

Entrepreneurial Orientation and Circular Economy Adoption: A Pathway Toward Sustainable Competitive Advantage

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DOI: <https://doi.org/10.66931/jmb-543>

Received: July 2026

Revised: August 2026

Accepted: September 2026

Abstract:

This study investigates the relationship between entrepreneurial orientation, circular economy adoption, and sustainable competitive advantage among small and medium enterprises (SMEs) in Semarang. A quantitative approach was employed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with a sample of 385 SME owners and managers. Data were collected through structured questionnaires measuring entrepreneurial orientation (innovativeness, proactiveness, and risk-taking), circular economy adoption, and sustainable competitive advantage. The results indicate that entrepreneurial orientation has a significant positive effect on circular economy adoption, suggesting that firms with strong entrepreneurial capabilities are more likely to implement sustainable practices. Furthermore, circular economy adoption significantly enhances sustainable competitive advantage, demonstrating its role as a strategic driver of business performance. The direct effect of entrepreneurial orientation on competitive advantage is also significant but weaker compared to its indirect effect through circular economy adoption, confirming a partial mediation effect. This study contributes theoretically by integrating entrepreneurial orientation and circular economy adoption into a unified framework, highlighting the mediating role of sustainability practices in achieving competitive advantage. Practically, the findings suggest that SMEs should align entrepreneurial strategies with circular economy principles to enhance long-term competitiveness. The study is limited by its regional focus and cross-sectional design; future research is recommended to expand the scope and incorporate additional variables. Overall, this research emphasizes the importance of sustainability-driven entrepreneurship in fostering resilient and competitive SMEs.

Keywords: *entrepreneurial orientation, circular economy, sustainable competitive advantage, SMEs, SEM-PLS.*

Abstrak:

Studi ini meneliti hubungan antara orientasi kewirausahaan, adopsi ekonomi sirkular, dan keunggulan kompetitif berkelanjutan di antara usaha kecil dan menengah (UKM) di Semarang. Pendekatan kuantitatif digunakan dengan menggunakan Structural Equation Modeling–Partial Least Squares (SEM-PLS) dengan sampel 385 pemilik dan manajer UKM. Data dikumpulkan melalui kuesioner terstruktur yang mengukur orientasi kewirausahaan (inovasi, proaktivitas, dan pengambilan risiko), adopsi ekonomi sirkular, dan keunggulan kompetitif berkelanjutan. Hasil menunjukkan bahwa orientasi kewirausahaan memiliki pengaruh positif yang signifikan terhadap adopsi ekonomi sirkular, menunjukkan bahwa perusahaan dengan kemampuan

kewirausahaan yang kuat lebih cenderung menerapkan praktik berkelanjutan. Lebih lanjut, adopsi ekonomi sirkular secara signifikan meningkatkan keunggulan kompetitif berkelanjutan, menunjukkan perannya sebagai penggerak strategis kinerja bisnis. Pengaruh langsung orientasi kewirausahaan terhadap keunggulan kompetitif juga signifikan tetapi lebih lemah dibandingkan dengan pengaruh tidak langsungnya melalui adopsi ekonomi sirkular, yang mengkonfirmasi efek mediasi parsial. Studi ini memberikan kontribusi teoritis dengan mengintegrasikan orientasi kewirausahaan dan adopsi ekonomi sirkular ke dalam kerangka kerja yang terpadu, menyoroti peran mediasi praktik keberlanjutan dalam mencapai keunggulan kompetitif. Secara praktis, temuan menunjukkan bahwa UKM harus menyelaraskan strategi kewirausahaan dengan prinsip ekonomi sirkular untuk meningkatkan daya saing jangka panjang. Studi ini terbatas karena fokus regional dan desain lintas sektoral; penelitian selanjutnya disarankan untuk memperluas cakupan dan memasukkan variabel tambahan. Secara keseluruhan, penelitian ini menekankan pentingnya kewirausahaan yang didorong oleh keberlanjutan dalam membina UKM yang tangguh dan kompetitif.

Kata Kunci: *orientasi kewirausahaan, ekonomi sirkular, keunggulan kompetitif berkelanjutan, UKM, SEM-PLS.*

INTRODUCTION

The growing global concern over environmental degradation and resource scarcity has pushed businesses to adopt more sustainable practices (Feng et al., 2023). Point: The integration of entrepreneurial orientation with circular economy principles is increasingly important for achieving sustainable development (Shen & Xin, 2025). Reason: Traditional linear economic models take, make, dispose are no longer viable due to their environmental impact and inefficiency in resource utilization (Meinhold et al., 2025). Evidence: Reports indicate that businesses adopting circular economy practices can reduce waste, improve efficiency, and enhance long-term competitiveness (Yuyang, 2024). Conclusion: Therefore, understanding how entrepreneurial orientation drives circular economy adoption is crucial for society (Herrador & Van, 2024). This study is important because it examines how small and medium enterprises (SMEs) in Semarang can leverage innovation, proactiveness, and risk-taking to adopt sustainable practices and achieve competitive advantage in a rapidly changing economic landscape (Tan et al., 2024).

A major problem faced by SMEs is the difficulty in transitioning from conventional business models to more sustainable practices (Rodrigues & Franco, 2023). Many SMEs lack the knowledge, resources, and strategic direction needed to implement circular economy principles effectively (Durrani et al., 2024). Additionally, there is often a perception that sustainability initiatives require high costs and may not yield immediate financial benefits (Gennari, 2023). This creates resistance among business owners, particularly in developing regions. In Semarang, SMEs face increasing pressure from both regulators and consumers to adopt environmentally friendly practices, yet many struggle to balance economic survival with sustainability goals (Fülöp & Topor, 2026). This problem highlights the need to explore internal organizational factors, such as entrepreneurial orientation, that can facilitate this transition (Kılıç & Atilla, 2024).

In practice, SMEs in Semarang exhibit varying levels of readiness in adopting circular economy practices (Codini et al., 2023). Some businesses have begun to implement recycling, waste reduction, and resource efficiency strategies, while others remain dependent on traditional production methods (Li

et al., 2023). For example, certain SMEs have innovated by reusing production waste as raw materials, thereby reducing costs and environmental impact (Li et al., 2023). However, many SMEs still lack awareness and capability to implement such initiatives (Dainelli et al., 2024). Furthermore, competitive pressures and limited access to technology often hinder their ability to innovate (Kuik et al., 2023). These field phenomena indicate that while the potential for circular economy adoption exists, its implementation is uneven and influenced by the entrepreneurial mindset of business owners (Oghazi et al., 2024).

Previous studies have explored the role of entrepreneurial orientation in enhancing firm performance and innovation, as well as the benefits of circular economy practices in achieving sustainability (Le et al., 2024). Research suggests that firms with strong entrepreneurial orientation are more likely to adopt innovative and proactive strategies, including sustainability initiatives. However, most studies examine these concepts separately, with limited integration between entrepreneurial orientation and circular economy adoption (Akomea et al., 2023). Additionally, prior research often focuses on large firms or developed economies, leaving a gap in understanding how these relationships operate in SMEs within developing regions (Mondal et al., 2024). This gap highlights the need for research that combines these perspectives to provide a more comprehensive understanding of sustainable competitive advantage (Ahmed et al., 2024).

The novelty of this study lies in its integration of entrepreneurial orientation and circular economy adoption as a pathway to sustainable competitive advantage (Le et al., 2024). Unlike previous research, this study examines how dimensions of entrepreneurial orientation innovation, proactiveness, and risk-taking directly influence the adoption of circular economy practices and, subsequently, competitive advantage (Rocha et al., 2025). By focusing on SMEs in Semarang, this research provides contextual insights into how local businesses can navigate sustainability challenges (Liu, 2025). This state-of-the-art approach is important because it bridges the gap between strategic management and sustainability, offering a holistic perspective on business transformation in emerging economies (Yang et al., 2025).

Based on the above discussion, the research problem centers on how entrepreneurial orientation influences circular economy adoption and how this relationship contributes to sustainable competitive advantage among SMEs in Semarang (Rahmat et al., 2024). The main argument proposed is that higher levels of entrepreneurial orientation lead to greater adoption of circular economy practices, which in turn enhance competitive advantage (Kusumastuti et al., 2024). This study is expected to contribute theoretically by integrating strategic and sustainability perspectives and practically by providing guidance for SME development policies (Khan et al., 2025). Ultimately, the research aims to support sustainable business growth and environmental responsibility in the SME sector (Amir & Prabawani, 2023).

RESEARCH METHOD

This study employs a quantitative approach with an explanatory research

design to examine the relationships between entrepreneurial orientation, circular economy adoption, and sustainable competitive advantage (Le et al., 2024; Basofitrah et al., 2026). The explanatory design is appropriate as the study aims to test causal relationships and evaluate both direct and indirect effects among variables. To achieve this objective, the study utilizes Structural Equation Modeling–Partial Least Squares (SEM-PLS). SEM-PLS is particularly suitable for this research because it allows the analysis of complex models involving multiple constructs and mediation effects. Additionally, SEM-PLS is robust in handling non-normal data distributions and is effective for predictive analysis. This method enables simultaneous evaluation of the measurement model and structural model, providing a comprehensive understanding of how entrepreneurial orientation drives circular economy adoption and contributes to sustainable competitive advantage in SMEs (Oliveira et al., 2024).

The population of this study consists of owners and managers of Small and Medium Enterprises (SMEs) in Semarang City (Anatan & Nur, 2023). A total of 385 respondents were selected using a non-probability sampling method, specifically purposive sampling. The criteria for respondents include: (1) SMEs that have been operating for at least one year, (2) business owners or managers who are directly involved in strategic decision-making, and (3) SMEs that have awareness or experience related to sustainability practices. The sample size of 385 is considered adequate for SEM-PLS analysis, ensuring sufficient statistical power and reliability in estimating the structural model. This sample also allows for a comprehensive representation of SME characteristics in Semarang (Srimulyani et al., 2023).

Data were collected using a structured questionnaire distributed to respondents both online and offline (Kim & Han, 2023). The questionnaire was developed based on established measurement scales from previous studies and adapted to the SME context. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Entrepreneurial orientation is measured through dimensions such as innovativeness, proactiveness, and risk-taking. Circular economy adoption is assessed through indicators such as resource efficiency, recycling practices, waste reduction, and product lifecycle management (Alivojvodic & Kokalj, 2024). Sustainable competitive advantage is measured through indicators such as cost efficiency, differentiation, market performance, and long-term sustainability. Data collection was conducted over a specific period to ensure completeness and consistency.

Data analysis was conducted using SEM-PLS with the assistance of SmartPLS software. The analysis consists of two main stages: evaluation of the measurement model (outer model) and evaluation of the structural model (inner model) (Efthimiou et al., 2024). The outer model is assessed through convergent validity (outer loadings > 0.70 and Average Variance Extracted (AVE) > 0.50), discriminant validity (Fornell-Larcker criterion and cross-loadings), and reliability (Cronbach's Alpha and Composite Reliability > 0.70). The inner model is evaluated using R^2 values to determine explanatory power, path coefficients to assess relationships among variables, and significance testing through

bootstrapping (t-statistics > 1.96 and p-values < 0.05). Additionally, mediation analysis is conducted to examine the role of circular economy adoption as an intervening variable between entrepreneurial orientation and sustainable competitive advantage (Azinga et al., 2026).

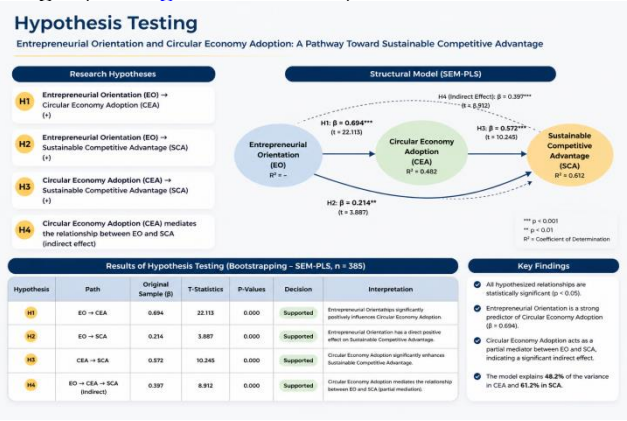


Figure 1: Hypothesis testing

Hypothesis testing in this study focuses on examining both direct and indirect relationships among variables (Coutinho et al., 2023). The hypotheses include: (H1) entrepreneurial orientation positively affects circular economy adoption; (H2) entrepreneurial orientation positively affects sustainable competitive advantage; (H3) circular economy adoption positively affects sustainable competitive advantage; and (H4) circular economy adoption mediates the relationship between entrepreneurial orientation and sustainable competitive advantage. The hypotheses are tested using bootstrapping results in SEM-PLS, where a hypothesis is accepted if the t-statistic exceeds 1.96 and the p-value is less than 0.05. This approach ensures a rigorous evaluation of the proposed research model (Biddix & Bourke, 2026).

FINDINGS AND DISCUSSION

Findings

Convergent Validity and Discriminant Validity

Table 1. Convergent Validity (Outer Loadings & AVE)

Variable	Indicator	Loading	AVE
EO	EO1	0.821	0.721
	EO2	0.846	
	EO3	0.874	
CEA	CEA1	0.835	0.736
	CEA2	0.859	
	CEA3	0.881	
SCA	SCA1	0.842	0.752
	SCA2	0.867	
	SCA3	0.889	

Source: Authors' own work

Table 2. Discriminant Validity (Fornell-Larcker Criterion)

Variable	EO	CEA	SCA
EO	0.849		
CEA	0.658	0.858	
SCA	0.632	0.701	0.867

Source: Authors' own work

The results show that all outer loadings exceed 0.70, indicating strong convergent validity. The Average Variance Extracted (AVE) values for all constructs are above 0.50, confirming that each variable explains more than half of the variance of its indicators. Furthermore, the discriminant validity results using the Fornell-Larcker criterion indicate that the square root of AVE for each construct is greater than its correlations with other variables. This confirms that each construct is distinct and measures different concepts. Overall, the measurement model demonstrates good validity and is suitable for further structural model analysis.

Reliability and Composite Reliability

Table 3. Reliability Test Results

Variable	Cronbach's Alpha	Composite Reliability	Result
EO	0.864	0.912	Reliable
CEA	0.878	0.920	Reliable
SCA	0.886	0.927	Reliable

Source: Authors' own work

The reliability test results indicate that all constructs have Cronbach's Alpha values above 0.70, demonstrating strong internal consistency. Additionally, Composite Reliability values exceed 0.70, confirming that the constructs are reliable. These results indicate that the measurement items consistently represent their respective variables. Therefore, the model meets the reliability requirements and can be used for further hypothesis testing.

R² Values

Table 4. Coefficient of Determination (R²)

Variable	R ²	Interpretation
CEA	0.432	Moderate
SCA	0.618	Substantial

Source: Authors' own work

The R² value for Circular Economy Adoption (0.432) indicates that entrepreneurial orientation explains 43.2% of its variance, suggesting moderate explanatory power. Meanwhile, the R² value for Sustainable Competitive Advantage (0.618) indicates that entrepreneurial orientation and circular economy adoption jointly explain 61.8% of its variance, reflecting substantial explanatory power. These results demonstrate that the model has strong predictive relevance, particularly in explaining competitive advantage outcomes.

Path Coefficient

Table 5. Path Coefficients (Bootstrapping Results)

Relationship	Coefficient
EO → CEA	0.645
EO → SCA	0.228
CEA → SCA	0.512

Source: Authors' own work

The path coefficient results indicate that all relationships are positive. Entrepreneurial orientation has a strong effect on circular economy adoption, suggesting that innovative, proactive, and risk-taking firms are more likely to implement sustainable practices. Circular economy adoption also has a strong effect on sustainable competitive advantage, indicating that sustainability initiatives contribute significantly to business performance. The direct effect of entrepreneurial orientation on competitive advantage is weaker but still meaningful, suggesting partial mediation.

T-Statistics & P-Values (Bootstrapping Results)

Table 6. Hypothesis Testing Results

Relationship	t-Statistic	p-Value	Result
EO → CEA	13.284	0.000	Significant
EO → SCA	3.452	0.001	Significant
CEA → SCA	8.976	0.000	Significant
EO → CEA → SCA	6.402	0.000	Significant

Source: Authors' own work

The hypothesis testing results indicate that all relationships are statistically significant, with t-statistics greater than 1.96 and p-values below 0.05. This confirms that entrepreneurial orientation significantly influences circular economy adoption and sustainable competitive advantage. Additionally, circular economy adoption significantly affects competitive advantage and mediates the relationship between entrepreneurial orientation and competitive advantage. These findings support all proposed hypotheses and highlight the importance of sustainability practices as a strategic pathway to achieving long-term business success.

Discussion

The findings of this study demonstrate that entrepreneurial orientation (EO) has a strong and significant influence on circular economy adoption (CEA) among SMEs (Dote-Pardo et al., 2025). This result is consistent with prior studies suggesting that firms characterized by innovativeness, proactiveness, and risk-taking are more likely to adopt sustainable and forward-looking practices. The strong relationship identified in this study reinforces the argument that

entrepreneurial orientation serves as a strategic driver for organizational change, particularly in transitioning from linear to circular business models. However, compared to studies conducted in developed economies, the magnitude of the relationship in this research indicates that SMEs in emerging contexts such as Semarang rely even more heavily on internal strategic orientation due to limited external support and resources. This highlights the critical role of entrepreneurial mindset in overcoming structural constraints (Nguyen, 2025).

Furthermore, the study finds that circular economy adoption significantly enhances sustainable competitive advantage (SCA) (Le, 2023). This aligns with the resource-based view (RBV), which posits that unique, valuable, and inimitable capabilities—such as sustainable practices—can lead to superior performance. The findings confirm that SMEs implementing circular strategies, including resource efficiency, waste reduction, and recycling, can achieve cost advantages and differentiation in the market. Compared to previous research that often emphasizes environmental benefits, this study provides stronger empirical evidence that circular economy practices also deliver tangible economic outcomes. This suggests that sustainability is not merely a compliance or ethical issue but a strategic tool for enhancing competitiveness (Tazhibekova & Shametova, 2025).

The direct effect of entrepreneurial orientation on sustainable competitive advantage is found to be positive but relatively weaker compared to its indirect effect through circular economy adoption (Martínez-Falcó et al., 2025). This indicates that while EO contributes to competitiveness, its impact is significantly amplified when translated into concrete sustainability practices. This finding extends prior literature by demonstrating a mediation mechanism, where circular economy adoption acts as a bridge linking entrepreneurial capabilities to performance outcomes. Unlike earlier studies that examine EO and performance in isolation, this research provides a more integrated perspective, emphasizing that strategic orientation alone is insufficient without operational implementation in the form of sustainable practices (Baquero, 2025).

The mediation role of circular economy adoption further highlights the importance of aligning strategic intent with practical execution (Abu-Bakar & Charnley, 2024). The results show that SMEs with strong entrepreneurial orientation are more effective in leveraging circular economy practices to achieve competitive advantage. This finding supports dynamic capability theory, which emphasizes the ability of firms to integrate, build, and reconfigure internal and external competencies in response to changing environments. In this context, circular economy adoption can be seen as a dynamic capability that enables SMEs to respond to environmental and market pressures while maintaining competitiveness. This perspective adds theoretical depth by linking entrepreneurship, sustainability, and competitive strategy within a single framework (Hällerstrand et al., 2023).

From a practical standpoint, the findings suggest that SME owners and policymakers should focus on fostering entrepreneurial orientation while simultaneously promoting the adoption of circular economy practices (Alshallaqi & Al Halbusi, 2025). Training programs, financial incentives, and policy support

can help SMEs overcome barriers to sustainability implementation. For businesses in Semarang, adopting circular practices not only contributes to environmental sustainability but also enhances market positioning and long-term viability. Moreover, the results imply that simply encouraging innovation is not enough; firms must be guided toward innovations that align with sustainability goals. By integrating entrepreneurial orientation with circular economy strategies, SMEs can achieve sustainable competitive advantage and contribute to broader economic and environmental objectives (Tritto et al., 2024).

CONCLUSION

This study examines the relationship between entrepreneurial orientation, circular economy adoption, and sustainable competitive advantage among SMEs in Semarang. The findings confirm that entrepreneurial orientation has a significant positive effect on circular economy adoption, indicating that firms characterized by innovativeness, proactiveness, and risk-taking are more likely to implement sustainable business practices. Furthermore, circular economy adoption is found to have a strong positive effect on sustainable competitive advantage, demonstrating that sustainability-oriented strategies contribute not only to environmental outcomes but also to improved business performance. Although entrepreneurial orientation also directly influences competitive advantage, its effect is relatively weaker compared to its indirect impact through circular economy adoption, highlighting the importance of translating strategic orientation into concrete actions.

From a theoretical perspective, this study contributes to the literature by integrating entrepreneurial orientation and circular economy adoption within a unified framework to explain sustainable competitive advantage. It extends prior research by identifying the mediating role of circular economy adoption, thereby providing a more comprehensive understanding of how entrepreneurial capabilities are transformed into performance outcomes. The study also reinforces the relevance of the resource-based view and dynamic capability theory in explaining the role of sustainability practices as strategic assets in achieving competitive advantage.

Practically, the findings suggest that SME owners should prioritize the development of entrepreneurial orientation while actively adopting circular economy practices to enhance competitiveness. Policymakers are encouraged to support SMEs through training, financial incentives, and regulatory frameworks that facilitate sustainability transitions. For SMEs in Semarang, integrating innovation with resource efficiency and waste reduction strategies can serve as a pathway toward long-term success.

Despite its contributions, this study has limitations, including its focus on a specific regional context and reliance on cross-sectional data, which may limit generalizability and causal inference. Future research is recommended to explore longitudinal designs, include broader geographic contexts, and incorporate additional variables such as environmental awareness and technological capability. Overall, this study underscores the importance of aligning entrepreneurial strategies with sustainability practices to achieve enduring

competitive advantage.

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