capabilities such as recycle, reduce, and reuse (Rovanto & Virtanen, 2025; Zorpas, 2024) is essential for attaining long-term sustainability goals (Khajuria et al., 2022). From this standpoint, prior studies highlight that firms with well-developed capabilities can navigate the complexity of the circular supply chain, such as stakeholder engagement and closed-loop logistics (Sudusinghe & Seuring, 2022; Sandberg, 2023). Thus, firms must build circular economy capability to effectively execute circular supply chain for sustainable outcomes. Moreover, the current research argues that by developing circular economy capability, firms can seize market opportunities to improve sustainable supply chains in the circular economy context.

Circular economy capability represents the technical know-how that enables organizations to integrate circular practices effectively. Such capabilities enable organizations to optimize internal circular activities such as resource recovery and waste reduction (Zorpas, 2024), while also improving collaboration with supply chain members to minimize waste, close resource loops, and design products for reuse (Sandberg, 2023). Although it may be challenging for manufacturing SMEs in emerging economies to develop circular

capabilities due to their small size and resource constraints, this study argues that by routinizing circular economy entrepreneurship practices, firms can efficiently and effectively utilize their limited resources to develop the CE capabilities needed to capitalize on emerging CE opportunities. Moreover, when circular economy entrepreneurship practices are routinized within firm processes and used to drive circular economy capability, it can trigger a chain reaction across the entire supply chain, positively influencing sustainability outcomes.

Furthermore, in the CE context, through circular economy capabilities, firms can streamline production processes needed to proactively innovate, minimize pollution, and develop environmentally friendly products (Coppolla et al., 2023). Adopting circular practices through the development of technical capabilities aligns with the procurement and use of raw materials in an ecological manner, which underlie reduce, reuse, and recycle (Liu et al., 2023). This study further proposes that circular economy entrepreneurship facilitates continuous recognition and exploitation of circular economy-related entrepreneurial opportunities and promotes circularity practices within the supply chains. Consistent with the PBV framework, SMEs can leverage circular economy capability to operationalize entrepreneurial initiatives that optimize resource use across their supply chain networks and drive circular supply chain sustainability.

Lastly, within the PBV framework, it is critical to highlight that although circular economy entrepreneurship facilitates continuous exploitation of circular opportunities, it is circular economy capability that determines how these circular economy-entrepreneurial practices are operationalized within an enterprise's operational processes. Simply put, circular economy capability serves as a bridge, ensuring that circular economy entrepreneurship is not merely a routinized practice but how value chain architectures are reconfigured that ultimately drive circular supply chain sustainability. In this vein, circular economy entrepreneurship alone may not guarantee the desired success, but the capability to reconfigure value chain architectures that convert exploitation of circular opportunities into desired outcomes. Thus, this study posits the following:

- H3: Circular economy capability has a direct positive relationship with circular supply chain sustainability
- H4: Circular economy entrepreneurship enhances circular supply chain sustainability by improving circular economy capability

## 2.7. The role of net-zero policy as a moderator

Net-zero policies aim to strike a balance between greenhouse gas emissions and those removed from the atmosphere. Such policies are commonly formulated via national targets, such as those developed under the Paris Agreement (UNFCCC, 2023) or corporate targets (SBTi, 2025). Based on this, recent studies highlight that such policies prompt firms to reconsider their operational practices by introducing regulations such as emission quotas, renewable energy targets, and carbon pricing (e.g., Haites et al., 2024). In the supply chain context, it has been highlighted that net zero requires a shift away from traditional linear supply chain management and design, promoting low-carbon circular models as viable substitutes (Garg et al., 2025). For example, through the Energy Transition Plan, the Nigerian government committed to achieving net zero emissions by 2060, supported by the Climate Change Act 2021, which provides a framework for decarbonization and offers green bonds (ETF, 2025).

Net-zero policies apply direct pressure on firms and supply chain networks by mandating emission reductions and integrating sustainability practices (Singh, 2025). Despite this, net zero policy as a policy-related condition on the relationship between circular economy entrepreneurship, circular economy capability, and circular supply chain sustainability remains unresearched. Based on this, this study proposes net-zero policy as a condition that can strengthen the relationships in the current study research framework, which will be discussed below.

As mentioned earlier, within the PBV framework, circular economy entrepreneurship introduces circular principles that define firms' everyday operational activities. However, net-zero policies provide regulations or incentives, such as penalties for linear waste or subsidies for low-emission supply chains (Garg et al., 2025), which can further promote the adoption of circular economy entrepreneurship practices into organizational operations. Research on decarbonization in the supply chain indicates that policy-driven incentives further strengthen the relationship between catalysts such as advanced digital technologies and sustainable capabilities, allowing organizations to reconfigure routines for closed-loop operations under

emissions ceilings (Ma et al., 2025). Consistent with the PBV perspective, this study argues that, under stringent net-zero regulations, circular economy entrepreneurship practices are likely to be formalized, resourced, and embedded into organizational operating standards, creating the trigger needed for practices to accelerate circular economy capability development.

Net-zero policy targets incentives and resources that minimize barriers to CE practices (Garg et al., 2025; Kaewunruen et al., 2024). For example, net-zero policies mandate inter-firm alignment by requiring Scope 3 reporting, developing collaborative transition maps, and including supplier decarbonization clauses (Butt et al., 2025). This is an example of how policies facilitate shared practices among supply chain partners (Sudusinghe & Seuring, 2022), synchronizing the use of circular economy entrepreneurship practices to achieve improved sustainable circular outcomes (Baah et al., 2024).

Likewise, net-zero policy can improve circular supply chain sustainability by helping organizations adapt to new boundaries. Empirical evidence among resource-constrained SMEs in Europe indicates that stringent environmental policies facilitate the conversion of ecological practices into circular-oriented capabilities by encouraging investment in circular technologies (Ren & Albrecht, 2023). From the PBV perspective, this study argues that net-zero policy can shift entrepreneurial practices from cost-focused to opportunity-driven, whereby circular-economy entrepreneurship drives the development of circular-economy capability and, in turn, promotes circular supply chain sustainability. Based on the above discussion:

- H5: Net-zero policy moderates the positive relationship between circular economy entrepreneurship and circular economy capability, with the positive relationship stronger among firms high on compliance with zero policy than among firms low on net-zero policy.
- H6: Net-zero policy moderates the positive link between circular economy entrepreneurship and circular supply chain sustainability, such that the positive link is stronger among firms high on compliance with net-zero policy than among firms low on net-zero policy.
- H7: The indirect link of circular economy entrepreneurship on circular supply chain sustainability through circular economy capability is stronger among firms high on compliance with net-zero policy than among firms low on net-zero policy.

### 3. Methods

#### 3.1. Research context

The Nigerian manufacturing industry remains a productive hub of the economy, contributing a significant share of the national GDP (Central Bank of Nigeria, 2026). Specifically, SMEs represent 99% of firms in Nigeria, highlighting their importance to sustainable economic growth. In Nigeria, SMEs contribute over 75% of total employment (Gajere, 2023). However, they are also significant contributors to industrial pollution arising from their supply chain activities, resulting in adverse environmental impacts (Dzikriansyah et al., 2023). Further, the Nigerian manufacturing industry's growth serves as a catalyst for wider industrial growth in West Africa. As the region's largest economy, the sector faces numerous challenges, such as unreliable infrastructure and environmental degradation arising from linear production (Circular Economy in Africa-EU Cooperation, 2020). Moreover, from this standpoint, transitioning to a CE has become a transformative approach that aligns with the Nigerian government's transition plan in sectors such as manufacturing for resource efficiency, waste management, and a decarbonization framework to achieve net zero emissions by 2060 (Circular Economy in Africa-EU Cooperation, 2020; ETF, 2025). The nation's ongoing policy shift, such as national CE efforts and roadmaps in sectors like manufacturing, provides a suitable research context.

Furthermore, Nigeria, an emerging economy, was selected as a suitable research context due to the need for an empirical understanding of essential mechanisms and policy contingencies regarding how firms in emerging economies can achieve circular supply chain sustainability. Thus, it is worth investigating the enabling role of circular economy entrepreneurship in enhancing circular economy capability towards circular supply chain sustainability.

### 3.2. Sampling and data collection

This study employed a multiple respondent cross-sectional survey design to collect data from senior-level managers from Nigerian manufacturing SMEs in the industrial cities of Lagos, Ogun, Port Harcourt, Ibadan, and Kano. These cities serve as hubs of manufacturing and industrial activities in Nigeria (Ogbeibu et al., 2018; Usman & Amran, 2015). The targeted SMEs met the following inclusion criteria: (1) must be manufacturing firms; (2) recognized and indexed on the Nigerian Stock Exchange (NSE); (3) integrating CE in some capacity, (4) ISO 4001 certified, and (5) participants with at least 5 years of work experience. Congruent with this, this study adopts a non-probabilistic sampling method (i.e., purposive sampling) for data collection.

The purposive sampling method targeted senior-level managers, including operations managers, supply chain managers, logistics managers, plant managers, and procurement managers. The approach prioritizes key informants who can provide accurate assessments informed by their strategic roles and professional experience. The targeted SMEs were contacted, and the study's objectives were communicated to them. Voluntary participation was sought. 779 managers were invited to participate in the survey using the criteria above, but only 512 volunteered. To collect reliable information and boost response rates, respondents were assured that their responses would remain anonymous. Moreover, consistent with Schoenherr et al. (2015), this study included attention-check questions unrelated to the study context. Specifically, one of the items was "Since three plus two is not equal to six, please choose 'strongly disagree' for this question", where only a single response option out of the five possible answers was correct. Thus, participants had to carefully read and think to pass the test. Data collection was between December 2024 and March 2025. This research was conducted in full compliance with the ethical standards developed by the Academic Committee of the University of Mediterranean Karpasia.

Considering the issue of common method bias, this study follows the suggestion of Podsakoff et al (2003), temporal separation of data collection by collecting data at different time intervals. Introducing a temporal gap (i.e., temporal separation) reduces participants' potential to recall and use earlier responses as cues when answering subsequent questions (Podsakoff et al., 2003). Based on this, questions related to circular economy entrepreneurship, circular economy capability, and net zero policy were distributed at time T1. After three weeks, questions related to circular supply chain sustainability were distributed at T2. This study matches survey responses at T1 and T2 using a unique code identifier. Additionally, only respondents who completed the questionnaires at T1 were eligible to participate in T2. Questionnaires were administered through paper survey (i.e., in-person visits). Of the 779 questionnaires administered, 512 responses were recovered; however, after removing incomplete responses, 447 valid responses were retained, yielding a response rate of 57.38%.

The sample distribution is tabulated in Table 1. The majority of the firms, 406 (90.82%) have been in operation for at least 11 years. Most of the respondents had at least 6 years of work experience 388 (86.80%). According to firm size, less than 50, 52 (11.63%), between 51 and 100, 268 (59.95%), and above 100, 127 (28.42%). Based on business type, oil refining and petrochemicals, 64 (14.32%), food and beverages and tobacco, 133 (29.75%), pharmaceuticals, 57 (12.75%), textile, apparel and leather 105 (23.49%), chemicals and plastics, 41 (9.17%), cement 16 (3.58%), miscellaneous (6.94%).

**Table 1.** Sample distribution

(n=447)	Classification	Frequency	Proportion (%)
<b>Firm age (years)</b>			
	0-10	41	9.18
	11-20	221	49.44
	21-30	152	34.00
	31 and above	33	7.38
<b>Experience (years)</b>			
	5	59	13.20
	6-10	106	23.71
	11-15	114	25.50
	16-20	83	18.57
	>20	85	19.02

**Table 1 (cont.).** Sample distribution

(n=447)	Classification	Frequency	Proportion (%)
<b>Job position</b>			
	Operations managers	105	23.49
	Supply chain managers	131	29.30
	Logistics managers	106	23.72
	Plant managers	39	8.72
	Procurement managers	66	14.77
<b>Firm size (number of employees)</b>			
	Less than 50	52	11.63
	Between 51 and 100	268	59.95
	Above 100	127	28.42
<b>Business type</b>			
	Oil refining and petrochemicals	64	14.32
	Food, beverages and tobacco	133	29.75
	Pharmaceuticals	57	12.75
	Textile, apparel and leather	105	23.49
	Chemicals and plastics	41	9.17
	Cement	16	3.58
	Miscellaneous	31	6.94

### 3.3. Measures

Circular economy entrepreneurship was measured using 5 items adopted from (Cullen & DeAngelis, 2021; Lynde, 2020). The items capture key organizational entrepreneurial practices and behaviors that aligned with CE principles, such as waste reduction, resource efficiency, and sustainable value creation. A sample item was “We have always thought that finding and exploiting new business opportunities in the circular economy will enhance our ability to make the environment and society better.”

Circular economy capability was measured using 10 items adopted from (Centobelli et al., 2021). The scale captures firm capability in waste minimization, resource recovery, eco-innovation practices, and sustainable supply chain integration for CE implementation. A sample item was “Waste and garbage are used after reprocessing to manufacture new products”.

Net zero policy was measured using 3 items adopted from (Lee et al., 2023). The participants rated the items reflecting their enterprise’s adoption of net-zero goals and the integration of relevant climate strategies to achieve carbon neutrality. An item was “The firm seems to do a good job of setting sectoral goals for Net Zero”.

Circular supply chain sustainability was measured using 3 items adopted from Das (2017). The scale captures the degree to which firms implement sustainability principles within their circular supply chain operations. An item is “Decrease in the occurrence of environmental incidents”.

All items were rated on a five-point Likert scale. The detailed measurement items for all variables, including circular economy entrepreneurship, CE capability, net zero policy, and circular supply chain sustainability, are included as supporting material.

### 3.4. Analytical procedures

Descriptive statistics, internal consistency (Cronbach’s alpha), and correlations among variables were examined using SPSS version 25. The measurement model was computed using confirmatory factor analysis (CFA) in AMOS version 24 to assess reliability, validity, and overall model fit.

The proposed hypotheses were tested using the PROCESS macro v.4.2 (Hayes, 2022). Specifically, Model 4 examined the direct effects (H1-H3) and simple mediation (H4). Model 59 examined the conditional direct effects (moderation: H5-H6) and the conditional indirect effect (moderated mediation: H7). Statistical significance was determined via bootstrapping with 5000 resamples and a 95% confidence interval. A significant effect is determined if zero does not lie between the lower and upper levels of the confidence interval. Moreover, for moderation analysis, the constructs were mean-centered to enhance interpretability, accuracy, and graphical representation (Hayes, 2022). Interaction effects were probed using simple slope analysis (Cohen et al., 2003).

### 3.5. Non-response bias

Time-trend extrapolation was employed by grouping survey participants into early and late respondents, with late respondents serving as proxies for non-respondents across sample characteristics (e.g., business type) (Armstrong & Overton, 1977). The t-test results indicated no significant difference between early and late respondents ( $p > 0.05$ ). Thus, the results indicate non-response bias is unlikely to be an issue in the research's data.

### 3.6. Common method bias

To mitigate issues related to common method bias (CMB), procedural and statistical controls were integrated during and after data collection. Procedurally, the scales (i.e., the measurement items) adopted were well-established in the literature and were extensively reviewed by four industry experts, reducing the risk of measurement error. Moreover, the survey exclusively targeted experienced managers actively involved in supply chain and operations activities, ensuring credible sources to accomplish the study's objectives and minimizing CMB concerns (Philips, 1981). Further, the measurement items were pretested with supply chain practitioners and academics to enhance clarity and reduce ambiguity.

To minimize social desirability bias, complete participant anonymity was ensured, complemented by face-to-face distribution, which allowed confirmation that respondents were comfortable and perceived the survey as non-sensitive, encouraging honest responses.

As recommended for cross-sectional data, post-data-collection (i.e., several statistical controls) were applied to assess for CMB in the collected data (Iyiola et al., 2023; Podsakoff et al., 2003). Harman's single-factor test was performed, with the results indicating that the highest factor with an eigenvalue greater than 1 accounted for less than 30% (27.18%) of the total variance. Therefore, this implies that CMB is not a serious concern in this study (Podsakoff et al., 2003). Further, the marker variable technique following Lindell and Whitney's (2001), where a theoretically unrelated construct, "favorite coffee brand" was included in the survey as the marker variable. The correlation between the marker variable and the study's constructs was very low ( $r = 0.02$ ,  $p > 0.05$ ), indicating a non-significant, extremely low correlation. Thus, further supporting CMB is not a major concern in this study (Lindell & Whitney, 2001). Moreover, the variance inflation factor (VIF) analysis indicates that all VIF values were below 3.3, suggesting that multicollinearity did not distort the study's results (Kock, 2015). Taken together, the procedural and statistical results indicate that CMB is not a major issue in this research.

### 3.7. Measurement model results

Conventionally, Cronbach's alpha ( $\alpha$ ) is used to assess scale reliability; however, composite reliability is argued as a more robust measure (Hair et al., 2017). This study uses both  $\alpha$  and composite reliability to assess the reliability of the adopted measures. Table 2 shows that  $\alpha$  (0.866 and 0.956) and composite reliability (0.866 and 0.953) were above 0.7, indicating that the variables under observation are reliable (Hair et al., 2019; Nunnally, 1978). Additionally, the standardized factor loadings for items loaded significantly ( $p < 0.001$ ) on the respective constructs, with each item loading higher than 0.6 (between 0.659 and 0.908), as shown in Figure 2, indicating convergent validity (Fornell & Larcker, 1981). Further, average variance extracted (AVE) values were above 0.5 (ranging from 0.567 to 0.781), further supporting convergent validity.

Furthermore, following Fornell and Larcker (1981), the square roots of each variable's AVEs were compared with the surrounding correlations. Table 3 shows that the square root of each AVE (in parentheses)

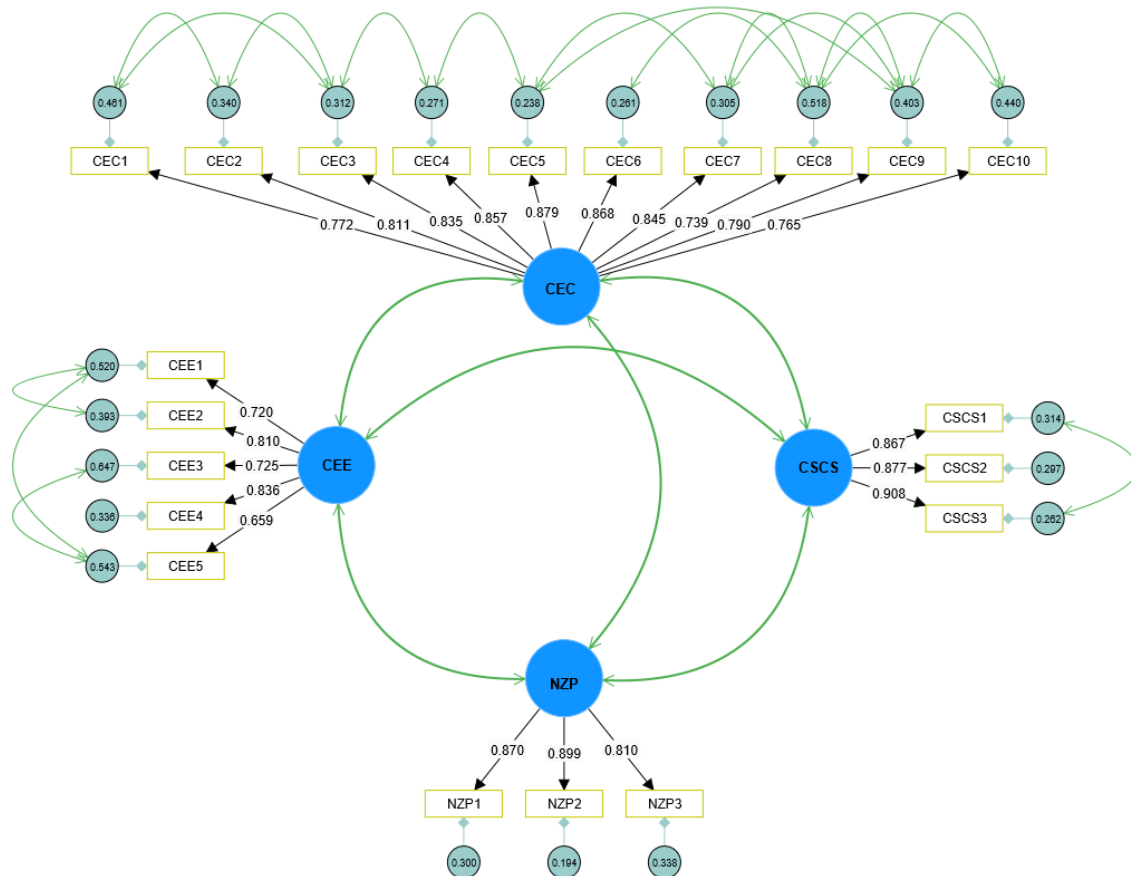
was greater than the nearby correlation coefficient, indicating that discriminant validity is ensured in this study (Fornell & Larcker, 1981). The data collected fit the integrated research model, with the model fit indices indicating acceptable fitness: CMIN/df = 2.451, IFI = 0.976, CFI = 0.976, NFI = 0.966, TLI = 0.969, RMSEA = 0.050.

Finally, in Table 2, the collected sample data were checked for normal distribution. Consistent with Lei and Lomax (2005) 2/3 indexes for Skewness and Kurtosis for normality. Table 2 shows that Skewness values range from 0.117 to 0.963, and Kurtosis values range from 0.016 to 0.862. The results indicate that the sample data collected is normally distributed.

**Table 2.** Measurement model assessment

Constructs	Codes	$\alpha$	CR	AVE	Skewness	Kurtosis
<b>Circular economy entrepreneurship</b>		<b>0.866</b>	<b>0.866</b>	<b>0.567</b>		
	CEE1	0.720			-0.663	-0.116
	CEE3	0.810			-0.643	-0.185
	CEE3	0.725			-0.117	-0.862
	CEE4	0.836			-0.666	-0.153
	CEE5	0.659			-0.920	0.648
<b>Circular economy capability</b>		<b>0.956</b>	<b>0.953</b>	<b>0.668</b>		
	CEC1	0.772			-0.698	-0.021
	CEC2	0.811			-0.695	0.267
	CEC3	0.835			-0.672	0.132
	CEC4	0.857			-0.621	0.043
	CEC5	0.879			-0.607	0.016
	CEC6	0.868			-0.645	0.129
	CEC7	0.845			-0.660	0.156
	CEC8	0.739			-0.324	-0.463
	CEC9	0.790			-0.464	-0.097
	CEC10	0.765			-0.426	-0.199
<b>Net zero policy</b>		<b>0.893</b>	<b>0.895</b>	<b>0.740</b>		
	NZP1	0.870			-0.906	0.170
	NZP2	0.899			-0.819	0.337
	NZP3	0.810			-0.963	0.685
<b>Circular supply chain sustainability</b>		<b>0.894</b>	<b>0.915</b>	<b>0.781</b>		
	CSCS1	0.867			-0.861	0.077
	CSCS2	0.877			-0.708	-0.296
	CSCS3	0.908			-0.592	-0.626

**Note:** CEE= Circular economy entrepreneurship; CEC=circular economy capability, NZP=net zero policy, CSCS= circular supply chain sustainability; CR= composite reliability,  $\alpha$ = Cronbach's alpha, AVE=average variance extracted.



**Figure 2.** Standardized factor loadings

**Table 3.** Correlation matrix, descriptive statistics and discriminant validity

Constructs	Mean	Std.	CEE	CEC	NZP	CSCS	Business type	Firm size
CEE	3.792	0.942	(0.753)					
CEC	3.607	0.875	0.424**	(0.817)				
NZP	3.093	1.132	0.630**	0.548**	(0.860)			
CSCS	3.634	1.054	0.489**	0.587**	0.608**	(0.884)		
Business type	-	-	0.021	0.020	0.005	0.019	-	
Firm size	-	-	0.016	0.014	0.012	0.003	0.017	-

**Note:** std.=standard deviation, values in brackets are the square root of AVEs; \*\*=significance at 0.01 level

**Table 4.** Indices of model fitness

Fit metrics	Model fit results	Acceptable range
CMIN/df	2.451	< 3
IFI	0.976	> 0.9
CFI	0.976	> 0.9
NFI	0.966	> 0.9
TLI	0.969	> 0.9
RMSEA	0.050	> 0.9

**Note:** CFI=Comparative fit index, NFI=Normed fit index, CMIN/df=Chi-Square to degrees of freedom ratio; TLI=Tucker-Lewis index, IFI=Incremental fit index, RMSEA=Root mean square error of approximation.

### 3.8. Testing of hypotheses

**3.8.1. Direct and mediation** The direct and mediation relationships in the integrated theoretical model were tested using the PROCESS macro (Model 4; Hayes, 2022). The results of the analyses are demonstrated in Table 5. Circular economy entrepreneurship has a significant and positive relationship with circular supply chain sustainability ( $\beta = 0.410$ ,  $t = 11.618$ ,  $p < 0.001$ ). Circular economy entrepreneurship is positively related to circular economy capability ( $\beta = 0.182$ ,  $t = 6.492$ ,  $p < 0.001$ ). Circular economy capability has a significant positive relationship with circular supply chain sustainability ( $\beta = 0.282$ ,  $t = 7.113$ ,  $p < 0.001$ ).

Consistent with recent consensus in mediation research, this study uses the bootstrapping approach (5000 resamples) to obtain the most reliable results for mediation analysis (Hayes, 2022; Preacher & Hayes, 2008). The bias-corrected percentile bootstrap results indicate that the indirect effect of circular economy entrepreneurship on circular supply chain sustainability through circular economy capability is significant ( $\beta = 0.052$ ,  $SE = 0.011$  [0.031, 0.075]). Moreover, the direct path remained significant with the inclusion of circular economy capability. Also, the indirect effect accounts for approximately 11% of the total effect, suggesting partial mediation. Therefore, circular economy capability partially mediates the relationship between circular economy entrepreneurship and circular supply chain sustainability. Taken together, H1-H4 were validated.

**Table 5.** Results of direct and mediation analyses

Direct and mediation results	Bootstrap 95% CI						R <sup>2</sup>	
	B	Std. error	t	p	LL	UP		
<b>Model 1: mediator variable model</b>		<b>Outcome: Circular economy capability</b>						0.042
Constant	2.566	0.101	25.510	0.000	2.368	2.763		
Circular economy entrepreneurship	0.182	0.028	6.492	0.000	0.127	0.237		
<b>Model 2: Response variable model</b>		<b>Circular supply chain sustainability</b>						0.191
Constant	1.308	0.160	8.167	0.000	0.994	1.623		
Circular economy entrepreneurship	0.410	0.035	11.618	0.000	0.341	0.479		
Circular economy capability	0.282	0.040	7.113	0.000	0.204	0.359		
<b>Total, direct and indirect effects of X on Y (Bootstrap, 5000 resamples)</b>								
Direct effect	0.410	0.035	11.618	0.000	0.341	0.479		
Total effect	0.461	0.035	13.023	0.000	0.392	0.531		
Indirect effect (Circular economy entrepreneurship on circular supply chain sustainability through circular economy capability)	0.051	0.011			0.031	0.075		

**Note:** UP=upper level of confidence interval, LL=lower level of confidence interval

**3.8.2. Moderation and moderated mediation** The conditional direct and indirect paths were tested using the PROCESS macro (Model 59; Hayes, 2022). Prior to testing, all constructs were mean-centered to prevent multicollinearity and facilitate straightforward interpretation (Cohen et al., 2003). Additionally, business type and firm size were added as covariates in the model.

In Table 6 (model 1), circular economy entrepreneurship is positively related to circular economy entrepreneurship ( $\beta = 0.081$ ,  $SE = 0.031$ ,  $t = 2.620$ ,  $p \leq 0.001$  [0.020, 0.142]). In addition to this, the direct path is moderated by the interaction between circular economy entrepreneurship and net zero policy ( $\beta = 0.089$ ,  $SE = 0.026$ ,  $t = 3.427$ ,  $p \leq 0.001$  [0.038, 0.140]). This study adopts *post hoc* probing to gain further insights into the interaction effect (Cohen et al., 2003). Accordingly, to further probe H5, a simple slope test was used to visualize the 3 levels of net-zero policy. Table 6 presents the estimates, and Figure 3 visualizes the simple slope test. The circular economy entrepreneurship-circular economy capability was insignificant at *low* net-zero policy (-1SD;  $\beta = -0.003$ ,  $SE = 0.043$ ,  $t = -0.059$ ,  $p > 0.05$  [-0.086, 0.081]), *mean* ( $\beta = 0.081$ ,  $SE = 0.031$ ,  $t = 2.620$ ,  $p < 0.01$  [0.020, 0.142]) and *high* net zero policy ( $\beta = 0.165$ ,  $SE = 0.036$ ,  $t = 4.582$ ,  $p < 0.001$  [0.094, 0.235]). Specifically, Figure 3 demonstrates the interaction pattern. Across net-zero policy levels,

circular economy capability increases as circular economy entrepreneurship rises, and the slope is steeper at higher net-zero policy levels. When circular economy entrepreneurship is low, differences across net zero policy are minimal; as circular economy entrepreneurship increases, the gap widens, suggesting larger gains in circular economy capability under high net zero policy. Thus, H5 is supported.

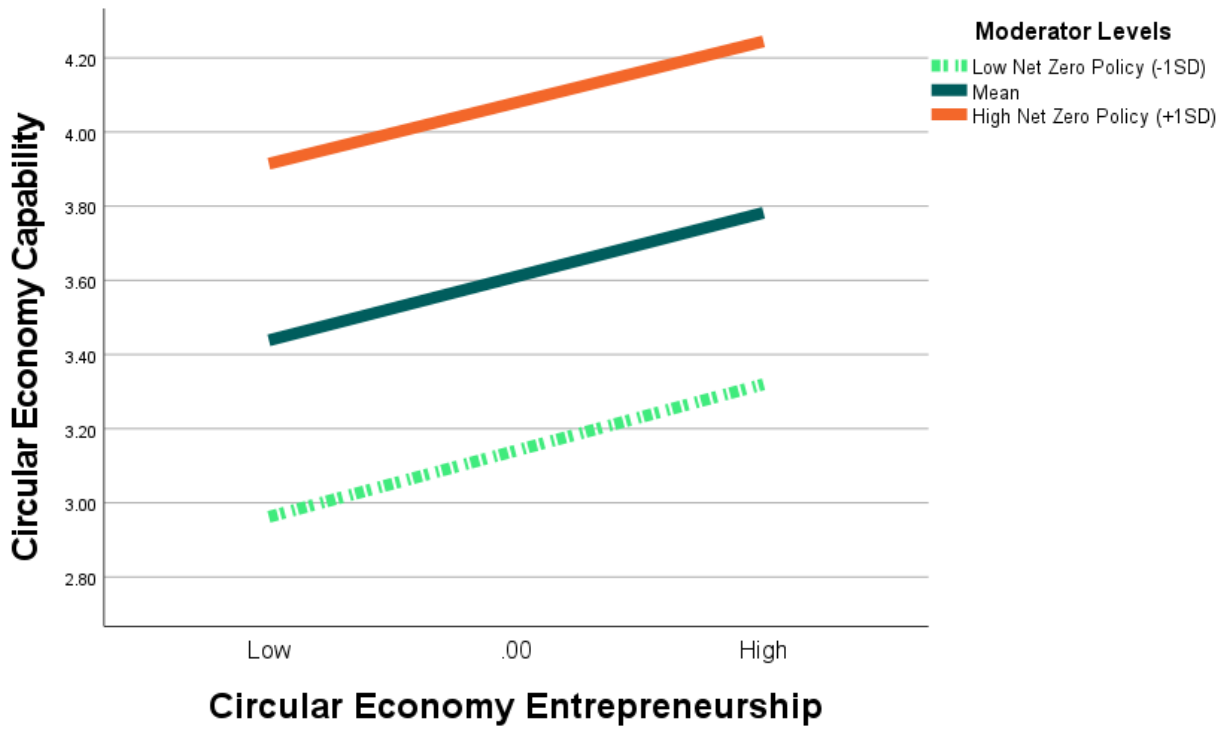
In Table 6 (model 2), circular economy entrepreneurship is positively related to circular supply chain sustainability ( $\beta = 0.195$ ,  $SE = 0.035$ ,  $t = 5.509$ ,  $p < 0.001$  [0.126, 0.264]). Despite this, the interaction between circular economy entrepreneurship and net zero policy ( $\beta = -0.008$ ,  $SE = 0.030$ ,  $t = -0.279$ ,  $p > 0.05$  [0.001, 0.050]), rejecting H6.

Lastly, moderated mediation was examined by probing the conditional indirect effect at 3 levels of net-zero policy. For the circular economy entrepreneurship  $\rightarrow$  circular economy capability  $\rightarrow$  circular supply chain sustainability; 95% CI[0.058, 0.220]. Since zero does not lie between the CIs, moderated mediation is supported. As reported in Table 6 and Figure 4, *post hoc* probing indicates that for circular economy entrepreneurship  $\rightarrow$  circular economy capability  $\rightarrow$  circular supply chain sustainability path, the 95% CIs were [-0.120, 0.129] (*low*), [0.059, 0.212] (*medium*), and [0.178, 0.355] (*high*). While the CIs include zero at the lower level of net zero policy, the conditional indirect effects were significant at higher levels of net zero policy. Specifically, the results revealed that the magnitude of the conditional indirect effect of circular on circular supply chain sustainability through circular economy capability increases as net zero policy increases. Thus, validating H7.

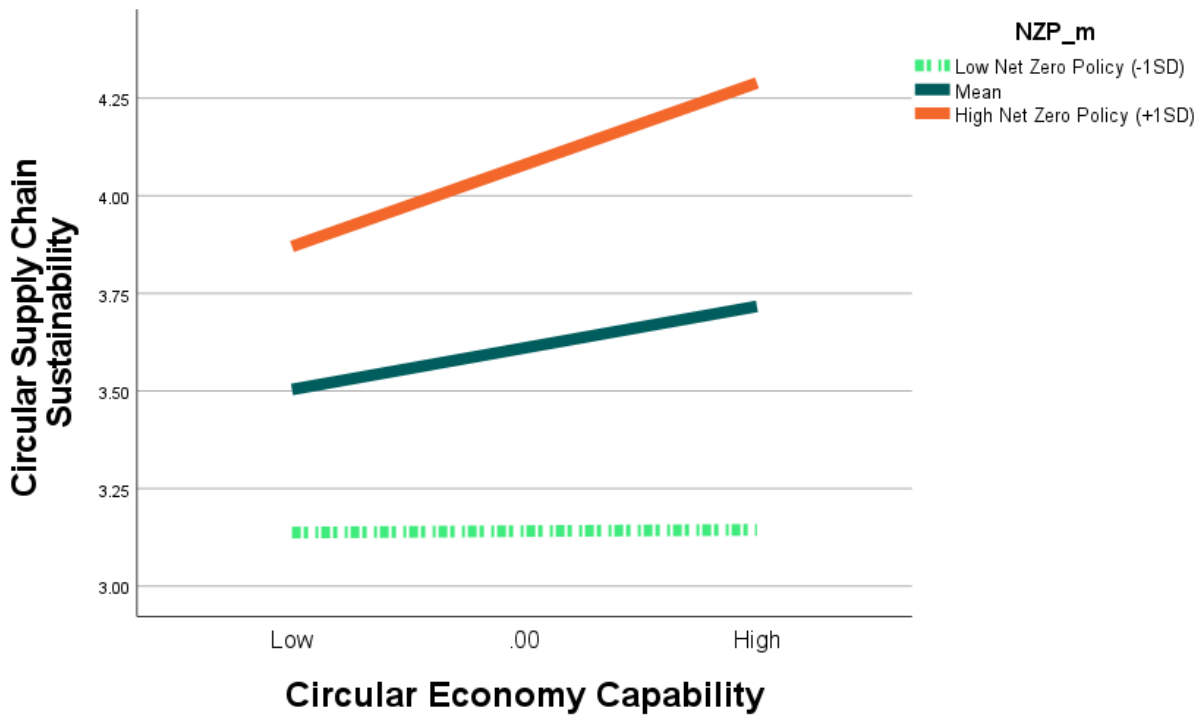
**Table 6.** Results of moderation and moderated mediation

Moderation mediation results	Bootstrap CI 95%						R <sup>2</sup>	
	B	Std. error	t	p	LL	UL		
<b>Model 1: mediator variable model</b>		<b>Outcome: Circular economy capability</b>						
Constant	-0.033	0.026	-1.253	0.000	-0.083	0.018		
Circular economy entrepreneurship	0.081	0.031	2.620	0.001	0.020	0.142		
Net zero policy	0.205	0.030	6.876	0.000	0.147	0.264		
Interaction: Circular economy entrepreneurship x Net zero policy	0.089	0.026	3.427	0.001	0.038	0.140	0.088	
Covariate: Business type	0.056	0.039	1.436	0.558	-0.045	0.096		
Covariate: Firm size	0.017	0.045	0.378	0.793	-0.099	0.117		
<b>The conditional direct effect of circular economy entrepreneurship on circular economy capability at levels of net zero policy</b>								
Net zero policy (-1SD)	-0.003	0.043	-0.059	0.093	-0.086	0.081		
Net zero policy (mean)	0.081	0.031	2.620	0.009	0.020	0.142		
Net zero policy (+1SD)	0.165	0.036	4.582	0.000	0.094	0.235		
<b>Model 2: Outcome variable model</b>		<b>Outcome: Circular supply chain sustainability</b>						
Constant	3.610	0.030	119.017	0.000	3.551	3.670		
Circular economy entrepreneurship	0.195	0.035	5.509	0.000	0.126	0.264		
Circular economy capability	0.136	0.039	3.492	0.000	0.059	0.212		
Net zero policy	0.498	0.035	14.228	0.001	0.430	0.567		
Circular economy entrepreneurship x Net zero policy	-0.008	0.030	-0.279	0.779	-0.067	0.050	0.345	
Circular economy capability x Net zero policy	0.139	0.041	3.365	0.001	0.058	0.220		
Covariate: Business type	0.022	0.048	0.458	0.612	-0.077	0.115		
Covariate: Firm size	0.029	0.047	0.617	0.503	-0.045	0.127		
<b>The conditional indirect effect of circular economy entrepreneurship on circular supply chain sustainability through circular economy capability at different levels of net zero policy</b>								
Net zero policy (-1SD)	0.045	0.063	0.070	0.944	-0.120	0.129		
Net zero policy (mean)	0.136	0.039	3.492	0.001	0.059	0.212		
Net zero policy (+1SD)	0.267	0.045	5.935	0.000	0.178	0.355		

**Note:** bootstrap sample = 5000; co= control variables



**Figure 3.** Relationship between circular economic entrepreneurship and circular economy capability at different levels of net-zero policy



**Figure 4.** Circular economic entrepreneurship on circular supply chain sustainability through circular economy capability at different levels of net-zero policy

## 4. Discussion

This research builds on PBV to examine the influence of circular economy entrepreneurship (an emerging construct in the circular economy literature) on circular supply chain sustainability using a sample obtained from Manufacturing SMEs in Nigeria. Circular economy capability was also examined as a central mechanism linking circular economy entrepreneurship to circular supply chain sustainability, and the moderating role of net-zero policy was further examined.

Circular economy entrepreneurship has a positive relationship with circular supply chain sustainability. This specific finding aligns with emerging studies in the CE and sustainability literature that highlight the transformative potential of entrepreneurial initiatives in driving sustainable outcomes (Baah et al., 2024; Mamash et al., 2025). Consistent with prior studies that highlight that supply chains are fundamentally practice-intensive systems (Agyabeng-Mensah et al., 2025), this research reveals that entrepreneurial practices, such as pursuing circular opportunities by continuously adapting and refining operations, can accelerate the development of circular practices within the firm and across its supply chain to achieve sustainability goals.

Circular economy entrepreneurship has a positive relationship with circular economy capability. This aligns with an emerging study that shows that circular economy entrepreneurship drives technical capability (Baah et al., 2024). Consistent with prior studies that demonstrated that entrepreneurial practices are fundamental in building organizational competencies (Baah et al., 2024), based on the PBV framework, a possible explanation for the finding is that, as new circular practices are integrated into firms' everyday operations, this transforms their capability to operate within CE. Circular economy capability is positively related to circular supply chain sustainability. This particular finding provides empirical support for the theoretical arguments that circular economy capability helps firms design products that are easily recyclable, minimizing waste and boosting the reuse of materials (Coppolla et al., 2023; Liu et al., 2023), developing such capability helps in creating a more sustainable supply chain because instead being disposed of, material flow back into the supply chain. Moreover, such capabilities boost sustainability indicators such as resource consumption and carbon footprints within the supply chain (Geyi et al., 2020)

Another important finding is that circular economy capability is a significant mediator of circular economy entrepreneurship and circular supply chain sustainability. This underscores the importance of internal organizational circular capability linking circular economy entrepreneurship to circular supply chain sustainability. Specifically, the finding demonstrates how internal organizational circular capability drives manufacturing SMEs to adapt their operational activities and design environmentally friendly products (Anderson, 2007), while also showing that it reinforces the implementation of circular economy entrepreneurship, demonstrating its central role in optimizing resource use, reducing waste, and adopting sustainable practices across their supply chain.

Interestingly, while net zero policy did not moderate the direct relationship between circular economy entrepreneurship and circular supply chain sustainability, it moderates the circular economy entrepreneurship-circular economy capability link, with the positive relationship stronger among firms high on compliance with zero policy than among firms low on net-zero policy. The indirect link of circular economy entrepreneurship on circular supply chain sustainability through circular economy capability is stronger among firms high on compliance with net-zero policy than among firms low on net-zero policy. A possible explanation for these results is that net-zero policies are inherently expansive and outcome-focused (Fankhauser et al., 2022), emphasizing emissions-reduction targets rather than specifying how individual organizations should implement or organize circular supply chain practices. From this standpoint, such practices might not immediately change how circular entrepreneurial actions transform directly into supply chain sustainability outcomes. However, net-zero policies could shape the capability-development environment in which organizations operate. The current research findings that net zero policies moderate the direct link between circular economy entrepreneurship and circular supply chain sustainability through circular economy capability could suggest that policies' impact is more effective for capability building rather than entrepreneurial actions alone in achieving circular supply chain outcomes. Thus, for manufacturing SMEs seeking to improve circular supply chain sustainability, they should do so through capability development.

## 5. Theoretical contributions

While there are emerging studies on circular economy entrepreneurship in the CE literature, this study offers unique contributions to the scarce literature on circular economy entrepreneurship by exploring its influence on circular supply chain sustainability. Hence, this research makes several contributions to the extant literature and provides critical insights for scholars engaged in circular entrepreneurship and circular supply chain sustainability research. Circular economy entrepreneurship is emerging as a critical factor in transitioning to circular economy models and developing capabilities among SMEs. While emerging studies are exploring the role of circular economy entrepreneurship in the circular economy literature (Baah et al., 2024; Rijal et al., 2024), this research confirms its specific benefits in developing circular economy capability and fostering circular supply chain sustainability. It demonstrates how CE entrepreneurial firms can routinize circular practices and seize opportunities. Below are the key contributions of the study.

First, this study advances the CE literature by demonstrating that circular economy entrepreneurship is a key driver of circular supply chain sustainability. The findings of this research extend current understanding of the consequences of circular economy entrepreneurship. Emerging empirical research investigated its influence on circular economy performance and technical capability (Baah et al., 2024; Rijal et al., 2024). These prior studies relied on RBV to conceptualize circular economy entrepreneurship, emphasizing on physical assets (technologies and physical resources). Drawing on PBV as a theoretical foundation, this study examines the influence of circular economy entrepreneurship on circular supply chain sustainability, highlighting its importance as a key driver of circular supply chain sustainability. Hence, this study demonstrates the importance of continuous practices and actions that create value as a key driver of circular supply chain sustainability. This highlights a divergence from RBV's emphasis on static resources that often overlook the importance of the dynamic nature of practices and shifts attention towards a more practice-oriented perspective, which offers a better understanding of how sustainability outcomes in the supply chain emerge from firms' key circular entrepreneurial practices. Thus, representing an initial study that views circular economy entrepreneurship in the extant literature as a practice.

Second, the current research enriches our understanding of circular economy capability by investigating how routinized organizational circular practices shape capability building. To be precise, this study examined the role of circular economy entrepreneurship in developing manufacturing SMEs' circular capability, building on previous studies that demonstrate the importance of organizational capabilities in the CE and sustainability literature (Baah et al., 2024; Rijal et al., 2024; Martínez-Falcó et al., 2024). By focusing on circular economy capability, this research offers new empirical insights into how repeated and routinized entrepreneurial practices influence circular economy capability, demonstrating its importance as a key driver of circular economy capability development. Moreover, the discovery of the enabling role of circular economy capability in developing CE capability in the Nigerian manufacturing SMEs' context shows that this connection is not limited to the Western context only (De Angelis, 2024; Elf et al., 2022; Reim et al., 2021).

Conceptually speaking, circular economy entrepreneurship might be a strategic approach that influences circular supply chain sustainability (Le et al., 2023). Despite this, the literature lacks the mechanisms through which circular economy entrepreneurship leads to circular supply chain sustainability. Moreover, the precise relationship between circular economy entrepreneurship and circular economy capability lacks empirical validation and remains poorly understood. By establishing the link between circular economy entrepreneurship and circular economy capability and by exploring the mediating role of circular economy capability on circular supply chain sustainability, this research contributes to the literature by extending the understanding of the relationships among circular economy entrepreneurship, circular economy capability, and circular supply chain sustainability. Specifically, building on prior studies that highlight the importance of capability building in circular supply chain management (Chari et al., 2022; Meier et al., 2023; Nacchiero et al., 2024), this study extends the understanding of the importance of CE capability and does so from the perspective of manufacturing SMEs in an emerging economy, which have been less investigated than advanced economies (Meier et al., 2023; Nacchiero et al., 2024). The empirical discovery of CE capability as a critical bridge that links circular economy entrepreneurship to circular supply sustainability adds an additional element of novelty to the CE literature. Moreover, the existing literature generally concentrates on how SMEs overcome resource constraints through organizational capabilities (Chaudhuri et al., 2022; Järvenpää et al., 2025), but its role in circular supply chain sustainability is underexplored. The current study

fills this research gap and demonstrates how circular economy capability can reinforce and transform SMEs' capacity to translate circular economy entrepreneurship practices into circular supply chain sustainability.

Finally, the current study contributes to the literature on policy-related contextual factors that shape the sustainability potential of circular supply chains (Garg et al., 2025; Singh, 2025) by exploring the moderating role of net-zero policy on the relationships among circular economy entrepreneurship, circular economy capability, and circular supply chain sustainability. Governments and the United Nations develop policies and continue to raise awareness, encouraging firms to adopt cleaner production practices, such as CE initiatives, to achieve net-zero by 2050. This study proposed and demonstrated that the impact of circular economy entrepreneurship on circular economy capability and circular supply chain sustainability is contingent on the level of firms' compliance with net zero policy, and found that compliance with net zero policy can interact with the routinization of circular economy entrepreneurship practices into firms operations to strengthen circular economy capability development and to actualize the sustainability potential of circular supply chain effectively. In doing so, this study provides a new perspective on the conditions under which the proposed predictor of circular economy capability and circular supply sustainability is more effective.

## 6. Implications for practitioners and policy makers

Based on the findings of this study, some of the critical implications for practice are as follows: First, despite the resource constraints faced by SMEs in developing economies, manufacturing SMEs should capitalize on circular economy entrepreneurship to improve circular economy capability and circular supply chain sustainability. Specifically, through circular-economy entrepreneurship practices, manufacturing SMEs could scan their external business environment to identify CE-related opportunities, routinize circular practices into their operations, and develop the capabilities required to capitalize on these opportunities. Manufacturing SMEs should also assess the sustainability of their supply chain and ascertain whether the routinized circular practices and the developed circular economy capability require reconfiguration to promote circular supply chain sustainability.

Second, the current research demonstrates the importance of capability building as a mechanism for achieving circular supply chain sustainability. In practice, manufacturing SMEs should prioritize investment programs that embed circular economy entrepreneurship routines, such as pilot projects or eco-design workshops for material recovery, to boost capabilities for reconfiguring production processes and implementing closed-loop systems. The mechanism pathway reveals that without an effective circular economy capability, the benefits of circular supply chain may not be realized fully. Hence, manufacturing SMEs could integrate capability evaluations into strategic planning, deploying supplier circularity indices or waste reduction rates to track adoption and alignment across the value chain.

Third, regarding policy implications, it is crucial to note the important role government policies can play in fostering an environment conducive to the adoption of circular economy entrepreneurship practices. In this vein, policies that promote circular and sustainable supply chain practices, such as grants, tax breaks, and subsidies for manufacturing SMEs that implement environmentally friendly practices in their operations, including optimized resource use, renewable energy, product design for reuse, and closed-loop systems. In addition, the government can establish stringent regulations for sustainable labelling and packaging to encourage manufacturing SMEs to adopt circular practices, aligning with the Sustainable Development Goals. Further, the government can set up certification schemes for suppliers that adhere to and meet established environmental standards, offering a credible benchmark for manufacturing SMEs to select them. Furthermore, embedding sustainability standards into public procurement policies may generate a ripple effect, prompting suppliers to adopt circular economy entrepreneurship practices, motivating manufacturing SMEs to both improve circular economy practices and ensure the long-term viability of sustainability investments.

The Nigerian manufacturing sector, particularly SMEs that dominate the industry, often operates in an environment characterized by institutional deficiencies, including inconsistent policies and poor infrastructure quality (Central Bank of Nigeria, 2026). These institutional deficiencies can impede the development of CE capability, making entrepreneurial activities more crucial yet more challenging to translate into circular supply chain outcomes. The positive indirect impact through CE may be stronger in

manufacturing firms where the interaction between entrepreneurial drive and policy support compensates for these voids or weaker where low entrepreneurial drive and institutional barriers (e.g., weak policy support and poor waste infrastructure) impede capability building. These findings highlight adaptability in necessity-driven entrepreneurship amid obstacles, but also demonstrate the critical need for supportive policies and institutions to scale the impact of CE.

Lastly, supportive policies include educating and training manufacturing SMEs on the environmental, economic, and social benefits of circular-economy entrepreneurship, as well as creating collaborative channels to share best circular practices and promote sustainability in manufacturing SMEs' value chains.

## 7. Limitations and future research directions

Despite the important contributions of this study, certain limitations open avenues for future research. Circular economy entrepreneurship and its impacts on circular economy capability and circular supply chain sustainability are empirically investigated in the context of Nigerian manufacturing firms only. Further studies could conduct a comparative analysis by collecting data from multiple nations. Specifically, a comparative analysis of the current integrated theoretical framework across developing and developed economies would promote the generalizability of the current research's findings. Future studies could also adopt a longitudinal research design to complement this study's findings and establish causal inference, as net-zero policies tend to be long-term.

Furthermore, the current study proposes circular economy capability as the mechanism of circular economy capability and circular supply chain sustainability link. However, this specific relationship is likely influenced by other mechanisms. Capabilities such as ecosystem orchestration capability, digital traceability capability and learning capability could be examined to capitalize on the efforts of circular economy entrepreneurship practices for circular supply chain sustainability improvements. Finally, exploring other contextual factors such as regulatory alignment and sustainability culture could provide additional insights into the conditions under which circular economy entrepreneurship can improve circular supply chain.

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## Declarations

**Competing Interests** The authors declare no competing interests.

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## References

- Aarikka-Stenroos, L., Chiaroni, D., Kaipainen, J., & Urbinati, A. (2022). Companies' circular business models enabled by supply chain collaborations: An empirical-based framework, synthesis, and research agenda. *Industrial Marketing Management*, 105, 322-339.
- Abuzawida, S. S., Alzubi, A. B., & Iyiola, K. (2023). Sustainable supply chain practices: An empirical investigation from the manufacturing industry. *Sustainability*, 15(19), 14395.
- Agyabeng-Mensah, Y., Oloruntoba, R., Earnest, J., & Mohammadi, H. (2025). Sustainable Supply Chain Management and Performance Outcomes: Supply Chain Practice View and Mediated Moderation Perspectives. *Business Strategy and the Environment*.
- Andersen, M. S. (2007). An introductory note on the environmental economics of the circular economy. *Sustainability science*, 2(1), 133-140.
- Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of marketing research*, 14(3), 396-402.
- Ayad, A., Iyiola, K., Alzubi, A. B., & Oz, T. (2025). From disaster to flourish: how and when supply chain memory drives supply chain performance under the knowledge-based view. *Kybernetes*, 1-31.
- Baah, C., Rijal, A., Agyabeng-Mensah, Y., Afum, E., & Acquah, I. S. K. (2024). Does circular economy entrepreneurship drive technical capabilities for circular economy performance? The moderating role of environmental dynamism. *Management of Environmental Quality: An International Journal*, 35(3), 567-586.
- Bag, S. (2025). Restorative supply chain practices in a circular economy and supply chain sustainability performance: the moderating effect of the perceived professional status of supply chain managers. *Benchmarking: An International Journal*, 32(1), 166-193.
- Bag, S., Routray, S., Rahman, M. S., & Gupta, S. (2025). Digital innovation for circular supply chain sustainability and resilience for achieving carbon neutrality: An empirical study. *Journal of Environmental Management*, 386, 125665.
- Balsalobre-Lorente, D., Radulescu, M., Pilař, L., & Shah, S. A. R. (2025). A Holistic approach to sustainability: Exploring the main and mediating role of circular economy in net zero emissions. *Journal of Environmental Management*, 382, 125319.
- Batista, L., Bourlakis, M., Smart, P., & Maull, R. (2018). In search of a circular supply chain archetype—a content-analysis-based literature review. *Production Planning & Control*, 29(6), 438-451.
- Bocken, N. M., Weissbrod, I., & Antikainen, M. (2021). Business model experimentation for the circular economy: definition and approaches. *Circular Economy and Sustainability*, 1(1), 49-81.
- Bromiley, P., & Rau, D. (2014). Towards a practice-based view of strategy. *Strategic Management Journal*, 35(8), 1249-1256.
- Butt, A. S., Alghababsheh, M., Sindhvani, R., & Gwalani, H. (2025). Role of supplier engagement to reduce Scope 3 emissions in circular supply chains. *Business Strategy and the Environment*, 34(1), 598-611.
- Centobelli, P., Cerchione, R., Esposito, E., & Passaro, R. (2021). Determinants of the transition towards circular economy in SMEs: A sustainable supply chain management perspective. *International Journal of Production Economics*, 242, 108297.
- Central Bank of Nigeria (2026). (<https://www.cbn.gov.ng/dfd/manufacturing.html>).
- Chari, A., Niedenzu, D., Despeisse, M., Machado, C. G., Azevedo, J. D., Boavida-Dias, R., & Johansson, B. (2022). Dynamic capabilities for circular manufacturing supply chains—Exploring the role of Industry 4.0 and resilience. *Business Strategy and the Environment*, 31(5), 2500-2517.
- Chaudhuri, A., Subramanian, N., & Dora, M. (2022). Circular economy and digital capabilities of SMEs for providing value to customers: Combined resource-based view and ambidexterity perspective. *Journal of Business Research*, 142, 32-44.

- Chavez, R., Malik, M., Ghaderi, H., & Yu, W. (2023). Environmental collaboration with suppliers and cost performance: exploring the contingency role of digital orientation from a circular economy perspective. *International Journal of Operations & Production Management*, 43(4), 651-675.
- Chen, Y., & Chen, I. J. (2019). Mixed sustainability motives, mixed results: the role of compliance and commitment in sustainable supply chain practices. *Supply Chain Management: An International Journal*, 24(5), 622-636.
- Circular Economy in Africa-EU Cooperation (2020). (<https://op.europa.eu/en/publication-detail/-/publication/26bf5dc9-3e85-11eb-b27b-01aa75ed71a1>).
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.). *Lawrence Erlbaum Associates Publishers*
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Routledge.
- Conca, L., Campobasso, F., & Toma, P. (2025). Exploring the Impact of Circular Economy Practices on Corporate Performance: A Global Analysis. *Business Strategy and the Environment*.
- Coppola, C., Vollero, A., & Siano, A. (2023). Developing dynamic capabilities for the circular economy in the textile and clothing industry in Italy: A natural-resource-based view. *Business Strategy and the Environment*, 32(7), 4798-4820.
- Cullen, U. A., & De Angelis, R. (2021). Circular entrepreneurship: A business model perspective. *Resources, conservation and recycling*, 168, 105300.
- Das, D. (2017). Development and validation of a scale for measuring Sustainable Supply Chain Management practices and performance. *Journal of cleaner production*, 164, 1344-1362.
- De Angelis, R. (2024). Circular economy business models as progressive business models: Evidence from circular start-ups. *Business Strategy and the Environment*, 33(7), 6303-6314.
- De Sousa Jabbour, A. B. L., Luiz, J. V. R., Luiz, O. R., Jabbour, C. J. C., Ndubisi, N. O., De Oliveira, J. H. C., & Junior, F. H. (2019). Circular economy business models and operations management. *Journal of cleaner production*, 235, 1525-1539.
- Dhar, B. K., Stasi, A., Döpping, J. O., Gazi, M. A. I., Shaturaev, J., & Sarkar, S. M. (2022). Mediating role of strategic flexibility between leadership styles on strategic execution: A study on Bangladeshi private enterprises. *Global Journal of Flexible Systems Management*, 23(3), 409-420.
- Ding, L., Wang, T., & Chan, P. W. (2023). Forward and reverse logistics for circular economy in construction: A systematic literature review. *Journal of Cleaner Production*, 388, 135981.
- Dong, H., & Wang, B. (2022). Direct and configurational paths of strategic orientation and business model innovation to successful enterprise performance. *Ieee access*, 10, 72671-72686.
- Dubey, R., Bryde, D. J., Dwivedi, Y. K., Graham, G., & Foropon, C. (2022). Impact of artificial intelligence-driven big data analytics culture on agility and resilience in humanitarian supply chain: A practice-based view. *International Journal of Production Economics*, 250, 108618.
- Dzikriansyah, M. A., Masudin, I., Zulfikarijah, F., Jihadi, M., & Jatmiko, R. D. (2023). The role of green supply chain management practices on environmental performance: A case of Indonesian small and medium enterprises. *Cleaner Logistics and Supply Chain*, 6, 100100.
- Elf, P., Werner, A., & Black, S. (2022). Advancing the circular economy through dynamic capabilities and extended customer engagement: Insights from small sustainable fashion enterprises in the UK. *Business Strategy and the Environment*, 31(6), 2682-2699.
- ETF (2025). (<https://energytransition.gov.ng/>).
- Fankhauser, S., Smith, S. M., Allen, M., Axelsson, K., Hale, T., Hepburn, C., ... & Wetzler, T. (2022). The meaning of net zero and how to get it right. *Nature climate change*, 12(1), 15-21.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.

- Gajere, M. C. (2023). Strategic orientation and performance of SMEs in Nigeria: moderating role of competitive intensity. *Journal of Global Entrepreneurship Research*, 13(1), 7.
- García-Quevedo, J., Jové-Llopis, E., & Martínez-Ros, E. (2020). Barriers to the circular economy in European small and medium-sized firms. *Business strategy and the environment*, 29(6), 2450-2464.
- Garg, A., Raut, R. D., Kumar, M., Zhang, C., & Gokhale, R. S. (2025). Does the circular economy transition aid to carbon neutrality? Examining net-zero policy and stakeholder impact from the environmental justice viewpoint. *Journal of Cleaner Production*, 491, 144851.
- Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy—A new sustainability paradigm?. *Journal of cleaner production*, 143, 757-768.
- Geyi, D. A. G., Yusuf, Y., Menhat, M. S., Abubakar, T., & Ogbuke, N. J. (2020). Agile capabilities as necessary conditions for maximising sustainable supply chain performance: An empirical investigation. *International Journal of Production Economics*, 222, 107501.
- Gotschol, A., De Giovanni, P., & Vinzi, V. E. (2014). Is environmental management an economically sustainable business?. *Journal of environmental management*, 144, 73-82.
- Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, 1(2), 107-123.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Haites, E., Bertoldi, P., König, M., Bataille, C., Creutzig, F., Dasgupta, D., ... & Sari, A. (2024). Contribution of carbon pricing to meeting a mid-century net zero target. *Climate Policy*, 24(1), 1-12.
- Hayes, A. F. (2022). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. The Guilford Press.
- Hazen, B. T., Russo, I., Confente, I., & Pellathy, D. (2021). Supply chain management for circular economy: conceptual framework and research agenda. *The International Journal of Logistics Management*, 32(2), 510-537.
- Iyiola, K., Alzubi, A., & Dappa, K. (2023). The influence of learning orientation on entrepreneurial performance: The role of business model innovation and risk-taking propensity. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(3), 100133.
- Järvenpää, A. M., Jussila, J., Kunttu, L., & Kunttu, I. (2025). Organizational Learning Practices to Develop Digitalization Capabilities in Circular Economy SMEs.
- Kaewunruen, S., Teuffel, P., Donmez Cavdar, A., Valta, O., Tambovceva, T., & Bajare, D. (2024). Comparisons of stakeholders' influences, inter-relationships, and obstacles for circular economy implementation on existing building sectors. *Scientific Reports*, 14(1), 11046.
- Kazancoglu, I., Sagnak, M., Kumar Mangla, S., & Kazancoglu, Y. (2021). Circular economy and the policy: A framework for improving the corporate environmental management in supply chains. *Business Strategy and the Environment*, 30(1), 590-608.
- Khajuria, A., Atienza, V. A., Chavanich, S., Henning, W., Islam, I., Kral, U., ... & Li, J. (2022). Accelerating circular economy solutions to achieve the 2030 agenda for sustainable development goals. *Circular Economy*, 1(1), 100001.
- Kim, K. C., Hornsby, J. S., Enriquez, J. L., Bae, Z. T., & El Tarabishy, A. (2021). Humane entrepreneurial framework: a model for effective corporate entrepreneurship. *Journal of Small Business Management*, 59(3), 397-416.
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (ijec)*, 11(4), 1-10
- Lahane, S., Kant, R., & Shankar, R. (2020). Circular supply chain management: A state-of-art review and future opportunities. *Journal of Cleaner Production*, 258, 120859.
- Le, T. T., Behl, A., & Graham, G. (2023). The role of entrepreneurship in successfully achieving circular supply chain management. *Global Journal of Flexible Systems Management*, 24(4), 537-561.

- Le, T. T., Behl, A., & Pereira, V. (2024). Establishing linkages between circular economy practices and sustainable performance: the moderating role of circular economy entrepreneurship. *Management Decision*, 62(8), 2340-2363.
- Lee, H. J. (2023). How do companies' net zero efforts affect consumer product evaluation through reciprocity and trust? A study in Korea. *Sustainable Production and Consumption*, 38, 149-158.
- Lei, M., & Lomax, R. G. (2005). The effect of varying degrees of nonnormality in structural equation modeling. *Structural equation modeling*, 12(1), 1-27.
- Li, L., Chen, L., & Liu, Y. (2024). Digital governance for supplier opportunism: The mediating role of supplier transparency. *International Journal of Production Economics*, 275, 109351.
- Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of applied psychology*, 86(1), 114.
- Liu, L., Song, W., & Liu, Y. (2023). Leveraging digital capabilities toward a circular economy: Reinforcing sustainable supply chain management with Industry 4.0 technologies. *Computers & Industrial Engineering*, 178, 109113.
- Lombani, I., Fraccascia, L., & Giannoccaro, I. (2025). Economic complexity tools to analyze circular economy capabilities in global economy. *Resources, Conservation & Recycling Advances*, 200286
- Lynde, R. (2020). Innovation & entrepreneurship driving food system transformation. *Physiology & behavior*, 220, 112866.
- Ma, J., Ni, J., Zhao, Y., & Wu, J. (2025). Environmental regulation, digital technology application and low-carbon supply chain resilience: Evidence from China. *Journal of Environmental Management*, 389, 126087.
- Mamash, A., Iyiola, K., & Aljuhmani, H. Y. (2025). The Role of Circular Economy Entrepreneurship, Cleaner Production, and Green Government Subsidy for Achieving Sustainability Goals in Business Performance. *Sustainability*, 17(9), 3990.
- Mansidão, R. M., & Alves, A. B. (2024). Entrepreneurship, Circular Economy and New Business Models. In *Entrepreneurship, Technological Change and Circular Economy for a Green Transition* (pp. 9-32). Springer, Cham.
- Martínez-Falcó, J., Sánchez-García, E., Marco-Lajara, B., & Andreu, R. (2024). Green supply chain management and sustainable performance: exploring the role of circular economy capability and green ambidexterity innovation. *British Food Journal*, 126(11), 3985-4011.
- Meier, O., Gruchmann, T., & Ivanov, D. (2023). Circular supply chain management with blockchain technology: A dynamic capabilities view. *Transportation Research Part E: Logistics and Transportation Review*, 176, 103177.
- Mirzaei, S., Shokouhyar, S., & Shokoohyar, S. (2023). Exploring trade-offs between basic and advanced sustainable supply chain practices among consumer electronics: a social media analytics approach. *The International Journal of Logistics Management*, 34(5), 1398-1421.
- Montag, L. (2023). Circular economy and supply chains: definitions, conceptualizations, and research agenda of the circular supply chain framework. *Circ Econ Sustain* 3: 35–75.
- Nacchiero, R., Massari, G. F., & Giannoccaro, I. (2024). Supply chain transformative capabilities and their microfoundations for circular economy transition: A qualitative study in Made in Italy sectors. *Business Strategy and the Environment*, 33(8), 8695-8715.
- Narimissa, O., Kangarani-Farahani, A., & Molla-Alizadeh-Zavardehi, S. (2020). Evaluation of sustainable supply chain management performance: Indicators. *Sustainable Development*, 28(1), 118-131.
- Nunnally J. C. (1978) Psychometric theory. (2nd ed.) *New York: McGraw-Hill*.
- Ogbeibu, S., Senadjki, A., & Gaskin, J. (2018). The moderating effect of benevolence on the impact of organisational culture on employee creativity. *Journal of Business Research*, 90, 334-346.
- Phillips, L. W. (1981). Assessing measurement error in key informant reports: A methodological note on organizational analysis in marketing. *Journal of marketing research*, 18(4), 395-415.

- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, 88(5), 879.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, 40(3), 879-891.
- Reddy, C. D. (2020). Entrepreneurial motivation to participate in the circular economy. In *Handbook of research on entrepreneurship development and opportunities in circular economy* (pp. 271-283). IGI Global.
- Reim, W., Sjödin, D., & Parida, V. (2021). Circular business model implementation: A capability development case study from the manufacturing industry. *Business Strategy and the Environment*, 30(6), 2745-2757.
- Ren, Q., & Albrecht, J. (2023). Toward circular economy: The impact of policy instruments on circular economy innovation for European small medium enterprises. *Ecological Economics*, 207, 107761.
- Rijal, A., Baah, C., Agyabeng-Mensah, Y., Afum, E., & Acquah, I. S. K. (2024). Shirking in supply chain collaborations: do circular economy entrepreneurship and technical capability moderate impacts for circular economy performance?. *Journal of Manufacturing Technology Management*, 35(5), 1081-1102.
- Rovanto, S., & Virtanen, Y. (2025). Circular Economy Capabilities for Slowing Resource Loops at Small Businesses in China, Finland and Japan—An Institutional Logics Perspective. *British Journal of Management*.
- Sahasranamam, S., Nandakumar, M. K., Pereira, V., & Temouri, Y. (2021). Knowledge capital in social and commercial entrepreneurship: Investigating the role of informal institutions. *Journal of International Management*, 27(1), 100833.
- Sandberg, E. (2023). Orchestration capabilities in circular supply chains of post-consumer used clothes—A case study of a Swedish fashion retailer. *Journal of Cleaner Production*, 387, 135935.
- SBTi (2025). (<https://files.sciencebasedtargets.org/production/files/CNZS-V2-Second-Consultation-Draft.pdf>).
- Scarpellini, S., Valero-Gil, J., Moneva, J. M., & Andraus, M. (2020). Environmental management capabilities for a “circular eco-innovation”. *Business Strategy and the Environment*, 29(5), 1850-1864.
- Schoenherr, T., Ellram, L. M., & Tate, W. L. (2015). A note on the use of survey research firms to enable empirical data collection. *Journal of Business Logistics*, 36(3), 288-300.
- Singh, R. K. (2025). Impact of net-zero policies on supply chain sustainability: mediating role of green technology adoption. *Supply Chain Management: An International Journal*, 30(5), 552-565.
- Singh, R. K., & Mathiyazhagan, K. (2024). Integrating flexibility and sustainability in supply chains: a practice-based view on leadership, knowledge and digital quality management practices. *The International Journal of Logistics Management*, 35(6), 1961-1980.
- Sudusinghe, J. I., & Seuring, S. (2022). Supply chain collaboration and sustainability performance in circular economy: A systematic literature review. *International Journal of Production Economics*, 245, 108402.
- Ul-Durar, S., Awan, U., Varma, A., Memon, S., & Mention, A. L. (2023). Integrating knowledge management and orientation dynamics for organization transition from eco-innovation to circular economy. *Journal of Knowledge Management*, 27(8), 2217-2248.
- UNFCCC (2023). (<https://unfccc.int/about-us/2023-highlights>).
- Usman, A. B., & Amran, N. A. B. (2015). Corporate social responsibility practice and corporate financial performance: evidence from Nigeria companies. *Social Responsibility Journal*, 11(4), 749-763.
- Van Buren, N., Demmers, M., Van der Heijden, R., & Witlox, F. (2016). Towards a circular economy: The role of Dutch logistics industries and governments. *Sustainability*, 8(7), 647.
- Veleva, V., & Bodkin, G. (2018). Corporate-entrepreneur collaborations to advance a circular economy. *Journal of Cleaner Production*, 188, 20-37.
- WEF (2024). (<https://initiatives.weforum.org/the-circular-transformation-of-industries/home>).

- Zhang, A., & Seuring, S. (2024). Digital product passport for sustainable and circular supply chain management: a structured review of use cases. *International Journal of Logistics Research and Applications*, 27(12), 2513-2540.
- Zorpas, A. A. (2024). The hidden concept and the beauty of multiple “R” in the framework of waste strategies development reflecting to circular economy principles. *Science of the Total Environment*, 952, 175508.

## Appendix

### **Circular economy entrepreneurship (Cullen & DeAngelis, 2021; Lynde, 2020)**

1. We explore and exploit new opportunities in the domain of circular economy in a continuous manner
2. We have always thought that finding and exploiting new business opportunities in the circular economy will enhance our ability to make the environment and society better
3. We always think that proactively innovating business models in accordance with the circular economy is the responsibility of businesses to stakeholders
4. We always think that sharing resources with supply chain partners to improve the performance of communities involved in the supply chain is the responsibility of the business
5. We always believe that proactively embracing and implementing alternative initiatives that are more resource-efficient, economic, environmental and social efficiency will make a significant contribution to the achievement of national and global sustainable development goals

### **Circular economy capability (Centobelli et al., 2021)**

1. The firm is devoted to reducing the unit product manual input
2. The firm is devoted to reducing the consumption of raw materials and energy
3. The firm initiatively enhances the energy efficiency of production equipment
4. Product packaging materials are used repeatedly.
5. Equipment cleaning materials are used repeatedly
6. Leftover material is used repeatedly to manufacture other products.
7. Waste produced in the manufacturing process is recycled
8. Waste products from consumers is recycled.
9. Recycling waste and garbage is reprocessed.
10. Waste and garbage are used after reprocessing to manufacture new products.

### **Net zero policy (Lee et al., 2023)**

1. The company seems to be good at setting and planning Net Zero goals
2. The company seems to be working on product development for Net Zero
3. The company seems to do a good job of setting sectoral goals for Net Zero

### **Circular supply chain sustainability (Das, 2017)**

1. Decrease in the release of harmful substances such as carbon dioxide
2. Decrease in the occurrence of environmental incidents
3. Progress towards achieving carbon neutrality across circular supply chain activities.