Journal of Business and Information Systems
Vol. 8, No. 1, June (2026)
www.thejbis.upy.ac.id
DOI: https://doi.org/10.31316/jbis.v8i1.348
ISSN:2685-2543

Accepted, February 2026
Revised, March 2026
Published, June 2026

Factors Determining the Success of Sustainable Supply Chain Management in Enhancing Circular Economy Capabilities

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Abstract: *The transition from a linear economy to a circular economy has become a major focus for small and medium-sized enterprises, particularly in the wood-based furniture sector, which now faces increasingly pressing environmental and sustainability challenges. This study aims to explore the impact of social pressure, environmentally sound economic incentives, and environmental commitment on the capacity to adopt a circular economy, with supply chain relationship management serving as an intermediary variable among small and medium-sized enterprises in Bantul, Yogyakarta. A quantitative approach was applied using Partial Least Squares Structural Equation Modeling (PLS-SEM), which was analyzed with Smart-PLS 4.0. Data were collected from 70 small- and medium-sized enterprise owners and managers using structured questionnaires rated on a five-point Likert scale. The study findings indicate that relational supply chain management plays a crucial role in enhancing circular economy capacity and acts as a bridge between organizational and external factors and circular performance. This study underscores the importance of collaboration within the supply chain in accelerating the shift of small and medium-sized enterprises towards circular practices. The uniqueness of this study lies in combining the Extended Theory of Planned Behavior and sustainable supply chain management to explain circular-economy capabilities at the small- and medium-sized-enterprise level.*

Keywords: *Circular economy capabilities; Environmental commitment; Green economic incentives; Supply chain relationship management.*

1. Introduction

The transition from a linear economic model to a circular economy is becoming increasingly crucial for achieving sustainable industrial development. The circular economy emphasizes efficiency in resource use, waste reduction, and value preservation throughout a product's lifecycle, enabling companies to improve both environmental and economic performance simultaneously (Centobelli et al., 2021). In resource-intensive industrial sectors such as the wood furniture manufacturing industry, implementing a circular economy is crucial given the high material dependence, the large volume of waste generated, and the associated environmental impact. However, implementing circular economy principles presents various obstacles for Small and Medium Enterprises (SMEs). Unlike large-scale companies, SMEs generally face limitations in capital, technological advancement, management capacity, and institutional systems. These various obstacles raise fundamental questions about the strategic steps SMEs can take to build circular economy capabilities amidst resource constraints and external pressures.

Unlike large companies with vertically integrated systems and stronger internal resources, SMEs operate within highly interdependent supply networks. In the wood-based

sector, production relies on wood suppliers, subcontract processors, finishing units, and distributors, making companies structurally dependent on external partners. This interdependence implies that sustainability transformation cannot be achieved solely through internal initiatives, as circular practices such as certified procurement, waste reuse, eco-design, and reverse logistics require coordination and information sharing among supply chain actors. Given the limited financial and technological capacity of SMEs, supply chain relationships serve as strategic drivers of circular economy capabilities, rather than simply operational arrangements. Empirical evidence shows that green supply chain practices improve environmental performance and strengthen SME competitiveness in dynamic markets (Gelmez et al., 2024). Supply chain-focused capabilities have also been identified as a key factor supporting SMEs' transition to a circular economy (Centobelli et al., 2021). Furthermore, the implementation of a circular economy in SMEs is strongly influenced by green economy incentives and environmental commitments, especially when these drivers are reinforced through collaborative supply chain mechanisms (Dong & Zhu, 2023). In this context, supply chain relationship management fosters collaboration, trust, and strategic alignment, enabling companies to translate internal commitments and external pressures into coordinated, effective circular practices.

From a behavioral perspective, the adoption and implementation of circular practices can be explained using the Theory of Planned Behavior (TPB), which states that behavior is shaped by attitudes, subjective norms, and perceived behavioral control (Yuriev et al., 2020). At the organizational level, environmental commitment reflects managerial attitudes, social pressure represents subjective norms, and green economy incentives indicate perceived behavioral control. These factors influence firms' pro-environmental strategies, particularly among SMEs operating in environmentally sensitive sectors (Dong & Zhu, 2023). Although the TPB has been widely applied in poverty research, its integration with inter-organizational supply chain mechanisms in circular economy studies remains limited. Few studies have explained how behavioral factors translate into circular economy capabilities through relational collaboration across supply networks. Although previous research has examined the implementation of the circular economy and sustainable supply chain management, several key issues remain. Sustainable supply chain practices have been identified as determinants of the circular transition in European companies, with a primary focus on organizational and technological capabilities rather than on behavioral or theoretical perspectives (Centobelli et al., 2021). Green transformation and industrial symbiosis have also been described at the macro or sectoral level, offering limited insights into relational supply chain mechanisms within SME clusters in developing countries (Dong & Zhu, 2023). While these studies significantly advance the circular economy literature, they do not specifically examine how behavioral drivers interact with supply chain relationship management to influence circular economy capabilities at the SME level. Furthermore, empirical evidence from wood-based SMEs in Indonesia, regardless of their export strategy and exposure to timber legality certification requirements, remains underexplored.

Therefore, this study aims to address this gap by integrating behavioral and relational supply chain governance theories to explain the development of circular economy

capabilities in wood-based SMEs. By positioning supply chain management relationships as a mechanism linking behavioral drivers (social pressures, green economy incentives, and environmental commitments) to circular economy capabilities, this study offers a new integrative framework that bridges micro-level behavioral perspectives and inter-organizational sustainability collaboration. The focus on SMEs in a developing country context further strengthens the contribution by providing contextualized empirical evidence from resource-constrained industrial clusters. Consequently, this study contributes theoretically by extending the SDGs to inter-organizational circular economy research and, practically, by identifying relational mechanisms that can enhance the development of circular capabilities among SMEs.

2. Literature Review & Hypotheses development

2.1. Theoretical Underpinnings

The Theory of Planned Behavior (TPB) posits that behavioral intention is shaped by attitude toward the behavior, subjective norms, and perceived behavioral control, which collectively influence actual behavior (Ajzen, 1991). Although originally developed to explain individual decision-making, TPB has been widely applied in environmental and sustainability research to predict green innovation, eco-friendly practices, and the adoption of organizational sustainability (Yuriev et al., 2020). Recent studies confirm that TPB remains a robust theoretical framework for explaining pro-environmental organizational behavior, particularly in small and medium-sized enterprises (SMEs) facing institutional and market pressures (Dong & Zhu, 2023). However, traditional TPB applications primarily explain intention formation rather than capability development. In contrast, in organizational contexts, sustainability intentions must be translated into structured routines, strategic resource allocation, and coordinated operational practices before tangible circular economy capabilities can emerge. To address this limitation, the Extended Theory of Planned Behavior (ETPB) incorporates institutional and structural determinants that shape managerial decision-making and strengthen TPB's explanatory power at the firm level (Singh et al., 2018). In this study, environmental commitment represents the attitudinal component of TPB; social pressure reflects subjective norms; and green economic incentives indicate perceived behavioral control, as financial and policy support enhance firms' ability to implement circular initiatives.

These behavioral determinants shape SMEs' strategic orientation toward circular transformation, particularly in resource-constrained environments (Yuriev et al., 2020). However, SMEs embedded in developing-country industrial clusters operate within highly interdependent supply networks, where circular transition outcomes are strongly influenced by sustainable supply chain capabilities (Centobelli et al., 2021). Thus, behavioral intention alone is insufficient to generate circular economy capability, as sustainability orientation must be translated into operational capability through relational coordination and inter-firm collaboration within supply chains. This study extends the Theory of Planned Behavior (TPB) beyond the organizational boundary by integrating Supply Chain Relationship Management (SCRM) as an inter-organizational mechanism that converts behavioral drivers into coordinated circular practices. Based on the TPB framework, environmental commitment, social pressure, and green

economic incentives are conceptualized as behavioral antecedents shaping SMEs' circular orientation. However, consistent with relational and supply chain perspectives, these drivers are expected to influence circular economy capability not only directly but also indirectly through SCRM, which facilitates coordination, trust-building, and the collective implementation of circular practices within SME networks. By linking TPB to relational supply chain governance, this research advances prior studies in the circular economy. It demonstrates that behavioral determinants and collaborative supply chain structures jointly shape circular economy capability in SMEs operating in emerging economies.

2.2. Circular Economy Capability

Circular economy capability (CEC) refers to a firm's ability to implement circular principles such as reduce, reuse, recycle, resource efficiency, and value preservation across operations and supply chains. It includes not only technical capacities, such as waste processing, but also organizational expertise and business model innovation (Kristoffersen et al., 2020; Aguirre Rodríguez et al., 2024). The circular economy seeks to generate sustainable value while reducing environmental impact (Centobelli et al., 2021). For SMEs, especially in manufacturing sectors such as wood furniture, CEC reflects environmental awareness and strategic adaptability, although its adoption is often constrained by limited financial and technological resources (Yuriev et al., 2020).

2.3. Social Pressure

Social pressure refers to coercive, normative, and mimetic forces from stakeholders such as governments, customers, communities, and competitors that encourage firms to adopt green innovations and sustainable practices (Zhang et al., 2024). In Indonesian MSMEs for wooden furniture, this pressure manifests as requirements for certified wood, environmental regulations, and competitive trends toward recycled materials. Empirical evidence shows that social pressure acts as a key external driver of circular economy capabilities, pushing firms toward circular supply chains and the integration of circular business models through supply chain collaboration and sustainability alignment (Bierza et al., 2023; Calzolari et al., 2023).

2.4. Green Economic Incentives

Green economic incentives are financial and policy mechanisms that reduce the cost and risk of sustainable investment and accelerate the transition to circular business models (D'Amato et al., 2020). Instruments such as subsidies, tax incentives, and soft loans are especially important for SMEs facing capital constraints. Prior studies highlight their role in strengthening circular capabilities and encouraging investment in resource efficiency (Marek, 2021; Rahmat et al., 2024). Empirical evidence shows that policy and financial support accelerate the adoption of circular practices in developing-country SMEs (Megawati et al., 2024). When sustainability initiatives are perceived as economically beneficial, SMEs demonstrate stronger managerial commitment and closer supply chain collaboration, enhancing sustainable value creation (Dong & Zhu, 2023).

2.5. Environmental Commitment

Environmental commitment reflects leadership's intent to allocate resources for sustainability, promoting resource efficiency and sustainable development. Strong managerial commitment supports circular economy practices and sustainability performance, especially when integrated into organizational routines and supply chain processes. Studies show that environmental orientation drives circular practices and green performance (Khan et al., 2022), facilitates the transition to circular business models, and strengthens circular innovation capabilities when aligned with internal mechanisms (Heshmati et al., 2020; Hou et al., 2023).

2.6. The Mediating Role of Supply Chain Relationship Management (SCRM)

Supply chain relationship management emphasizes collaboration, communication, and long-term partnerships within supply networks to improve sustainability outcomes, especially for resource-constrained SMEs. Effective collaboration allows firms to share information, coordinate circular practices, and enhance sustainability performance (Jum'a et al., 2025). Government incentives and regulatory pressures further encourage closer engagement with supply partners to adopt green practices (Hou et al., 2023). Stakeholder and market pressures encourage environmentally responsible relationships. At the same time, environmental commitment enhances firms' willingness to collaborate with green partners, thereby supporting reverse flows and resource recovery, which are essential for circular economy capabilities (Sudusinghe & Seuring, 2022). Therefore, supply chain relationship management acts as a mediating mechanism that translates social pressure, green economic incentives, and environmental commitment into improved circular economy capabilities through coordinated supply chain actions.

2.7. Hypotheses

Supply chain relationship management is viewed as a key mediator linking social pressure, green economic incentives, and environmental commitment to enhanced circular economy capabilities. Prior studies show that green HR and sustainability practices link organizational drivers to environmental performance (Kuo et al., 2022), while green supply chain collaboration transmits institutional pressures and environmental commitment into circular implementation (Wu & Wang, 2023). Empirical evidence further confirms that eco-innovation strengthens green supply chain management and circular economy capabilities, highlighting the role of collaborative supply chain practices as strategic bridges toward sustainability outcomes (Dina & Kusmantini, 2025).

H_1a: Social pressure positively influences circular economy capability.

Social pressure refers to coercive, normative, and mimetic forces arising from government regulations, customer demands, industry standards, and broader societal expectations. For SMEs, increasing environmental regulations and stakeholder awareness encourage the adoption of circular practices to maintain legitimacy and competitiveness. Empirical evidence from European manufacturing firms shows that institutional and stakeholder pressures significantly drive circular economy adoption and strengthen circular capabilities (Bierza et al., 2023), while research among Spanish industrial SMEs

demonstrates that external stakeholder expectations positively influence firms' transition toward circular business models (Castro-Lopez et al., 2023). Furthermore, a cross-national review of sustainability practices in manufacturing sectors highlights that regulatory pressure reinforces firms' environmental strategies and accelerates circular transformation, particularly in developed economies with strong institutional enforcement (Yuriev et al., 2020). Although these findings provide robust evidence from European and other developed contexts, limited empirical validation exists in developing-country SME clusters, where institutional enforcement, resource availability, and relational supply chain dynamics differ substantially; therefore, examining the influence of social pressure on circular economy capability in Indonesian wood-based SMEs contributes to strengthening contextual generalizability and external validity.

H_1b: Green economic incentives have a positive influence on circular economy capability.

An inclusive green economy encompasses subsidies, tax breaks, financial support schemes, and access to green markets that reduce the costs and risks associated with sustainable investments. For SMEs with limited financial resources, these incentives play a crucial role in enabling the adoption of circular technologies and infrastructure. Empirical evidence from SMEs in Central and Eastern Europe shows that financial incentives and public support programs significantly increase firms' readiness to adopt circular practices and improve environmental performance (Marek, 2021). Similarly, research conducted among manufacturing SMEs in Southeast Asia shows that fiscal and policy-based incentives positively influence green investment decisions and sustainable innovation (Rahmat et al., 2024). Furthermore, a study of SMEs in developing countries found that government policy support and green financing mechanisms accelerate the adoption of circular practices by reducing perceived financial constraints (Megawati et al., 2024). While these findings provide evidence across European and developing contexts, variations in institutional support systems and market maturity suggest that the effectiveness of green economy incentives may vary across regions. Therefore, research on their influence on circular economy capabilities in wood-based SMEs in Indonesia contributes to strengthening contextual relevance and external validity.

H_1c: Environmental commitment positively influences circular economy capability.

Environmental commitment reflects the extent to which a company embeds environmental values into strategic decision-making and allocates resources to sustainability initiatives, leading to proactive efforts to reduce waste, improve resource efficiency, and pursue circular innovation. Empirical evidence from Chinese manufacturing firms indicates that managerial environmental commitment significantly enhances circular practices and supports green transformation strategies (Dong & Zhu, 2023). Similarly, research conducted among Indian manufacturing SMEs indicates that internal environmental orientation strengthens sustainable supply chain practices and improves environmental performance. Studies in other developing Asian countries further confirm that managerial commitment strengthens a company's ability to integrate circular principles into production processes and supply chain coordination (Rahmat et al., 2024). Although these studies provide consistent

evidence across Asian contexts, variations in institutional environments, leadership structures, and resource availability suggest that the magnitude of these relationships may differ across SME clusters in developing countries. Therefore, examining the effect of environmental commitment on circular economy capabilities in wood-based SMEs in Indonesia enhances contextual generalizability and strengthens external validity.

H_2a: Social pressure positively influences supply chain relationship management.

Empirical evidence from European manufacturing firms indicates that institutional pressures significantly strengthen sustainable supply chain integration and inter-firm coordination mechanisms (Centobelli et al., 2021). In addition, a global scoping review synthesizing TPB-based studies of pro-environmental behavior across multiple countries, including the United Kingdom, the United States, Australia, China, Germany, and other European and Asian contexts, confirms that social and normative pressures consistently influence sustainability-oriented behavior (Yuriev et al., 2020). However, most prior evidence comes from developed economies with strong institutional enforcement and relatively mature supply chain systems. Limited research investigates how social pressure shapes supply chain relationship management within SME clusters in developing economies, where regulatory implementation, relational governance structures, and resource constraints differ substantially. Examining this relationship in Indonesian wood-based SMEs, therefore, enhances contextual generalizability and strengthens the external validity of research on the circular economy.

H_2b: Green economic incentives have a positive influence on supply chain relationship management.

Green economic incentives are the financial and competitive benefits of adopting environmentally friendly strategies, including subsidies, tax reductions, access to green markets, and reputational benefits. For SMEs operating under resource constraints, such incentives reduce investment risks and encourage the adoption of sustainability-oriented practices, which often require coordination with supply chain partners. Empirical evidence from Chinese manufacturing firms suggests that economic and policy incentives significantly stimulate green transformation and collaborative sustainability initiatives within industrial networks (Dong & Zhu, 2023). Similarly, research conducted among European SMEs suggests that sustainable supply chain collaboration enhances long-term competitiveness and performance, particularly when supported by economic and strategic incentives (Türkeş et al., 2024). While these findings provide evidence from Asian and European contexts, research on how green economic incentives shape supply chain relationship management in developing-country SME clusters remains limited, where financial constraints and relational governance mechanisms differ substantially. Therefore, investigating these relationships among wood-based SMEs in Indonesia helps strengthen contextual generalizability and external validity.

H_2c: Environmental commitment has a positive influence on supply chain relationship management.

Environmental commitment reflects an organization's dedication to sustainability and environmental responsibility. Firms with a strong commitment integrate ecological considerations into strategic and operational decisions, fostering long-term collaboration with environmentally aligned suppliers. Empirical evidence from Chinese manufacturing SMEs shows that environmental commitment significantly influences the adoption of the circular economy and strengthens sustainability-oriented strategic behavior (Dong & Zhu, 2023). Similarly, research conducted among Turkish manufacturing firms demonstrates that internal sustainability orientation enhances green supply chain initiatives and inter-firm environmental collaboration (Gelmez et al., 2024). While these findings provide evidence from Asian and European contexts, research on how environmental commitment shapes supply chain relationship management within SME clusters in developing economies such as Indonesia remains limited, as relational governance and resource constraints differ substantially. Therefore, environmental commitment is expected to positively influence supply chain relationship management in Indonesian wood-based SMEs.

H_3: Supply chain relationship management positively influences circular economy capability.

Supply Chain Relationship Management reflects a firm's ability to build trust, cooperation, and long-term partnerships with supply chain actors. Effective relational management supports information sharing, joint problem-solving, and coordinated environmental innovation, all of which are essential for implementing the circular economy. Empirical evidence from European manufacturing firms indicates that relational capabilities and sustainable supply chain integration significantly facilitate SMEs' transition toward circular practices (Centobelli et al., 2021). Similarly, research conducted in South Asian manufacturing contexts demonstrates that strong green supply chain coordination enhances circular economy implementation and improves sustainability performance (Karmaker et al., 2023). Although these findings provide robust evidence from European and South Asian industrial settings, empirical research remains limited on how supply chain relationship management strengthens circular economy capabilities within SME clusters in developing economies such as Indonesia, where relational governance structures and resource constraints differ substantially. Therefore, supply chain relationship management is expected to positively influence circular economy capabilities in Indonesian wood-based SMEs.

H_4a: Supply chain relationship management mediates the relationship between social pressure and circular economy capability.
H_4b: Supply chain relationship management mediates the relationship between green economic incentives and circular economy capability.
H_4c: Supply chain relationship management mediates the relationship between environmental commitment and circular economy capability.

Although social pressure, green economic incentives, and environmental commitment drive the adoption of sustainability, their effects on circular economy capabilities are not always direct, especially in SMEs facing financial and technological constraints, making inter-organizational collaboration essential for translating sustainability orientation into

operational capability. Evidence from European manufacturing firms shows that circular transformation requires coordinated supply chain action supported by relational governance (Centobelli et al., 2021), while studies in Chinese industrial sectors confirm that green upgrading depends on structured collaboration among supply chain actors (Dong & Zhu, 2023). Additional findings from Central and Eastern European firms and Turkish manufacturing SMEs indicate that relational supply chain practices function as effective implementation mechanisms for environmental initiatives (Türkeș et al., 2024; Gelmez et al., 2024). These findings imply that supply chain relationship management (SCRM) serves as a mediating mechanism, translating behavioral and institutional drivers into coordinated circular practices and measurable capability outcomes. However, research on this mediating role within SME clusters in developing economies remains limited. Thus, investigating Indonesian wood-based SMEs enhances contextual generalizability and strengthens external validity.

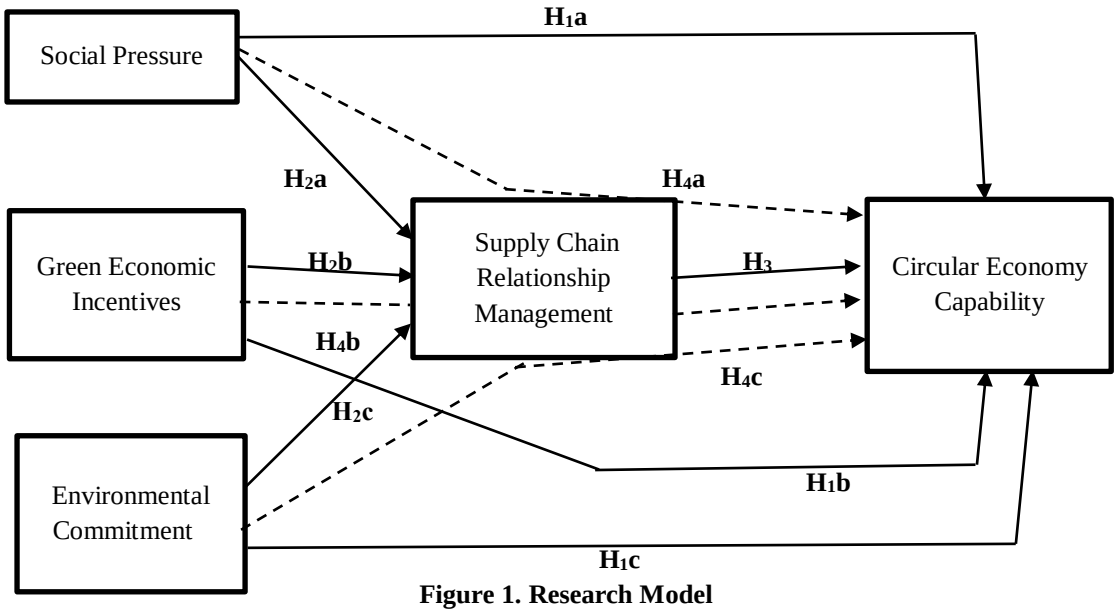

Figure 1. Research Model

3. Method

This study uses a quantitative cross-sectional survey design to examine causal relationships among variables in wood furniture SMEs in Bantul Regency, collecting data at a single point in time to estimate structural relationships among latent constructs (Hair, 2022). Primary data were collected through direct field surveys, in which structured questionnaires were distributed to SME owners or employees involved in strategic and operational decision-making. The sampling technique applied was non-probability purposive sampling with two criteria: SMEs that conduct repair, restoration, or remanufacturing activities as part of circular economy practices, and those that ensure the safety of wood materials in consumer products, and that have operated for at least three years (Wahab & Saad, 2022). Based on official data from the Bantul Regency Cooperatives, SMEs, and Industry Office (2025), 2,900 wood-based SMEs are operating in Bantul Regency, of which 70 agreed to participate and provided complete responses. Therefore, the sample size is considered adequate for

PLS-SEM analysis, which prioritizes predictive accuracy and structural model estimation over broad statistical generalizations (Hair, 2022).

Table 1. Research Instrument

Variable	Instrument
Social Pressure (Centobelli et al., 2021)	1. Our SME produces environmentally friendly furniture products in accordance with national/global market demands. 2. Our SME applies circular economy principles (reduce, reuse, recycle) in production activities. 3. Our SME complies with environmental regulations such as SVLK certification. 4. Our SME meets the environmental performance expectations required by financial institutions.
Green Economic Incentives (Centobelli et al., 2021)	1. Our SME receives government incentives or subsidies related to environmentally friendly practices. 2. Our SME gains financial benefits because customers are willing to pay premium prices for eco-friendly furniture products. 3. Our SME obtains recycled raw materials at lower costs compared to new materials.
Environmental Commitment (Centobelli et al., 2021)	1. Our SME considers environmental impact in every furniture production process. 2. Our SME is committed to reducing the use of virgin wood materials through reuse and recycling practices. 3. Our SME demonstrates environmental responsibility through waste management and efficient resource utilization.
Supply Chain Relationship Management (Centobelli et al., 2021)	1. Our SME regularly evaluates suppliers' environmental performance. 2. Our SME ensures suppliers possess legal certifications such as SVLK. 3. Our SME collaborates technically with suppliers to reduce the environmental impacts of furniture products. 4. Our SME works together with suppliers to solve sustainability-related problems.
Circular Economy Capability (Centobelli et al., 2021)	1. Our SME reduces the amount of wood used per unit of product. 2. Our SME reduces raw material and energy consumption during production. 3. Our SME uses energy-efficient production equipment. 4. Our SME reuses product packaging materials. 5. Our SME reuses cleaning materials repeatedly. 6. Our SME utilizes wood scraps to create additional or new products. 7. Our SME recycles production waste into other materials or for resale. 8. Our SME reprocesses recycled materials for reuse. 9. Our SME utilizes waste from re-processing for further production.

4. Result & Discussion

This study recruited 70 respondents through direct distribution of questionnaires, visiting each wooden furniture SME in Bantul Regency. Data collection was conducted face-to-face to ensure that the questionnaires were completed in full and met the research criteria. The characteristics of the respondents and their businesses are shown in Table 2. In this study, hypothesis testing was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. The measurement model was assessed by examining the outer loadings, Composite Reliability, Cronbach's Alpha, and Average Variance Extracted (AVE) to assess the validity and reliability of the constructs. The results of the measurement

model testing indicate that all indicators have outer loadings exceeding 0.70. Of the 23 indicators used in this study, 12 had outer loading values above 0.70, and 11 had values above 0.80. In this way, all indicators in this study are declared valid because they show outer loading values greater than 0.70 in accordance with the PLS-SEM analysis criteria. In this case, all indicators are considered suitable for use in future analyses.

Table 2. Characteristics of Respondents and SMEs

No	Characteristics	Category	Amount	Percentage
1	**Gender**	Male	64	91.4%
		Female	6	8.6%
2	**Last education**	SD/SMP/SMA	56	80%
		Diploma	4	5.7%
		Bachelor	10	14.3%
3	**Position**	Owner	18	25.7%
		Employee	52	74.3%
4	**Age of SMEs**	2 – 5 years	23	32.9%
		>5 years	47	67.1%
5	**Number of employees**	< 10 employees	58	82.7%
		10 – 20 employees	10	14.5%
		20 – 30 employees	1	1.4%
		> 30 employees	1	1.4%

The reliability and validity assessment indicate that all constructs meet the recommended thresholds. Composite Reliability (CR) values exceed 0.70 for SP (0.853), GEI (0.910), EC (0.879), SCRM (0.905), and CEC (0.924), confirming strong internal consistency, supported by Cronbach's Alpha values above 0.70. Additionally, all Average Variance Extracted (AVE) values are above 0.50 (SP 0.593; GEI 0.771; EC 0.708; SCRM 0.705; CEC 0.574), demonstrating satisfactory convergent validity.

Table 3. Reliability Testing

Variable	Cronbach's Alpha	CR	AVE
Social Pressure (SP)	0.769	0.853	0.593
Green Economic Incentives (GEI)	0.854	0.910	0.771
Environmental Commitment (EC)	0.798	0.879	0.708
Supply Chain Relationship Management (SCRM)	0.861	0.905	0.705
Circular Economy Capabilities (CEC)	0.907	0.924	0.574

The R-square value for circular economy capabilities (CEC) is 0.589, indicating that the predictor variables explain 58.9% of the variance in CEC. Meanwhile, supply chain relationship management has an R-square of 0.632, meaning that the exogenous constructs explain 63.2% of its variance. According to Hair et al. (2022), R-square values of 0.75, 0.50, and 0.25 are categorized as substantial, moderate, and weak; thus, the results indicate moderate to substantial explanatory power.

Empirical analysis indicates that social pressure from customers, suppliers, and local communities strengthens circular-economy capabilities among wood-furniture SMEs in Bantul (H_1a accepted). In this cluster context, social pressure serves as a legitimacy-seeking mechanism, encouraging firms to align their production practices with prevailing environmental expectations. When firms perceive reputational risk or social scrutiny, they tend to adopt practices of repair, refurbishment, remanufacturing, material efficiency, and

waste reduction as visible signals of responsibility. Institutional theory explains that normative and coercive pressures shape organizational behavior by motivating conformity to socially accepted standards to secure market legitimacy and sustainability. In SME environments where formal enforcement may be limited, social expectations often serve as a stronger driver of behavior than regulatory mandates. Social pressure also reduces uncertainty about sustainability norms, guiding managerial decision-making toward environmentally oriented operational adjustments. In tightly connected industrial clusters, reputational information spreads rapidly, reinforcing collective expectations and strengthening adaptive responses. This process stimulates internal reflection and learning, gradually enhancing firms' environmental competence. Over time, repeated adaptations embed circular routines into daily operations. As a result, social pressures act not only as external constraints but also as catalysts that directly shape strategic adaptation and strengthen circular economy capabilities (Centobelli et al., 2021; Yuriev et al., 2020).

Empirical findings indicate that green economic incentives strengthen circular economy capabilities among wood-based SMEs in Bantul (H_1b accepted). Economic incentives not only encourage environmental intentions but also alter firms' resource allocation decisions by reducing the financial burden of circular investments. When subsidies, tax breaks, or market rewards are available, firms are more willing to invest in cleaner technologies, material recovery systems, and eco-design processes. These investments facilitate organizational learning and the development of new operational routines related to waste minimization and resource efficiency. Over time, repeated implementation of these routines transforms discrete environmental actions into structured, replicable capabilities. From a capabilities-based perspective, incentives serve as external drivers that stimulate internal reconfiguration of resources and processes. For resource-constrained SMEs, reducing economic risk is crucial for initiating experiments with circular production models. This research encourages knowledge accumulation and process integration, which are essential elements of capability formation. As firms institutionalize these practices, circular economy initiatives become embedded within their strategic and operational systems rather than remaining isolated projects. Therefore, green economy incentives contribute to the gradual development of circular economy capabilities by enabling investment, learning, and the formation of organizational routines (Khan et al., 2022; Castro-Lopez et al., 2023; Jin et al., 2024).

Empirical analysis indicates that environmental commitment does not directly enhance circular economy capability among wood-based SMEs in Bantul (H_1c rejected). Environmental commitment reflects managerial intention and environmental awareness, but intention alone does not guarantee operational transformation. Circular economy capability requires structured routines such as eco-design integration, waste recovery systems, and coordinated reverse logistics processes. These capabilities emerge through systematic resource allocation, process reconfiguration, and continuous organizational learning. In many SMEs, environmental commitment remains normative due to limited financial, technological, and managerial resources. Without dedicated investment and formal implementation mechanisms, environmental values do not evolve into repeatable operational

practices. Capability development is cumulative and path-dependent, requiring sustained experimentation and monitoring rather than isolated declarations of support. Moreover, firms operating in resource-constrained cluster environments often prioritize short-term efficiency over long-term systemic restructuring. As a result, environmental commitment may shape strategic orientation but fail to generate embedded circular routines. Therefore, commitment alone lacks the structural and resource-based foundation necessary to build circular economy capability (Jiao et al., 2025; Hernández-Arzaba et al., 2022).

Empirical evidence indicates that social pressure does not significantly enhance supply chain relationship management among wood-based SMEs in Bantul (H_2a rejected). Social pressures primarily influence firms at the cognitive and normative level by shaping environmental awareness and legitimacy concerns. However, SCRM represents a structural and strategic construct that requires formal coordination mechanisms and long-term relational commitments. In SME clusters characterized by informal and trust-based exchanges, external expectations rarely translate into systematic governance changes. The development of SCRM depends on deliberate managerial investment in joint planning, information sharing systems, and relational monitoring routines. Such mechanisms require internal strategic alignment and resource allocation rather than reactive responses to external scrutiny. While social pressure may encourage firms to appear environmentally responsible, it does not automatically induce structural integration with suppliers or buyers. Resource constraints and limited managerial capacity further restrict SMEs' ability to institutionalize collaborative supply chain practices. Consequently, social pressure remains confined to internal motivational signals and does not transform inter-organizational coordination patterns. Therefore, in this empirical context, social pressure lacks the structural leverage needed to drive the development of relational supply chain management (Yuriev et al., 2020; Jum'a et al., 2025; Li et al., 2025).

Empirical evidence indicates that green economic incentives strengthen supply chain relationship management among wood-based SMEs in Bantul (H_2b accepted). Economic incentives reduce financial uncertainty and lower the perceived risks associated with collaborative environmental initiatives. When firms receive subsidies or regulatory support, they are more willing to formalize partnerships with suppliers and buyers to maximize collective benefits. Such incentives encourage joint planning, shared environmental standards, and coordinated resource management across the supply chain. In resource-constrained SMEs, external financial support decreases coordination costs and makes investments in communication systems and monitoring mechanisms more feasible. Incentive schemes often require reporting and compliance procedures, which indirectly stimulate transparency and structured interaction among supply chain partners. This process enhances trust, mutual commitment, and relational embeddedness within the network. By aligning economic rewards with environmental collaboration, incentives reshape managerial priorities toward long-term partnership orientation. Over time, repeated coordinated activities evolve into stable relational routines that characterize effective SCRM. Therefore, green economic incentives serve as structural enablers, transforming financial motivation

into stronger inter-organizational coordination (Hou et al., 2023; Ren et al., 2025; Bolaji et al., 2024).

Empirical results indicate that environmental commitment strengthens supply chain relationship management among wood-based SMEs in Bantul (H_2c accepted). Environmental commitment reflects a strategic orientation that embeds sustainability into managerial priorities and decision-making processes. When top management consistently emphasizes environmental responsibility, firms are more likely to align supplier selection, evaluation criteria, and partnership strategies with sustainability objectives. This alignment encourages the development of shared environmental goals between buyers and suppliers. Shared sustainability values enhance trust, reduce relational uncertainty, and strengthen long-term commitment within the supply chain. Environmental commitment also motivates firms to establish structured communication and monitoring mechanisms related to environmental performance. Through repeated coordination around sustainability objectives, collaborative routines gradually become institutionalized. In SME clusters characterized by close social proximity, visible environmental dedication reinforces relational credibility and network stability. Over time, these relational adjustments evolve into structured governance mechanisms that define effective SCRM. Therefore, environmental commitment operates as an internal strategic driver that shapes relational alignment and strengthens collaborative supply chain management (Bashar et al., 2025; Nabilla et al., 2025).

Empirical findings indicate that supply chain relationship management does not directly enhance circular economy capability among wood-based SMEs in Bantul (H_3 rejected). While relational coordination improves communication and trust among partners, circular capability requires deeper operational and technological transformation. Circular economy capability involves structured routines such as eco-design integration, reverse logistics systems, and material recovery processes. These routines depend on internal investment, technical expertise, and organizational learning rather than relational alignment alone. In many SMEs, supply chain relationships remain transactional and efficiency-oriented instead of innovation-driven. As a result, collaboration may facilitate information exchange without generating structural reconfiguration of production processes. Capability development is cumulative and path-dependent, requiring sustained experimentation and institutionalization of new practices. Without adequate internal readiness and resource commitment, collaborative ties cannot evolve into embedded circular routines. In cluster-based SME environments, informal governance further limits the depth of integration needed for systemic circular redesign. Therefore, SCRM functions as a supportive relational mechanism but lacks the structural leverage necessary to build circular economy capability directly (Hernández-Arzaba et al., 2022; Jiao et al., 2025; Aguirre-Rodríguez et al., 2024).

Empirical evidence indicates that supply chain relationship management does not mediate the relationship between social pressure and circular economy capability among wood-based SMEs in Bantul (H_4a rejected). Although social pressure directly motivates firms to adopt visible circular practices, this influence does not operate through structured relational coordination within the supply chain. Social pressure was found to impact circular

economy capabilities directly. However, its indirect effect through supply chain relationship management was not significant, indicating that the mediating role of supply chain relationship management was not supported. Prior research highlights the strategic role of supply chain relationship management in bridging social pressure and circular economy capabilities (Zeng et al., 2017). Other studies also argue that supply chain relationship management, without effective stakeholder collaboration, technology transfer, and organizational learning, cannot drive improvements in circular economy practices (Mishra et al., 2021). In the furniture SMEs context, supply chain relationship management is reflected in strengthening long-term partnerships, particularly in raw material management, energy efficiency, and recycling technology innovation; however, these efforts were insufficient to translate social pressure into indirect enhancements in circular economy capabilities.

Table 4. Direct Relationship Testing

Hypothesis	Beta	Sample Mean	STDEV	T-Statistic	P-values	Results
SP => CEC	0.542	0.559	0.105	5.166	0.000**	H_1a: Accepted
GEI => CEC	0.353	0.334	0.097	3.624	0.000**	H_1b: Accepted
EC => CEC	0.092	0.088	0.140	0.661	0.509	H_1c: Rejected
SP => SCRM	0.092	0.094	0.087	1.058	0.290	H_2a: Rejected
GEI => SCRM	0.274	0.269	0.116	2.371	0.018**	H_2b: Accepted
EC=> SCRM	0.558	0.568	0.096	5.829	0.000**	H_2c: Accepted
SCRM => CEC	- 0.110	-0.094	0.118	0.934	0.350	H_3: Rejected

** Sig < 5%

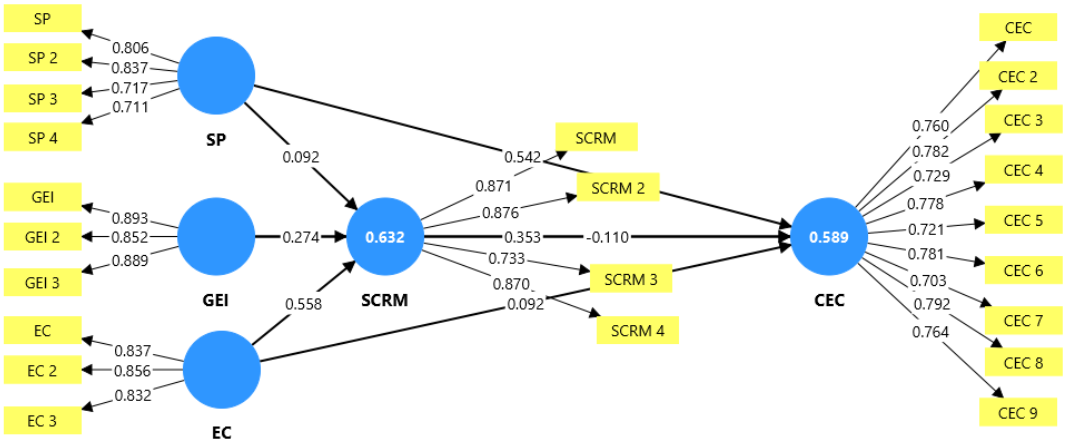

Figure 2. PLS-Algorithm Model

Empirical findings indicate that supply chain relationship management does not mediate the relationship between green economic incentives and circular economy capability among wood-based SMEs in Bantul (H_4b rejected). Although green economic incentives have a direct impact on circular economy capabilities, their indirect effect through supply chain relationship management is insignificant, indicating that this relationship is not mediated by supply chain relationship management. Effective mediation would require incentives first to strengthen structured coordination between suppliers and buyers, and subsequently to translate that coordination into embedded circular routines. However, in SME cluster settings, supply chain collaboration often remains limited to operational

efficiency rather than strategic sustainability integration. Previous studies highlighted that supply chain relationship management plays a strategic role in translating external support into supply chain collaboration and integrated circular practices, including eco-design, waste reduction, and technology adoption (Khan et al., 2022; Türkeş et al., 2024). Other studies also argue that without adequate organizational readiness, technology transfer, and internal learning, supply chain relationship management may not effectively translate green economic incentives into enhanced circular economy capabilities (Aguirre-Rodríguez et al., 2024). In furniture SMEs, supply chain relationship management is reflected in efforts to strengthen sustainable partnerships in raw material management, energy use, and recycling technologies. However, these practices have not been implemented optimally to enhance circular economy capabilities significantly.

Empirical findings indicate that supply chain relationship management does not mediate the relationship between environmental commitment and circular economy capability among wood-based SMEs in Bantul (H4c rejected). Although environmental commitment strengthens sustainability orientation at the managerial level, this orientation does not operate through relational supply chain mechanisms to generate capability development. Mediation would require an environmental commitment to first reinforce structured collaboration between suppliers and buyers, and subsequently translate that collaboration into embedded circular routines. However, supply chain relationships within SME clusters often remain informal and operationally focused rather than strategically aligned around shared environmental innovation. Several previous studies have highlighted the importance of supply chain relationship management in bridging environmental commitments with circular economy capabilities, stating that supply chain relationship management plays a strategic role for MSMEs by promoting the use of clean energy, sustainable production technologies and processes, eco-friendly design, waste commercialization, logistics optimization, recycling practices, and waste management centers (Centobelli et al., 2021). Previous researchers have argued that environmental commitments alone will not enhance circular economy capabilities without the structured implementation and integration of internal capabilities, such as waste-management SOPs, raw-material monitoring systems, and certified-supplier policies. In this context, supply chain relationship management that fails to foster collaborative innovation and alignment of environmental goals across the supply chain, particularly without adequate technology transfer and organizational learning, will struggle to translate these commitments into concrete circular practices (Abdallah et al., 2024; Sudusinghe & Seuring, 2022).

Table 5. Indirect Relationship Testing

Hypothesis	Beta	Mean	STDEV	T-Statistic	P-values	Results
SP => SCRM => CEC	- 0.010	0.008	0.019	0.906	0.588	H_4a: Rejected
GEI => SCRM => CEC	- 0.030	0.026	0.037	0.824	0.410	H_4b: Rejected
EC => SCRM => CEC	- 0.061	0.052	0.068	0.541	0.365	H_4c: Rejected

5. Conclusions, Limitations, and Suggestions

This study examines the influence of social pressure, green economy incentives, and environmental commitment on circular economy capability among wood-based SMEs in

Indonesia by integrating the Extended Theory of Planned Behavior with Supply Chain Relationship Management (SCRM). The findings indicate that social pressure and green economy incentives directly enhance circular economy capability, while green economy incentives and environmental commitment significantly strengthen SCRM; however, environmental commitment and SCRM do not directly influence circular economy capability, and the mediating role of SCRM is not supported. These results suggest that in resource-constrained SME clusters, behavioral and economic drivers play a more decisive role in shaping the development of circular capability than relational supply chain mechanisms. This study makes a theoretical contribution by extending behavioral theory to inter-organizational sustainability research and demonstrates that relational governance alone is insufficient to generate embedded circular routines. In practice, policymakers should prioritize effective incentive schemes and regulatory strengthening. At the same time, SME managers need to strengthen internal implementation mechanisms to ensure that sustainability orientation translates into measurable circular-economy capability.

This study has several limitations. First, the insignificant mediation of Supply Chain Relationship Management (SCRM) suggests that relational coordination alone is insufficient to translate behavioral determinants into circular economy capabilities, suggesting the existence of additional internal mechanisms not examined in this study. Previous research highlights the importance of dynamic capabilities and absorptive capacity in translating sustainability orientation into operational performance (Teece, 2018; Khan et al., 2022). Second, this study employed a linear SEM approach, and the mixed significance of some relationships suggests that the formation of circular economy capabilities may involve more complex dynamics. Therefore, future research is encouraged to examine additional internal capability factors, such as organizational learning, green innovation capabilities, or digital supply chain integration, and to consider alternative research designs to better understand the dynamic development of circular economy capabilities in SMEs.

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