“Enhancing sustainable business performance through green entrepreneurial orientation in circular economy food SMEs”

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ENHANCING SUSTAINABLE BUSINESS PERFORMANCE THROUGH GREEN ENTREPRENEURIAL ORIENTATION IN CIRCULAR ECONOMY FOOD SMES

Abstract

Food SMEs in emerging markets face increasing environmental pressures and regulatory demands, requiring them to achieve sustainable business performance within the circular economy. This paper aims to investigate the influence of green entrepreneurial orientation toward sustainable business performance as mediated by green innovation and green marketing strategies, and environmental regulation and environmental consciousness as moderators, using food industry SMEs in Riau, Indonesia, as the context of analysis. Quantitative explanatory research design was employed wherein a structured questionnaire was administered to 225 SMEs practicing circular economy in urban, mainland, and coastal regions. Data were collected in April–June 2024, and SEM-PLS were employed for analysis. Results indicate that green entrepreneurial orientation directly ($\beta = 0.209$; $p < 0.001$) and indirectly through green innovation ($\beta = 0.416$; $p < 0.001$) increases sustainable business performance significantly, while green marketing strategies have no significant impact. The effect of green entrepreneurial orientation on sustainable business performance is positively moderated by environmental regulation ($\beta = 0.136$; $p < 0.001$) and negatively by environmental consciousness ($\beta = -0.042$; $p < 0.05$). The implications of the results suggest that innovation plays a pivotal role in transforming green entrepreneurial orientation into sustainability outcomes, and regulatory support is crucial.

Keywords sustainability, innovation, entrepreneurship, marketing, environment

JEL Classification Q56, L26, O31, M31

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INTRODUCTION

Economic growth pressures and excessive exploitation of natural resources directly increase environmental risks, leading to a global reassessment of business strategies related to sustainability (Geissdoerfer et al., 2017; Kirchherr et al., 2018). Currently, the circular economy is recognized as a practical response to environmental issues, particularly through strategies that reduce waste, extend product life cycles, and promote the reuse of resources in closed-loop production systems (Kraus et al., 2020). In contrast to the traditional "take, make, dispose" model, the circular economy focuses on long-term preservation rather than short-term output. Moreover, it places sustainability as a dimension of economic development rather than an obstacle.

In Indonesia, the principle of circular economy is reflected in national development policies, driven by the urgency of environmental challenges and the promise of innovation-driven growth (Bappenas, 2022). In this context, the food industry is a major contributor to environmental impacts, as well as a significant contributor to Gross Domestic

Product (GDP), employment, and exports (Citraningrum & Ardi, 2023). This sector is dominated by small and medium enterprises (SMEs), the majority of which operate on a traditional and small scale. Common problems encountered in these companies include a lack of financial and technological capacity to respond to changing market expectations, new regulatory frameworks, and consumer demand influenced by concerns about sustainability (Megawati et al., 2024; Rahmawati & Novani, 2024).

Green entrepreneurship orientation is an orientation strategy that incorporates an environmental dimension into basic organizational activities, promoting proactivity, innovation, and risk-taking in value creation, which underlies sustainability (Jiang et al., 2018; Muangmee et al., 2021; Pratono et al., 2019). Previous research has linked green entrepreneurship orientation to improving sustainable business performance. However, MSMEs in developing countries differ from those in developed countries in terms of institutional requirements, resource constraints, and market dynamics (Kraus et al., 2020). In addition, the mechanisms explaining this relationship, in particular the mediation of green innovation and green marketing strategies, have scarcely been explored in the context of food SMEs.

The prospects for green entrepreneurship orientation are strongly influenced by exogenous factors. Environmental regulation can promote the integration of green practices with business performance in the form of standards, compliance, and incentives. Likewise, stakeholder environmental consciousness (customers, suppliers, and local community) has the potential to facilitate or hinder green strategy adoption depending on the level of awareness, the values, and the extent to which they are committed to sustainability (Huang et al., 2014; Martínez-Falcó et al., 2023; San et al., 2022). Despite the growing body of literature on green entrepreneurship orientation, little is known about how it interacts with internal strategic capabilities and external environmental factors to impact sustainable business performance in resource-poor settings.

1. LITERATURE REVIEW

The increased emphasis on sustainable development has been extensively researched to examine how entrepreneurship, innovation, marketing, and regulatory frameworks can support the transition to a circular economy. The circular economy has been widely recognized as a new paradigm for sustainable development. It emphasizes resource recycling, waste minimization, and product life cycle extension (Anbumozhi & Kimura, 2018; Geissdoerfer et al., 2017; Kirchherr et al., 2018). In Indonesia, the principles of the circular economy have been mainstreamed through national policy (Bappenas, 2022), with the food sector being a priority due to its significant impact on both the economy and the environment (Rahmawati & Novani, 2024).

Previous studies emphasize that the adoption of the circular economy by SMEs is influenced by driving factors such as regulatory support and technological innovation. However, it also faces obstacles in the form of limited resources (Citraningrum & Ardi, 2023; Megawati et al., 2024). Empirical studies in Riau show that SMEs, including those in the food sector, can contribute to sustainable development (Caska, 2022; Savitri et al., 2023). This synthesis demonstrates that the circular economy is not merely an efficiency strategy but a pathway for SMEs to achieve sustainable competitiveness, despite evident gaps in implementation capacity.

Sustainable business performance is defined as a multidimensional measure of business performance. This concept encompasses economic, social, and environmental aspects, aligning with the triple bottom line concept (Elkington, 2013). The long-term competitiveness of a company can be maintained by balancing these three dimensions (Asadi et al., 2020; Shen et al., 2017; Tanwir et al., 2020; Zarefar et al., 2024). Companies that integrate sustainability into their operations can increase resilience while meeting stakeholder expectations (Astuty et al., 2024; Fernando et al., 2019; Gonzalez-Prida & Raman, 2015; Haffar & Searcy, 2017; Prakasa & Jumani, 2024; Sheikh et al., 2018; Susanto, 2019). Although there is consensus on the importance of sustainable business performance,

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empirical evidence on how food SMEs balance the triple bottom line dimensions (profit, planet, and people) is still limited.

Green entrepreneurship orientation is an applied entrepreneurship concept that prioritizes environmentally friendly goals. This concept encompasses a strategic orientation that incorporates proactivity, innovation, and risk management in conjunction with environmental objectives (Jiang et al., 2018; Muangmee et al., 2021; Pratono et al., 2019; Sharma et al., 2022). The positive contribution of green entrepreneurship orientation to sustainable business performance, both directly and indirectly through innovation capabilities, has been stated in several studies (Ghoniyah et al., 2024; Guo et al., 2023). However, this is inconsistent with research by Magaji et al. (2017), which found a weaker impact of green entrepreneurship orientation on SMEs in specific contexts. This discrepancy indicates that the effectiveness of green entrepreneurship orientation is highly influenced by institutional conditions, resources, and market dynamics (Baig & Yadegaridehkordi, 2023; Makhloufi et al., 2021; Yadegaridehkordi et al., 2023; Ye et al., 2022).

Green innovation is considered an important mechanism for sustainability because it involves designing environmentally friendly products, processes, and technologies (Tantayanubutr & Panjakajornsak, 2017; Ullah et al., 2021). Green innovation can reduce costs, increase resource productivity, and strengthen regulatory compliance, thereby improving sustainable business performance (Asadi et al., 2020; Chavira et al., 2023; Muangmee et al., 2021). However, the impact of green innovation is not equally distributed across all sectors. It has a strong influence on technology-intensive sectors as a driver of competitiveness, but its role is still developing in food SMEs due to capacity constraints. Therefore, this study emphasizes the mediating role of green innovation in the relationship between green entrepreneurship orientation and sustainable business performance in a context with limited resources.

Green marketing strategies have emerged as a crucial factor for firms in integrating sustainability into their marketing operations. This includes the marketing mix, which covers product, price, distribution, and promotion (Ara et al., 2019; Dangelico & Vocalelli, 2017). Empirical studies demonstrate that this strategy enhances reputation and sustainability performance (Khan et al., 2020; Nadesan & Weerasinghe, 2019), primarily through eco-branding and sustainable packaging (Eneizan, 2016; Mushtaq et al., 2019). However, the implementation of green marketing strategies in SMEs is often hampered by limited capital and human resources, which has an impact on sustainable business performance (Hairudinor & Barkatullah, 2020).

Environmental regulation provides the institutional mechanism for the sustainability of industrial establishments. It serves as an institutional instrument to promote sustainability, whether through emission standards, incentives, or renewable energy credits (Ramzy & Zaki, 2018; Tran et al., 2022). Well-designed regulations can stimulate innovation and strengthen competitiveness (Korhonen et al., 2015; Ribeiro & Kruglianskas, 2015; Wang et al., 2016). However, overly strict regulations risk suppressing SMEs due to high compliance costs (Peuckert, 2014). Government regulations serve as norms, such as environmental regulations, which can act as a moderating variable and have rarely been tested (Solimun et al., 2017). This study on food SMEs will expand the literature by examining how environmental regulation can strengthen or weaken the relationship between green entrepreneurship orientation and sustainable business performance.

Environmental consciousness reflects the level of environmental awareness, attitudes, and behavior of individuals and organizations (Huang et al., 2014). Numerous studies confirm that environmental consciousness can encourage companies to adopt green practices and improve sustainable performance (Martínez-Falcó et al., 2023; San et al., 2022; Yucedag et al., 2018). However, the results showed that environmental consciousness puts additional pressure on SMEs that lack resources, thereby weakening the green entrepreneurship orientation–sustainable business performance relationship (Kraus et al., 2020; Teh et al., 2022). Thus, environmental consciousness can act as both an opportunity and an obstacle, and further testing is needed in the context of food SMEs in Riau, Indonesia.

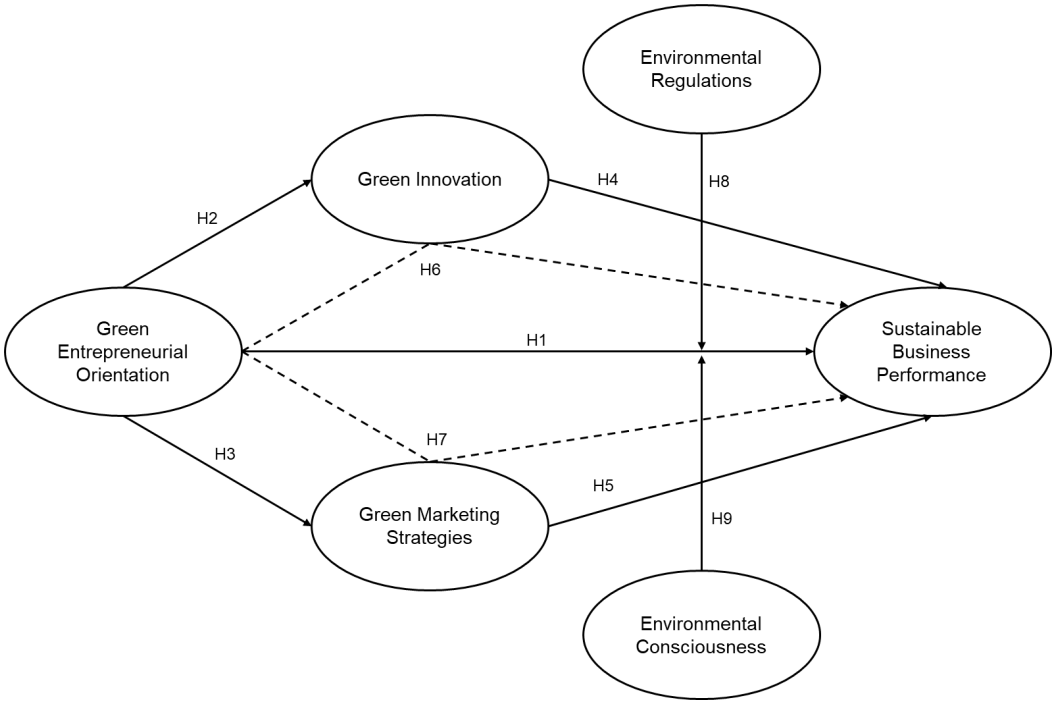

Figure 1. Research model

Overall, green entrepreneurship orientation, green innovation, green marketing strategies, environmental regulation, and environmental consciousness have significant potential to improve sustainable business performance. However, previous findings remain diverse and primarily focus on the non-food sector. This study fills the gap in examining these relationships in circular economy-based food SMEs in developing countries, particularly Indonesia.

Figure 1 presents a research model that examines the relationship between green entrepreneurship orientation and sustainable business performance in circular economy-based food SMEs. This study analyzes the role of green entrepreneurial orientation in improving food SMEs' sustainable business performance in Riau's circular economy. Thus, the hypotheses are formulated as follows:

H1: Green entrepreneurship orientation has an impact on sustainable business performance.

H2: Green entrepreneurship orientation has an impact on green innovation.

H3: Green entrepreneurship orientation has an impact on green marketing strategies.

H4: Green innovation has an impact on sustainable business performance.

H5: Green marketing strategies have an impact on sustainable business performance.

H6: Green entrepreneurship orientation has an impact on sustainable business performance with green innovation as a mediator.

H7: Green entrepreneurship orientation impacts sustainable business performance with green marketing strategies as a mediator.

H8: Environmental regulation moderates the impact of green entrepreneurship orientation on sustainable business performance.

H9: Environmental consciousness moderates the impact of green entrepreneurship orientation on sustainable business performance.

2. METHODS

This study employed a quantitative explanatory approach to investigate the causal relationships among green entrepreneurship orientation, green innovation, green marketing strategies, environ-

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Table 1. Cluster sample distribution

No.	Cluster	Regency/City	Number of Respondents
1	Urban	Pekanbaru, Dumai	75
2	Riau Mainland	Kampar, Pelalawan, Siak, Rokan Hulu, Indragiri Hulu, Kuantan Singingi	75
3	Coastal Riau	Bengkalis, Kepulauan Meranti, Rokan Hilir, Indragiri Hilir	75
		Total Respondents	225

mental regulation, environmental consciousness, and sustainable business performance. A cross-sectional design was adopted because it enables simultaneous analysis of multiple variables and allows for the testing of mediation and moderation effects within a single research framework.

The population of the study consisted of 954 registered SMEs in the food sector in Riau Province, Indonesia, based on Government Regulation No. 7/2021 (Legislation of The Republic of Indonesia, 2021) and Statistics Indonesia (BPS). Since not all of these enterprises consistently implement circular economy principles, the sample was determined using the calculation formula suggested by Hair et al. (2014). A total of 225 SMEs that actively applied circular economy initiatives such as rethink, reuse, reduce, repair, refurbish, remanufacture, repurpose, recycle, and recover were selected. To ensure representativeness across socio-economic and geographic contexts, a cluster sampling method was applied, dividing respondents into urban, mainland, and coastal categories. The distribution of respondents is presented in Table 1.

Data were collected between April and June 2024 using a structured questionnaire measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The items were adapted from previously validated studies (Jiang et al., 2018; Liu et al., 2022; Muangmee et al., 2021), which ensured both reliability and comparability of measurement. Items were chosen according to their theoretical relevance to the constructs under investigation. A pilot test of 20 SMEs was performed to improve the wording and clarity of the items before they were distributed. In addition to cluster-based sample distribution, the socio-demographic characteristics of respondents, such as gender, age, education, and length of business operation, were also recorded.

This study recorded the socio-demographic profiles of 225 respondents. Respondent details include 54.2% male and 45.8% female; 67.6% are aged 17–35 years; 56.9% are high school graduates, while 34.2% have higher education (diploma, bachelor's, or postgraduate). A total of 43.1% of SMEs have been operating for less than five years; the majority have an annual turnover of less than IDR 2 billion; asset values are generally in the range of IDR 1–5 billion; and the number of employees is mainly in the range of 6–19 people.

For purposes of transparency, the full questionnaire was published in the supplementary material and posted on the Zenodo repository (Tengku, 2025). Ethical standards were maintained throughout the study. Participation was not compulsory, and full confidentiality and anonymity were ensured.

The data analysis was performed in Smart PLS using the partial least squares structural equation modeling (PLS-SEM). This technique was chosen for its robustness, capability to handle predictive models, fit for small sample sizes, and ability to analyze data that were not normally distributed (Hair et al., 2014). The analysis included the evaluation of measurement validity and reliability, assessment of the structural model, and hypothesis testing for both direct and indirect relationships, as well as moderation effects.

The characteristics of respondents, representing food sector SMEs engaged in the circular economy in Riau Province, are presented in Table 2.

Table 2 presents respondents' demographics, with the majority of respondents in this study being male, which reflects their dominance in managing food sector SMEs. In terms of age, it is dominated by the 17-25 age group, followed by the 26-35 age group; this indicates a high interest from younger generations in the food business. Regarding educational level, most re-

Table 2. Recapitulation of respondent demography

Respondent Characteristics	Frequency	Percentage (%)
Gender		
Male	122	54.2
Female	103	45.8
Age		
17-25 years	78	34.7
26-35 years	74	32.9
36-45 years	42	18.7
46-55 years	21	9.3
> 55 years	10	4.4
Level of education		
Junior High School	20	8.9
Senior High School	128	56.9
Diploma and Bachelor's Degree	74	32.9
Postgraduate	3	1.3
Business Duration		
< 5 years	97	43.1
5-10 years	78	34.7
10-15 years	27	12.0
> 15 years	23	10.2
Total Asset		
< IDR 1,000,000,000 (USD 60.26)	89	39.6
IDR 1,000,000,001-5,000,000,000 (USD 60.26-USD 301.30)	107	4.6
IDR 5,0000,000,001-10,000,000,000 (USD 301.30-USD 602.59)	29	12.9
Annual Turnover		
< IDR 2,000,000,000 (USD 120,481.93)	110	48.9
IDR 2,000,000,001 – 15,000,000,000 (USD 120,481.93-USD 903,61446)	79	35.1
IDR 15,000,000,001 – 50,000,000,000 (USD 903,614.46-USD 3,012,048.19)	36	16.00
Number of Employees		
1-5 employees	60	26.7
6-19 employees	151	67.1
20-99 employees	14	6.2

spondents are high school graduates; however, the considerable participation of diploma and bachelor's degree holders reflects the diversity of educational backgrounds in the industry.

The majority of surveyed businesses have been operating for less than five years, indicating a high rate of new businesses in the food sector, with only a small number operating for more than 15 years. In terms of assets, most businesses have asset values ranging from IDR 1–5 billion, reflecting a domination of small and medium enterprises, while businesses with asset valuations higher than IDR 5 billion are fewer in number. In terms of revenue, the majority of businesses generate an annual sales turnover of less than IDR 2 billion, which confirms that most SMEs in this sector operate on a small scale, with only a few businesses earning a revenue between IDR 15–50 billion. Employees in these businesses are mostly between 6 and 19 people, while businesses with a larger workforce (20–99 people) are relatively small, which means that the industry studied in this research consists mostly of small businesses.

3. RESULTS

A descriptive analysis was conducted to explore the key statistical values of each variable based on 225 respondents. This process involved calculating the mean, minimum, and maximum values to understand the data distribution and overall characteristics of the variables, as presented in Table 3.

Table 3 presents descriptive statistics of the research variables, with the average values ranging between 3.70 and 4.01, indicating respon-

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Table 3. Descriptive statistics

Variable	Min	Max	Mean	Category
Sustainable Business Performance	1	5	3.85	Agree
Green Entrepreneurial Orientation	1	5	4.01	Agree
Green Innovation	1	5	3.88	Agree
Green Marketing Strategy	1	5	3.78	Agree
Environmental Regulation	1	5	3.99	Agree
Environmental Consciousness	1	5	3.70	Agree
Total Mean			386	Agree

dents' tendency to agree with the related statements. The Grand Mean of 3.86 reinforces that respondents generally agree with all the variables examined. The evaluation of the measurement model in this study aims to assess the validity and reliability of the constructs, as presented in Table 4.

Table 4 presents information on outer loading, AVE, Cronbach's alpha, and composite reliability. Outer loading values obtained for each construct are more than 0.05, which means that each construct can be considered valid. The AVE values for all constructs exceed the 0.50 threshold, which indicates these variables adequately represent their respective constructs. All research variables have Cronbach's alpha and composite reliability values exceeding 0.70, indicating that the instruments used are reliable.

Table 4. Outer loadings, AVE, Cronbach's alpha, and composite reliability

Variable	Indicator	Outer Loading	AVE	Cronbach's Alpha	Composite Reliability
Environmental consciousness	EC1	0.686	0.573	0.906	0.923
	EC2	0.784			
	EC3	0.842			
	EC4	0.772			
Environmental regulation	ER1	0.668	0.643	0.815	0.878
	ER2	0.746			
	ER3	0.966			
	ER4	0.679			
Green entrepreneurship orientation	GEO1	0.799	0.653	0.866	0.904
	GEO2	0.807			
	GEO3	0.826			
	GEO4	0.777			
Green innovation	GI1	0.829	0.542	0.927	0.938
	GI2	0.775			
	GI3	0.770			
	GI4	0.885			
	GI5	0.775			
Green marketing strategies	GMS1	0.894	0.599	0.823	0.854
	GMS10	0.736			
	GMS11	0.744			
	GMS12	0.641			
	GMS13	0.712			
	GMS2	0.941			
	GMS3	0.666			
	GMS4	0.671			
	GMS5	0.635			
	GMS6	0.700			
	GMS7	0.583			
	GMS8	0.711			
	GMS9	0.844			
Sustainable business performance	SBP1	0.712	0.597	0.774	0.855
	SBP2	0.782			
	SBP3	0.753			
	SBP4	0.720			
	SBP5	0.831			
	SBP6	0.771			
	SBP7	0.800			
	SBP8	0.716			
	SBP9	0.719			

Table 5. Cross loading

Indicator	EC	ER	GEO	GI	GMS	SBP
EC1	0.686	–0.021	0.443	0.433	0.368	0.448
EC2	0.784	–0.033	0.406	0.491	0.444	0.518
EC3	0.842	0.037	0.507	0.565	0.489	0.594
EC4	0.772	0.079	0.458	0.490	0.528	0.575
ER1	0.046	0.668	0.023	0.007	0.169	–0.013
ER2	0.052	0.746	0.124	–0.017	0.259	–0.015
ER3	0.015	0.966	0.150	–0.057	0.237	–0.062
ER4	–0.021	0.679	0.116	–0.019	0.230	–0.009
GEO1	0.464	0.082	0.799	0.540	0.473	0.587
GEO2	0.437	0.071	0.807	0.538	0.486	0.569
GEO3	0.500	0.091	0.826	0.524	0.542	0.558
GEO4	0.481	0.216	0.777	0.546	0.577	0.569

Table 5 (cont.). Cross loading

Indicator	EC	ER	GEO	GI	GMS	SBP
GI1	0.530	–0.124	0.578	0.829	0.472	0.793
GI2	0.581	–0.075	0.525	0.775	0.454	0.688
GI3	0.470	0.123	0.528	0.770	0.483	0.689
GI4	0.533	–0.034	0.575	0.885	0.570	0.778
GI5	0.487	–0.061	0.496	0.775	0.513	0.715
GMS1	0.455	0.248	0.463	0.424	0.894	0.407
GMS2	0.575	0.242	0.547	0.540	0.941	0.524
GMS3	0.360	0.176	0.410	0.414	0.666	0.392
GMS4	0.348	0.142	0.434	0.418	0.671	0.429
GMS5	0.367	0.108	0.457	0.375	0.635	0.394
GMS6	0.375	0.303	0.470	0.397	0.700	0.384
GMS7	0.538	–0.008	0.482	0.542	0.583	0.570
GMS8	0.460	0.140	0.501	0.462	0.711	0.470
GMS9	0.476	0.221	0.418	0.436	0.844	0.413
GMS10	0.381	0.290	0.471	0.437	0.736	0.420
GMS11	0.440	0.216	0.484	0.474	0.744	0.467
GMS12	0.433	0.212	0.517	0.484	0.641	0.492
SBP1	0.472	–0.113	0.440	0.632	0.390	0.712
SBP2	0.566	–0.028	0.549	0.714	0.455	0.782
SBP3	0.476	–0.045	0.495	0.673	0.450	0.753
SBP4	0.471	–0.008	0.522	0.654	0.421	0.720
SBP5	0.557	–0.009	0.607	0.745	0.507	0.831
SBP6	0.549	0.018	0.551	0.693	0.469	0.771
SBP7	0.659	–0.095	0.615	0.733	0.506	0.800
SBP8	0.478	–0.050	0.553	0.679	0.478	0.716
SBP9	0.489	–0.016	0.502	0.658	0.489	0.719

Note: EC = Environmental Consciousness, ER = Environmental Regulations, GEO = Green Entrepreneurial Orientation, GI = Green Innovation, GMS = Green Marketing Strategies, SBP = Sustainable Business Performance.

Table 5 contains information on the convergent validity test results based on cross-loading values. Cross-loading values on each latent variable are higher than the indicators in other constructs; therefore, it can be decided that discriminant validity has been fulfilled. Thus, all tested constructs meet the validity and reliability criteria, allowing the analysis to proceed to the evaluation of the inner model. Inner model evaluation is conducted using the model fit via SRMR, Q^2, and R^2. Meanwhile, the significance of path coefficients is used to test hypotheses and predict relationships among latent variables, as presented in Table 6.

Table 6. Model fit

SMRM	Conclusion
0.065	Model Fit

Standardized Root Mean Square Residual (SRMR) value is 0.065 (<0.08), which indicates a good model fit, implying the model is suitable for hypothesis testing.

Table 7. Q^2

Endogen Variables	Q^2	Category
Green Innovation	0.290	Predictive relevance value is strong
Green Marketing Strategies	0.213	Predictive relevance value is strong
Sustainable Business Performance	0.496	Predictive relevance value is strong

The Q^2 values (Table 7) demonstrate strong predictive relevance for endogenous variables, with Q^2 values for green innovation (0.290), green marketing strategies (0.213), and sustainable business performance (0.496).

Table 8. R^2

Endogen Variables	R Square	Category
Green Innovation	0.449	Moderate
Green Marketing Strategies	0.421	Moderate
Sustainable Business Performance	0.884	High

The R^2 (Table 8) values also indicate that green innovation (R^2 = 0.449) and green marketing strategies (R^2 = 0.421) are moderately influenced by exogenous variables, while sustainable business performance (R^2 = 0.884) is highly influenced. The detailed results of the structural or inner model analysis are presented in Figure 2.

Figure 2 illustrates the structural model results. It confirms that green entrepreneurship orientation significantly influences green innovation and green marketing strategies, which in turn have varying impacts on sustainable business performance. Green innovation has a positive and significant impact on sustainable business performance, while the effect of green marketing strategies on sustainable business performance appears negative and insignificant. In addition, environmental regulation positively moderates the relationship between green entrepreneur-

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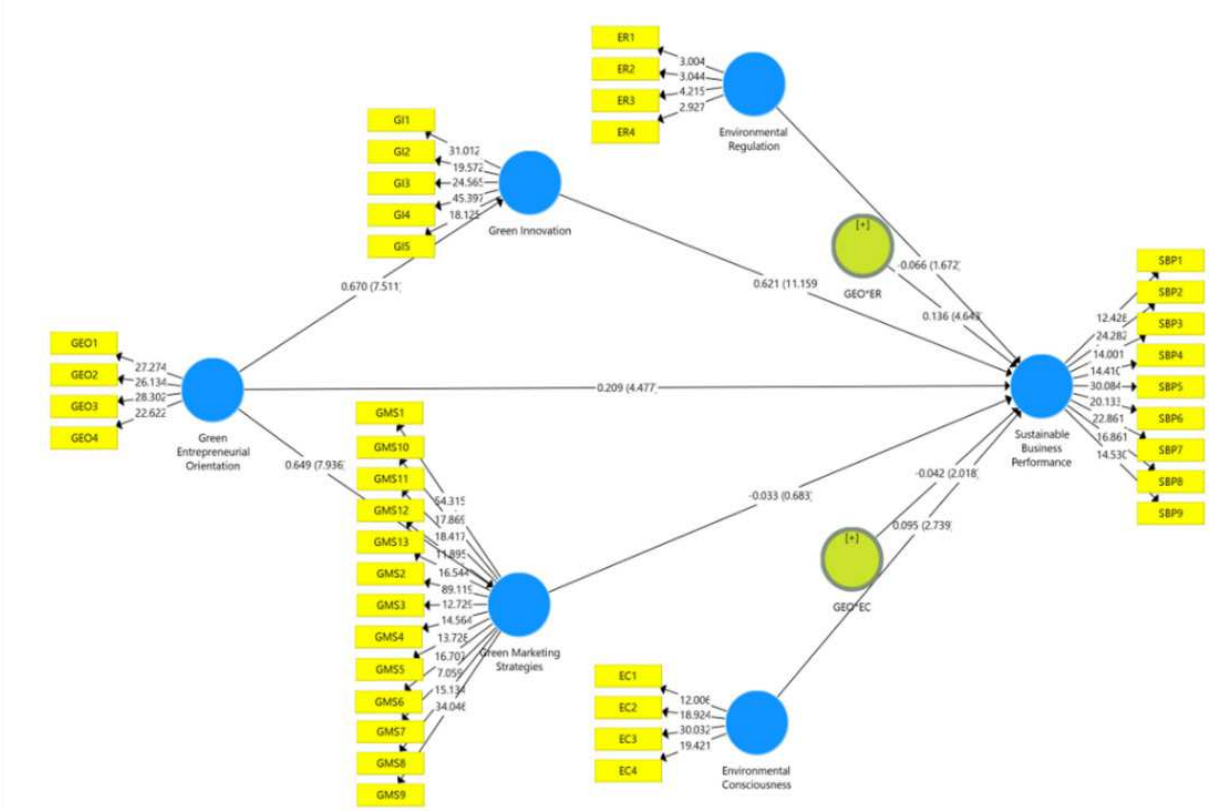

Figure 2. Path diagram, path coefficients, and t-statistics of the structural model (Inner model)

ship orientation and sustainable business performance, while environmental regulation exhibits moderating effects in the opposite way. This finding illustrates the complicated interactions that make sustainability achievable for circular economy-based food SMEs.

Based on the structural model (inner model) presented in Figure 2, which includes the path coefficients and corresponding *t*-statistics, the findings from hypothesis testing are presented in Table 9, Table 10, and Table 11.

Table 9 presents the relationships between green entrepreneurship orientation and sustainable business performance, showing a positive original sample value of 0.209 and a *p*-value of 0.000. Therefore, it can be concluded that H_1 is accepted. Green entrepreneurship orientation affects green innovation, with the original sample value of 0.670 and a *p*-value of 0.000; H_2 is accepted. Green entrepreneurship orientation affects green marketing strategies, with an original sample value of 0.649 and a *p*-value of 0.000; thus, H_3 is accepted. Green innovation affects sustainable business performance, with an original sample value of 0.621 and a *p*-value of 0.000; H_4 is accepted. Green marketing strategies affect sustainable business performance, with an original sample value of –0.033 and a *p*-value of 0.248; H_5 is rejected.

Table 9. Direct effects

Hypothesis	Relationship	Original Sample (Path Coefficient)	t-statistics	p-value	Description
H1	GEO → SBP	0.209	4.477	0.000	Positive (Significant)
H2	GEO → GI	0.670	7.511	0.000	Positive (Significant)
H3	GEO → GMS	0.649	7.936	0.000	Positive (Significant)
H4	GI → SBP	0.621	11.159	0.000	Positive (Significant)
H5	GMS → SBP	–0.033	0.683	0.248	Negative (Not Significant)

Note: GEO = Green Entrepreneurial Orientation, GI = Green Innovation, GMS = Green Marketing Strategies, SBP = Sustainable Business Performance.

Table 10. Indirect effects

Hypothesis	Relationship	Original Sample (Path Coefficient)	t-statistics	p-value	Description
H6	GEO → GI → SBP	0.416	9.003	0.000	Mediates (Significant)
H7	GEO → GMS → SBP	–0.021	0.677	0.250	Does Not Mediate

Note: GEO = Green Entrepreneurial Orientation, GI = Green Innovation, GMS = Green Marketing Strategies, SBP = Sustainable Business Performance.

Table 11. Moderation effects

Hypothesis	Relationship	Original Sample (Path Coefficient)	t-statistics	p-value	Description
H8	GEO*ER → SBP	0.136	4.643	0.000	Positive (Significant)
H9	GEO*EC → SBP	–0.042	2.018	0.022	Weakens (Significant)

Note: EC = Environmental Consciousness, ER = Environmental Regulations, GEO = Green Entrepreneurial Orientation, SBP = Sustainable Business Performance.

Table 10 presents mediation results, where green innovation mediates the relationship between green entrepreneurial orientation and sustainable business performance, this is evidenced by the original sample value of 0.416 and a *p*-value 0.000, so H_6 is accepted. Meanwhile, green marketing strategies do not mediate the relationship between green entrepreneurial orientation and sustainable business performance; this is indicated by the original sample value of –0.021 and a *p*-value 0.250, so H_7 is rejected.

Table 11 presents moderation results, indicating that environmental regulation strengthens the relationship between green entrepreneurial orientation and sustainable business performance. This is demonstrated by the original sample value of 0.136 and a *p*-value of 0.000; thus, H_8 is accepted. In contrast, environmental consciousness does not succeed in moderating the relationship between green entrepreneurial orientation and sustainable business performance, as evidenced by the original sample value of –0.042 and a *p*-value of 0.022; H_9 is rejected.

4. DISCUSSION

The results show that green entrepreneurial orientation has a significant effect on the sustainable business performance of food SMEs in Riau, Indonesia. These findings indicate that green entrepreneurial orientation is capable of simultaneously balancing economic, social, and environmental objectives. This is consistent with Ullah and Danish (2020) and Makhloufi et al. (2021), who emphasized the role of green entrepreneurial orientation in improving business competitiveness and resilience. Although Muangmee et al. (2021) found a weaker effect, the results of this study can be explained by the existence of national policy support in Indonesia in encouraging the implementation of a circular economy (Bappenas, 2022). Theoretically, these findings expand the literature by demonstrating that the institutional context significantly influences the effectiveness of green entrepreneurial orientation in enhancing sustainable performance.

The positive relationship between green entrepreneurial orientation and green innovation is also proven to be strong. These results show that SMEs with a green orientation tend to be more innovative in developing environmentally friendly products and processes. These findings align with those of Jiang et al. (2018) and Guo et al. (2023), who emphasize the role of green entrepreneurial orientation in promoting sustainable innovation. The theoretical implication of these findings is that an environmentally-based strategic orientation forms the basis for green innovation formation. In practical terms, governments and SME associations can use green entrepreneurial orientation as the basis for green innovation assistance programs for food businesses.

This study also found that green entrepreneurial orientation contributes to the formation of green marketing strategies. However, no significant influence of these strategies on sustainable business

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performance was observed. This finding differs from the studies by Khan et al. (2020) and Ara et al. (2019), which reported that green marketing strategies can improve sustainability performance through eco-branding and marketing innovation. This difference can be attributed to the limited capacity of food SMEs in Riau to consistently implement environmentally friendly marketing strategies, both in terms of financial resources and human capital. Thus, the effectiveness of green marketing strategies is highly dependent on the local context. Therefore, policy support and consumer education are necessary to ensure that green marketing strategies have a meaningful impact on SMEs that are not yet established.

The results also show that green innovation acts as a mediator in the relationship between green entrepreneurial orientation and sustainable business performance. These findings suggest that green orientation is insufficient; it only has a significant impact when it is translated into product and process innovation. These results align with those of Khan et al. (2020) and Muangmee et al. (2021). This study found that green innovation serves as a strategic mechanism linking green entrepreneurial orientation with sustainable business performance. To strengthen the innovation capacity of SMEs, policies such as access to environmentally friendly technologies and incentives for green product research are necessary.

Conversely, green marketing strategies do not act as a mediator in the relationship between green entrepreneurial orientation and sustainable business performance. This is due to the limited purchasing power of local consumers and the low differentiation of green products in the market, which has prevented green marketing strategies from making a significant contribution to the performance of food SMEs. This finding is consistent with Hairudinor and Barkatullah (2020), who emphasize the barriers to implementing green marketing in SMEs. Thus, green marketing strategies will only be effective if supported by market awareness and adequate environmentally friendly marketing support (Mushtaq et al., 2019).

Regarding external factors, environmental regulation has been proven to strengthen the relationship between green entrepreneurial orientation and sustainable business performance. These results are consistent with the research conducted by Makhloufi et al. (2021) and Ahmad et al. (2021), which confirms the role of regulation in promoting sustainable business practices. This study adds evidence that environmental regulation is not only an instrument of compliance but can also serve as a driver of innovation in SMEs. Therefore, the government needs to design regulations that are encouraging, for example, through incentives, green certification programs, or tax breaks, so that SMEs are more motivated to adopt sustainable practices.

Meanwhile, environmental consciousness actually weakens the relationship between green entrepreneurial orientation and sustainable business performance. Although numerous studies confirm that environmental consciousness encourages the adoption of green practices (Kraus et al., 2020; Yucedag et al., 2018), this study shows a different side. High environmental awareness increases stakeholder demands and becomes an additional burden for SMEs with limited resources. These findings indicate that environmental consciousness can serve as both an opportunity and a challenge. A contextual study of the role of environmental consciousness is needed to influence the relationship between green orientation and sustainable performance. The practical implication is the need for support from the government and associations to help SMEs balance stakeholder demands with their internal capacity.

Overall, this study confirms that a combination of internal (green entrepreneurial orientation, green innovation, green marketing strategies) and external factors (environmental regulation, environmental consciousness) determines sustainable business performance of food SMEs within the circular economy framework. The main contribution of this study is to reveal unique dynamics in the context of developing countries, where environmentally friendly innovation plays a more important role than sustainable marketing strategies, and regulation is a crucial driver. Thus, these findings not only enrich the literature but also provide policy directions and practical strategies to strengthen the sustainable competitiveness of food SMEs in Riau, Indonesia.

CONCLUSION

The objective of this study is to investigate the impact of green entrepreneurial orientation, green innovation, green marketing strategies, environmental regulation, and environmental consciousness on the sustainable business performance of food sector SMEs in Riau Province. The results verify that green entrepreneurial orientation has a significant and positive effect on sustainable business performance through green innovation, green marketing strategies, environmental regulation, and environmental consciousness, which play a moderating role in the influence on sustainable business performance. These findings highlight the role of innovation, marketing, and regulation in the progression of sustainability in business practices.

Based on these findings, SMEs should integrate green orientation with innovation and marketing strategies, as well as environmental compliance and expectations, to improve long-term performance. This means that the empowerment of SMEs and the adoption of green practices depend on sustainability-related policies, such as government incentives and compliance systems. This study deepens theoretical understanding by highlighting the mediating role of green innovation and green marketing strategies, as well as the moderating role of environmental regulation and environmental consciousness, in fostering sustainable business performance. However, this paper is limited to food SMEs in a single province, so recommendations for future research should aim to expand its scope to other sectors, regions, and contexts to provide broader insights.

AUTHOR CONTRIBUTIONS

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