GREEN PACKAGING AND THE PROFITABILITY OF MANUFACTURING FIRMS: THE MODERATING ROLE OF MARKET RESPONSIVENESS

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Abstract

This study examined how market responsiveness influences the relationship between green packaging and the profitability of manufacturing firms. The study utilized a self-administered questionnaire, yielding 267 completed responses, which were subsequently analyzed using Smart PLS (version 4). The findings showed a significant positive relationship between environmental commitment and profitability. Furthermore, innovation in green packaging has a positive and significant effect on profitability. However, the relationship between consumer perception and profitability, while positive, was not statistically significant. The relationship between regulatory compliance and profitability was negative and statistically insignificant. Additionally, market responsiveness positively and significantly moderates the link between consumer perception and profitability. On the other hand, market responsiveness has a negative and significant moderating effect on the relationship between regulatory compliance and profitability. Market responsiveness also negatively impacts the relationship between innovation in green packaging and profitability. However, market responsiveness has a non-significant moderation effect on the relationship between environmental commitment and profitability. This study offers insights into the importance of market responsiveness in enhancing the relationship between green packaging and profitability, emphasizing its implications for theory, managers, and business success.

Keywords: Green Packaging, Profitability, Market Responsiveness, Manufacturing Firms, Sustainability Performance

Authors' individual contribution: Conceptualization — J.K.A. and D.N.A.; Methodology — J.K.A. and D.N.A.; Software — D.N.A.; Validation — J.K.A. and I.K.A.-A.; Formal Analysis — D.N.A.; Investigation — E.A.K. and I.K.A.-A.; Resources — P.B.A.; Data Curation — P.B.A.; Writing — Original Draft — J.K.A. and D.N.A.; Writing — Review & Editing — D.N.A. and E.A.K.; Visualization — I.K.A.-A. and P.B.A.; Supervision — J.K.A. and D.N.A.; Project Administration — E.A.K. and I.K.A.-A.; Funding Acquisition — I.K.A.-A. and P.B.A.

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1. INTRODUCTION

The rising global focus on environmental sustainability has brought major changes in manufacturing. Companies are increasingly using green packaging as part of their eco-friendly efforts. Green packaging is defined by the use of recyclable, biodegradable, and minimal materials, and it is seen as a good strategy for improving a company's environmental reputation and attracting environmentally aware consumers (Rabnawaz, 2024).

In recent years, growing awareness of environmental issues has put pressure on businesses, especially in developing countries like Ghana, to adopt sustainable practices. A key method that manufacturing firms have taken on is green packaging (Mahmoud et al., 2022). This approach is seen as a way for firms to decrease their environmental impact while boosting their brand image and appeal to eco-friendly consumers (Huang & Jiang, 2024). Therefore, manufacturing companies aiming to thrive need to adopt effective management practices, including those that are environmentally friendly.

Some scholars argue that green packaging raises short-term costs due to research and development (R&D), material sourcing, and production changes, which can burden firms in resource-constrained emerging markets (Al-Nimer, 2024). In Ghana, the profitability impact remains uncertain, as it depends on factors such as consumer demand, government incentives, and market competition (Akuma et al., 2025). This uncertainty underscores the need for further research on the financial effects of green packaging for Ghanaian manufacturers.

Supporters contend that green packaging can lead to long-term profits through better brand loyalty, market differentiation, and compliance with stricter environmental rules (Dzage et al., 2024). However, there is a lack of empirical studies directly linking green packaging to profitability, and existing studies show mixed outcomes. This raises questions about the specific circumstances under which green packaging truly contributes to profits, especially in competitive markets.

Empirical evidence from Ghana suggests that firms that respond quickly to consumer preferences and market signals in relation to green packaging (for example, through improvements in packaging durability, compliance with regulatory requirements, and sensitivity to packaging costs) are more likely to achieve profitability advantages over time (Tham-Agyekum et al., 2023). Consequently, this reflects a firm's ability to adapt to market changes, such as consumer demand for sustainable products. Responsive firms can leverage green packaging to align sustainability with market trends and gain a competitive advantage (Adela et al., 2024). Market responsiveness plays a vital role in the profitability of green packaging; firms that quickly sense and act on consumer and regulatory signals are better able to convert green innovations into financial gains (Dzage et al., 2024).

In Ghana's manufacturing industry, the impact of market responsiveness on the profitability of green packaging has not been widely studied despite the rising interest. There is a growing interest in sustainable business practices, but there is not enough evidence on how manufacturing companies in Ghana can use market responsiveness to improve the financial results of their green packaging efforts. It is important to understand this relationship for firms that want to deal with sustainability challenges while staying competitive and making money (AlKhars et al., 2024).

Given these differing views, it's important to look at how market responsiveness affects the relationship between green packaging and profitability for manufacturing companies. This study aims to fill this gap by exploring how market responsiveness impacts the financial success of green packaging efforts. Understanding this connection is essential for manufacturing firms that wish to combine sustainability with profitability in today's eco-aware market. Explicitly, the objectives of this investigation are:

- to assess the relationship between green packaging and profitability;
- to scrutinize the moderating role of market responsiveness on the relationship between green packaging and profitability.

The structure of this paper is as follows. Section 2 provides a review of the relevant literature. Section 3 outlines the research methodology adopted to conduct the empirical research on green packaging and profitability with market responsiveness as the moderator. Section 4 presents the results. Section 5 discusses the analyses of the results. Section 6 presents the conclusion.

2. LITERATURE REVIEW

2.1. Theoretical foundation

Green packaging, profitability, and the moderating role of market responsiveness constitute a complex interplay within the domain of manufacturing industries. This literature review aims to synthesize existing theoretical frameworks and empirical literature to elucidate the relationships between these constructs.

2.1.1. Stakeholder theory

Stakeholder theory, introduced by Freeman (1984), argues that businesses must consider the needs of multiple stakeholders, including customers, employees, and environmental groups, alongside shareholder interests. In green packaging, this means firms should account for environmental and social impacts as well as financial results to ensure long-term sustainability (Freeman et al., 2010).

Regulators are pivotal stakeholders, as many governments, including Ghana's, have introduced policies to reduce pollution, particularly plastic waste (Osei-Bonsu et al., 2023). By adopting green packaging, companies can comply with these rules, avoid penalties, and potentially receive incentives, thereby fostering positive relationships with regulatory bodies (Yang et al., 2024).

Also, communities and environmental organizations exert pressure on firms to implement sustainable practices. Green packaging demonstrates a company's environmental responsibility, strengthens its reputation, and helps prevent disputes or boycotts from advocacy groups (Baah et al., 2021). Despite stakeholder support, firms face challenges such as increased costs from sustainable materials and advanced technologies. These expenses can negatively affect profitability, particularly in competitive and price-sensitive markets like Ghana's manufacturing sector (Bour et al., 2024).

Stakeholder theory maintains that long-term profitability can be achieved by incorporating stakeholder interests into strategy. Involving customers, suppliers, and environmental groups in decision-making enables firms to design packaging solutions that meet environmental standards while aligning with consumer needs and cost constraints (Agyabeng-Mensah et al., 2024). Close collaboration with suppliers to source eco-friendly materials or develop innovative packaging can help reduce costs and improve supply chain sustainability. This collaborative approach ensures all stakeholders remain committed to successful green packaging initiatives (Zhang & Li, 2024).

Although green packaging materials can be more expensive than conventional options, making competitiveness difficult in cost-driven markets, stakeholder theory suggests that firms prioritizing sustainability and stakeholder engagement are better positioned for long-term success than those focused solely on short-term profits (Freeman et al., 2010).

2.1.2. Resource-based view theory

The resource-based view (RBV), proposed by Barney (1991), argues that a firm's sustainable competitive advantage comes from internal resources and capabilities that are valuable, rare, inimitable, and non-substitutable (VRIN). In manufacturing, profitability depends on effectively managing resources such as technology, skilled labor, intellectual property, and unique processes to drive efficiency, innovation, and competitiveness (Zhu et al., 2024).

Distinctive resources like advanced technology, efficient processes, and skilled employees enable cost savings and product differentiation. For example, investments in automation can reduce production costs, enhance quality, and increase profit margins (Wang et al., 2024). Likewise, strong brand reputations in quality or sustainability allow firms to charge premium prices and build customer loyalty, thereby enhancing profitability (Sun et al., 2024).

The RBV emphasizes organizational capabilities, specifically how firms deploy resources to address market demands. In manufacturing, this perspective encompasses operational capabilities for maintaining high-quality production and innovation capabilities for developing new products. Firms with strong innovation skills are better positioned to attract customers and boost profits (Asiedu et al., 2025).

Since manufacturing operates in dynamic environments, RBV highlights the need for firms to adapt to shifts in consumer demand, market conditions, and technology. Companies with flexible capabilities, such as adopting eco-friendly production or responding to sustainability preferences, can secure competitiveness and profitability (Ullah et al., 2024).

Sustainability practices are increasingly recognized as valuable resources within the RBV. Initiatives such as waste reduction, adoption of green technologies, and implementation of eco-friendly operations enhance organizational reputation, attract environmentally conscious consumers, and facilitate compliance with regulatory requirements, thereby contributing to overall profitability (Li, Ahmad, et al., 2023).

Firms that invest in green technologies differentiate themselves as sustainability leaders, gaining customer loyalty and pricing power. Such practices also reduce long-term operational costs through energy efficiency and waste reduction, thereby increasing profitability (Liu et al., 2025).

Despite the benefits, firms face barriers such as resource constraints, high technology costs, and difficulties in retaining skilled labor. Moreover, rapid market and technological changes may erode resource value, making continuous investment in resources and capabilities necessary to maintain competitiveness (Wu et al., 2025).

2.1.3. Dynamic capability theory

The dynamic capability theory (DCT), introduced by Teece et al. (1997), posits that firms sustain competitiveness by developing, integrating, and reconfiguring their skills and resources to respond effectively to rapid market changes. For manufacturers, these capabilities enable quick responses to consumer shifts, technological changes, and competition, thereby enhancing profits. Market responsiveness refers to a firm's ability to detect and act on market changes to meet customer needs and seize opportunities. According to DCT, firms with strong dynamic capabilities can adjust their resources and processes effectively, thereby improving responsiveness (Teece, 2016).

Dynamic capabilities consist of sensing, seizing, and reconfiguring. Sensing involves identifying opportunities and risks, seizing entails mobilizing resources to exploit them, and reconfiguring involves adapting resources to meet evolving needs (Bornay-Barrachina et al., 2023).

Manufacturing firms face challenges such as rapid technological change, shifting consumer preferences, and regulatory updates. These necessitate dynamic capabilities to remain competitive. For example, firms adopt green technologies to meet sustainability demands, demonstrating adaptability to evolving market conditions (Çelik et al., 2025).

Dynamic capabilities also drive innovation, enabling firms to create or improve products in response to market shifts. For instance, manufacturers who develop eco-friendly packaging can exploit sustainability trends for competitive advantage (Teece, 2016).

Sensing helps firms to anticipate trends like eco-conscious consumer behavior. Manufacturers with strong sensing abilities can proactively design sustainable products, improving market responsiveness, customer loyalty, and profitability (Jin et al., 2024).

Seizing allows firms to act on identified opportunities by reallocating resources effectively. For manufacturers, this could involve adopting automation or new production methods to enhance efficiency and adapt quickly to demand changes (Van Hoang et al., 2025).

Reconfiguration involves adjusting existing resources to align with market needs. Manufacturers that shift from mass production to customized production, for example, improve responsiveness. It also includes adopting advanced technologies like Industry 4.0 to enhance competitiveness (Ostadi et al., 2024).

Building dynamic capabilities poses challenges, as it requires continual investment in technology and workforce development. Smaller firms, in particular, may face financial pressures in sustaining these investments (Supramono et al., 2025). Maintaining dynamic capabilities is further

complicated by rapid technological change. Firms need a culture of flexibility and continuous improvement, supported by strong leadership, to thrive in dynamic markets and sustain long-term profitability (Hossain et al., 2025).

2.2. Green packaging and profitability

Studies show that green packaging enhances profitability by improving brand loyalty and attracting eco-conscious consumers. A recent study of Japanese food firms showed that efforts to reduce plastic usage (including in packaging) led to productivity improvements of about 39%, which helped offset cost increases and enhanced profit outcomes (Kumamaru & Takeuchi, 2025). Another study investigated the influence of green brand innovation on green brand loyalty in Ethiopia's banking sector, while also assessing the mediating role of green perceived value and the moderating role of consumer green knowledge. The results showed that green perceived value positively drives green brand innovation and indirectly enhances green brand loyalty. Additionally, consumer green knowledge significantly strengthens the link between green brand innovation and perceived value (Jalu et al., 2024). These findings suggest that improving environmental awareness and encouraging favourable attitudes toward green initiatives are critical strategies for banks aiming to strengthen customer loyalty to environmentally innovative brands.

Green packaging enables firms to differentiate themselves, charge premium prices, and build customer loyalty, thereby increasing profits (Barbosa et al., 2023). However, studies have neglected the communication aspect, which is decisive for linking green packaging to profitability (Shimul & Cheah, 2023).

Recent studies have highlighted competitive advantages, enhanced customer satisfaction, and improved retention resulting from sustainable packaging practices. For instance, Atta-Delgado et al. (2024) observed that consumers prioritize quality, price, and nutritional value, with willingness to consume and pay extra varying by generation and other factors. Similarly, Khalufi et al. (2025) found that eco-friendly packaging that meets or exceeds consumer expectations enhances customer relationship quality by increasing perceived value, satisfaction, and trust. Yet, as Shimul and Cheah (2023) note, research has not adequately explored how firms communicate these benefits to consumers and how this impacts profitability.

To address this gap, the operational definition of green packaging has been revised to include consumer perception and communication elements, recognizing their importance in understanding how green packaging drives profitability. Consequently, the following hypotheses have been proposed:

H1: There is a statistically significant relationship between green packaging as well as profitability.

H1a: There is a statistically significant relationship between environmental commitment as well as profitability.

H1b: There is a statistically significant relationship between innovation in green packaging as well as profitability.

H1c: There is a statistically significant relationship between regulatory compliance as well as profitability.

H1d: There is a statistically significant relationship between consumer perception as well as profitability.

2.3. Moderating effects of market responsiveness

Studies confirm a positive link between green packaging and profits (Zhu et al., 2023). Zhu et al. (2023) found that firms adopting green technology and dynamic capabilities gained a competitive advantage through green product innovation. Similarly, Asiedu et al. (2025) observed that green dynamic capabilities mediate the relationship between green product innovation and competitive advantage in manufacturing firms. However, the moderating role of market responsiveness in this relationship was not examined, though DCT suggests success depends on adapting to market changes (Teece et al., 1997).

Unlike prior studies, the present research surveyed 267 Ghanaian manufacturing firms to test how market responsiveness moderates the green packaging-profitability relationship, applying partial least squares structural equation modeling (PLS-SEM).

Studies have shown that highly market-responsive Ghanaian firms gained greater profitability from green packaging than less responsive ones (Asiedu, 2025; Mahmoud et al., 2022). Similarly, proactive firms aligned packaging with sustainability expectations, boosting market share and loyalty, while slower firms missed out (Li, Ahmad, et al., 2023; Yu et al., 2022; Liang et al., 2022). Yet, these studies also overlooked the moderating role of market responsiveness, which, according to DCT, enables green packaging to improve performance when firms adjust to evolving market conditions (Teece et al., 1997).

While evidence from developed economies highlights the benefits of green packaging and responsiveness, Ghanaian small and medium-sized enterprises (SMEs) face adoption barriers. Omowole et al. (2024) noted that high upfront costs and limited finances hinder SMEs from investing in green packaging technologies. Consequently, the following hypotheses have been suggested:

H2: There is a statistically significant moderation effect of market responsiveness on the relationship between green packaging as well as profitability.

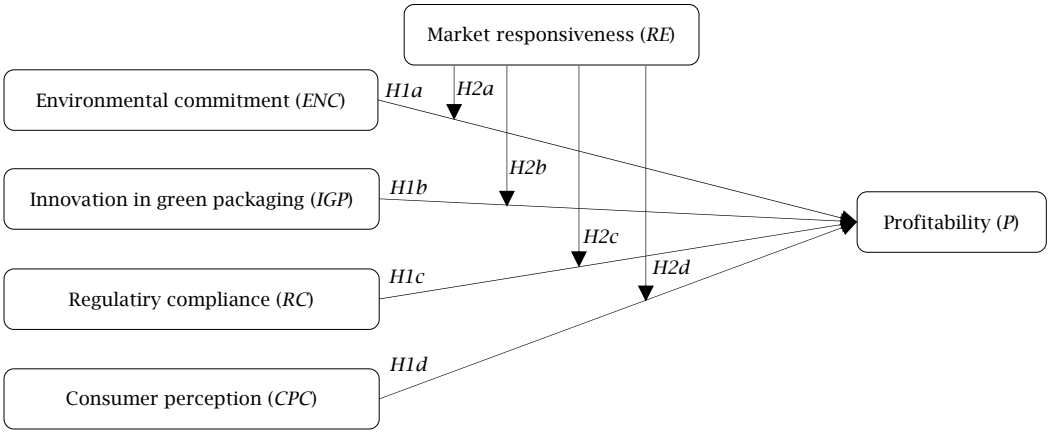
H2a: There is a statistically significant moderation effect of market responsiveness on the relationship between environmental commitment as well as profitability.

H2b: There is a statistically significant moderation effect of market responsiveness on the relationship between innovation in green packaging as well as profitability.

H2c: There is a statistically significant moderation effect of market responsiveness on the relationship between regulatory compliance as well as profitability.

H2d: There is a statistically significant moderation effect of market responsiveness on the relationship between consumer perception as well as profitability.

Figure 1. Conceptual framework



3. RESEARCH METHODOLOGY

3.1. Survey instrument

The survey instrument was created by selecting a questionnaire from the literature to assess the research model's constituent parts. Using information from a survey sample, the study assessed the validity as well as the reliability of the instrument and tested the proposed relations. The question types used to assess green packaging have been modified (Rettie et al., 2012). Additionally, the questions used for profitability were modified (Venkatraman & Ramanujam, 1986; Kaplan & Norton, 2005); the items utilized to assess market responsiveness were modified (Narver & Slater, 1990; Kohli et al., 1993). For the investigation, a five-point Likert scale was used. Data were collected from January 2025 to May 2025. It is worth noting that three academic faculties (Marketing, Finance, and Accounting) assessed the content validity of the initial survey.

3.2. Sampling and data collection

The cross-sectional survey scheme targeted 634 manufacturing firms registered with the Association of Ghana Industries (AGI) as of 2024 as its population. These firms were categorized based on their respective products. The study relied on the Krejcie and Morgan (1970) formula below to determine the minimum sample size.

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)} \quad (1)$$

where,

- S = the required sample size;
- X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841);
- N = the population size;
- P = the population proportion assumed to be 0.5 since this would provide a maximum sample size;
- d = the degree of accuracy expressed as a proportion (0.05).

According to the sample size determination formula by Krejcie and Morgan (1970), with a target population of 634 registered manufacturing firms, the minimum sample size required for this survey at a 95% confidence level and a 0.05 margin of error is 242. To achieve this target, 285 questionnaires were distributed via Google Forms on a pro-rata basis.

A sample of 285 firms was selected using simple random sampling on a pro-rata basis across subsectors, reflecting Ghana's manufacturing sector structure per the AGI (see Table 1). The names of 634 firms were grouped, shuffled, and drawn proportionally until the minimum sample was achieved, ensuring representation of SMEs and larger firms, thus enhancing generalizability (Ullah Khan et al., 2024). Questionnaires were completed by managerial representatives, providing responses informed by strategic and operational insights (Bondar et al., 2024).

A total of 267 questionnaires were retrieved, yielding a response rate of 93.6%. Each questionnaire was completed by a manager from each of the respective firms. Prior to the main survey, respondents' familiarity with green packaging was assessed to ensure informed responses. Screening questions and specific items evaluated respondents' understanding of sustainable packaging materials, durability, and design considerations. It took four months (September 2024 to December 2024 to collect the data.

Table 1. Population and sample

Manufacturing industry	*Number of firms*	*Percentage*	*Distribution of the questionnaire*	*Retrieved questionnaire*
Furniture-producing firms	59	9.3%	27	25
Food and beverage-producing firms	118	18.7%	53	50
Drugs and pharmaceutical-producing firms	55	8.7%	25	23
Chemical-producing firms	28	4.4%	13	12
Building and construction firms	103	16.2%	46	43
Clothing and textiles-producing firms	18	2.8%	8	7
Toiletries and cosmetics-producing firms	76	12%	34	32
Electrical and electronic firms	97	15.3%	43	41
Energy-producing firms	14	2.2%	6	6
Printing and packaging firms	66	10.4%	30	28
Total	634	100%	285	267

The study utilized simple random sampling to select respondents from manufacturing firms listed by the AGI. Firms were grouped into ten strata based on product categories, and the required sample size from each group was determined using Krejcie and Morgan's (1970) guidelines. Firms were then randomly selected by shuffling and drawing names to ensure equal selection chances. Questionnaires were administered both via Google Forms and hard copies to expedite data collection. Table 1 presents the target population and the final sample used for statistical analysis.

The AGI was selected as the target population due to its national and international reputation, strong advocacy for sustainable manufacturing, and regular engagement with government on sector-related issues. As the sole body representing manufacturing firms in Ghana, with representation on the Public Utilities Regulatory Commission (PURC), AGI organizes workshops and trade fairs and comprises small, medium, and large firms across all regions. Its readily available, up-to-date database of registered members also facilitated easy access to the sample frame for this study.

3.3. Data analysis

The analysis employed SmartPLS (version 4.0) to examine the relationship between green packaging and profitability, with market responsiveness as a moderator (Ringle et al., 2022). Structural equation modeling (SEM) was chosen for its flexibility in addressing modeling challenges compared to the strict assumptions of multivariate statistics (Vispoel et al., 2024).

Covariance-based SEM (CB-SEM) is best suited for theory testing with reflective constructs and normally distributed data, but it requires large samples and strict statistical assumptions. These demands make it less practical for complex models or emerging market contexts like Ghana (Hair et al., 2025).

4. RESULTS

4.1. Profile of respondents

In total, 267 valid responses were collected and used for the statistical analysis. Of these, 64.5% (n = 172) were males, and 35.5% (n = 95) were females, indicating a higher number of male respondents compared to females. The study employed the age classifications recommended by Clarke et al. (2020), namely young adults (< 31 years old), middle-aged adults (31 years old to 50 years old), and senior adults (> 50 years old).

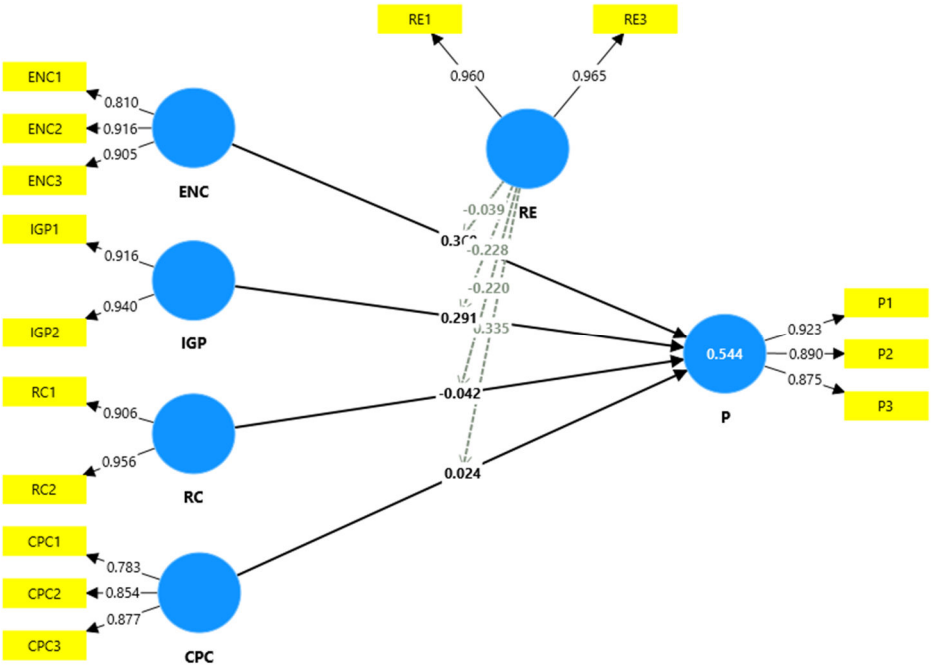
The study reveals that 39% (n = 104) of the respondents were young adults, 53% (n = 142) were middle-aged adults, and 8% (n = 21) were senior adults, indicating that middle-aged managers comprised the majority of respondents. This suggests that the respondents are mature and experienced, making them well-positioned to provide insights into the green marketing communication practices of their firms.

Regarding the positions held by the respondents, 16.7% (n = 45) were chief executive officers (CEOs) or general managers, 58.7% (n = 157) were senior managers, 12.5% (n = 33) were board members, and 12.1% (n = 32) were middle-level managers. This indicates that senior managers and CEOs together constituted 75.6% (n = 202) of the respondents. These top-level employees, with their extensive experience, are thus capable of providing high-quality responses regarding their green communication practices.

4.2. Evaluation of measurement model

We appraised the measurement model utilizing SmartPLS (version 4). Six modules made up the concept outline of this investigation, namely: environmental commitment, innovation in green packaging, shareholder compliance, consumer perception, profitability, and market responsiveness.

Figure 2. Measurement model



Source: Authors' elaboration using SmartPLS.

To assess the measurement model, the construct reliability, convergent validity, and discriminant validity of the six constructs were evaluated (Hair et al., 2019; Hanafiah, 2020). Reliability is established if Cronbach's alpha, composite reliability (rho_a and rho_c), are all above 0.7. Additionally, to establish convergent validity, the average variance extracted (AVE) must exceed 0.5 (Ringle et al., 2022).

Table 2. Cronbach alpha, composite reliability (rho_a and rho_c)

Variable	*Cronbach's alpha*	*rho_a*	*rho_c*	*AVE*
CPC	0.789	0.801	0.877	0.704
ENC	0.854	0.899	0.910	0.771
IGP	0.840	0.856	0.925	0.861
P	0.877	0.887	0.924	0.803
RC	0.853	0.937	0.929	0.868
RE	0.921	0.923	0.962	0.926

Table 2 demonstrates that items, as well as constructs in this investigation, had adequate degrees of convergent validity as well as reliability on each of the five constructs used in this investigation. The study utilized the heterotrait-monotrait (HTMT) ratio to evaluate the discriminant validity (Henseler et al., 2015). To substantiate discriminant validity, each concept's HTMT ratio needs to be less than 0.9 (Ringle et al., 2022). The conclusions of HTMT are presented in Table 3, which reveals satisfactory discriminant validity.

Table 3. Discriminant validity assessment (HTMT)

Variable	*CPC*	*ENC*	*IGP*	*P*	*RC*
ENC	0.877				
IGP	0.879	0.879			
P	0.585	0.697	0.694		
RC	0.870	0.855	0.786	0.470	
RE	0.264	0.277	0.367	0.463	0.142

4.3. Evaluation of the structural model

The structural model must be appraised to scrutinize the interrelationship between green packaging as well as profitability with market responsiveness as the moderator. Consequently, the hypotheses of the investigation were tested.

4.4. Collinearity assessment

Collinearity among latent variables is evaluated using the variance-inflated factor (VIF). According to Hair et al. (2019), a VIF value of 5 or higher indicates a likely collinearity issue. The findings in Table 4 demonstrate that all VIF values are below 5, indicating no potential collinearity concerns in the model. Consequently, the model is not affected by common method bias (Kock, 2015).

Table 4. Inner variance-inflated factor

Relationship	*VIF*
CPC → P	2.699
ENC → P	3.022
IGP → P	2.744
RC → P	2.595

Table 5. Coefficient of determination (R^2) and predictive relevance (Q^2)

	R^2	*R^2 adjusted*	*Q^2 predict*
p-value	0.544	0.528	0.496

The R^2 value of 0.544 for profitability is regarded as a medium score in the behavioral sciences (Ali et al., 2018). This indicates that 54.4% of the four predictors explain the variance in profitability. It is worthwhile noting that the variance, as explained, was above the minimum threshold R^2 assessment of 25% (Hair et al., 2023).

According to Ali et al. (2018), the assessment of Q^2 ought to be greater than zero to show that a structural model is prognostic; in this situation, we observed a Q^2 assessment of 0.496 for profitability. These numbers demonstrate the model's good predictive capabilities.

Environmental commitment, innovation in packaging, as well as consumer perception have a positive effect on profitability, respectively. However, regulatory compliance has a negative effect on profitability. It is worth noting that environmental commitment influenced profitability the most, followed by innovation in green packaging, consumer perception, and regulatory compliance.

4.5. Hypothesis testing (Direct effect)

As a conclusion of the direct effect, two of the four hypotheses were supported: environmental commitment to cost profitability ($\beta = 0.360$, $p < 0.05$), innovation in green packaging to profitability ($\beta = 0.291$, $p < 0.05$). However, consumer perception of profitability is insignificant ($\beta = 0.024$, $p = 0.778$); regulatory compliance to profitability ($\beta = -0.042$, $p = 0.753$) is insignificant, as can be demonstrated in Table 5.

Table 5. Hypotheses analysis

Relationship	*Original sample (O)*	*F-square*	*T statistics (|O/STDEV|)*	*p-values*	*Decision*
CPC → P	0.024	0.000	0.281	0.778	Not supported
ENC → P	0.360	0.070	3.359	0.001	Supported
IGP → P	0.291	0.046	3.076	0.002	Supported
RC → P	-0.042	0.001	0.315	0.753	Not supported

The investigation also appraised the effect size (f^2), which is a measure of whether a certain exogenous construct significantly affects an outcome variable. Subject to Cohen's (1988) suggestion, the result of the investigation revealed that environmental commitment ($f^2 = 0.070$) and innovation in green packaging ($f^2 = 0.046$) have a small effect on profitability, respectively. However, consumer perception ($f^2 = 0.000$) and regulatory compliance ($f^2 = 0.001$) do not affect profitability.

4.6. Moderation effect

The appraisal of the moderation effect was applied. It is worth noting that market responsiveness has a significantly positive moderating effect ($\beta = 0.335$, $p < 0.05$) on the relationship between consumer perception as well as profitability. Furthermore, market responsiveness has a negative moderating effect on the relationship between regulatory compliance ($\beta = -0.220$, $p < 0.05$), as well as profitability. Additionally, market responsiveness has a negative moderating effect on the relationship between innovation in green packaging ($\beta = -0.228$, $p < 0.05$) as well as profitability. However, market responsiveness has a non-significant moderating effect on the relationship between environmental commitment ($\beta = -0.039$, $p = 0.677$), as well as profitability (see Table 6).

Table 6. Hypothesis testing (Moderation effect)

Relationship	*Original sample (O)*	*F-square*	*T statistics (|O/STDEV|)*	*p-values*	*Decision*
*RE * CPC → P*	0.335	0.061	2.603	0.009	Supported
*RE * RC → P*	-0.220	0.028	2.005	0.045	Supported
*RE * IGP → P*	-0.228	0.023	1.977	0.048	Supported
*RE * ENC → P*	-0.039	0.001	0.417	0.677	Not supported

Subject to Cohen's (1988) suggestion, Table 6 further indicates that the moderating role of market responsiveness has a small effect on the relationship between consumer perception ($f^2 = 0.061$) and profitability. Furthermore, the moderation role of market responsiveness had a small effect on the relationship between regulatory compliance ($f^2 = 0.028$) and profitability. Moreover, the moderating role of market responsiveness has a small effect on the relationship between innovation in green packaging ($f^2 = 0.023$) and profitability. However, the moderating role of market performance has no effect on the relationship between environmental commitment ($f^2 = 0.001$) and profitability.

5. DISCUSSION

The study, drawing on stakeholder theory, RBV, and DCT, examines how market responsiveness moderates the link between green packaging and manufacturing firm profitability. The findings confirm that market responsiveness plays a critical role in strengthening this relationship.

Two of the four direct-effect hypotheses were supported. The study found a positive relationship between environmental commitment and manufacturing firms' profitability. Sustainable practices enhance brand image, customer loyalty, and market access, while also reducing costs and attracting investors. Regulatory incentives like tax breaks may follow, though challenges include high initial investments. Long-term planning and strong top management support are essential to maximize profitability from sustainability.

Similarly, the study shows that innovation in green packaging positively impacts manufacturing firms' profitability. Implicatively, eco-friendly packaging strengthens brand loyalty, expands market presence, lowers costs through material efficiency and logistics, and enhances reputation and compliance. However, challenges such as high initial costs and supply chain adjustments require careful planning, stakeholder involvement, and partnerships for successful implementation.

However, the study reveals a statistically insignificant relationship between consumer perception and profitability in manufacturing firms. This questions the idea that good views directly lead to profits. This lack of importance may come from things like how much people care about price, competition, and how the market works. Even if perceptions are good, profits may rely more on how good the product is, the value being offered, and how well the company operates.

However, the study found no significant relationship between consumer perception and the profitability of manufacturing firms, suggesting that positive views alone do not guarantee profits. Factors like price sensitivity, competition, product quality, and operational efficiency may matter more. Therefore, firms should focus marketing on tangible value, performance, quality, and affordability.

Additionally, the study found a negative, but insignificant, relationship between regulatory compliance and profitability in manufacturing firms. While compliance can raise short-term costs, firms often offset these through efficiency gains and risk reduction. Beyond legal duty, compliance enhances brand value and mitigates future risks. Industry differences and evolving compliance practices may explain the weak link, highlighting the need for innovative, cost-effective strategies to support long-term profitability.

The next hypothesis considered the moderating role of market responsiveness on the link between green packaging as well as profitability (see Table 6).

The study shows that market responsiveness positively moderates the relationship between consumer perception and profitability. Implicatively, firms that quickly adapt to consumer needs, trends, and competition can better leverage positive perceptions, aligning strategies and offerings with expectations. This responsiveness enhances loyalty, drives profits, and gives firms a competitive edge by turning favorable views into tangible financial gains.

Moreover, the study finds a negative moderation effect of market responsiveness on the link between regulatory compliance and profitability. This indicates that overemphasis on agility can undermine compliance, leading to inefficiencies and higher costs. Firms must balance responsiveness with regulatory adherence by integrating compliance into market strategies and leveraging teamwork and technology to stay flexible while keeping costs under control.

Furthermore, the study shows that market responsiveness negatively moderates the relationship between innovation in green packaging and profitability. This suggests that excess focus on rapid market shifts can disrupt the long-term investment and consistency needed for green packaging, reducing potential savings and customer loyalty benefits. Firms should balance short-term agility with sustained commitment to eco-friendly initiatives to maximize profitability.

However, the study finds that market responsiveness negatively and insignificantly moderates the relationship between environmental

commitment and profitability in manufacturing firms. This shows the difficulty in balancing long-term sustainability goals with market changes. While being environmentally friendly is connected to better profits, the small negative effect means that quick market changes do not greatly influence this link. This implies that companies can concentrate on sustainability without stressing too much on market responsiveness. Environmental efforts usually need long-term financial commitment, and too much focus on quick market shifts might distract from these aims.

However, the study finds that market responsiveness negatively but insignificantly moderates the link between environmental commitment and profitability. This suggests that sustainability-driven profits are not heavily influenced by rapid market changes. Firms can prioritize long-term environmental goals without overemphasizing responsiveness, though a balanced approach, addressing market shifts while maintaining sustainability commitments, is recommended.

6. CONCLUSION

The study reveals that sustainability plays a crucial role in shaping profitability within manufacturing firms, though its effects vary across different dimensions. A strong positive relationship exists between environmental commitment and profitability, as well as between green packaging innovation and financial performance, demonstrating that integrating eco-friendly practices enhances competitiveness, operational efficiency, and stakeholder trust. However, consumer perception shows only a weak positive link to profitability, suggesting that long-term success also depends on product quality, market alignment, and efficient operations. Regulatory compliance, while essential, exerts a slight negative impact on profitability due to associated costs, though firms that treat compliance as a long-term investment can mitigate these effects. Market responsiveness emerges as a key moderator, strengthening the profitability outcomes of positive consumer perception but weakening those associated with regulatory compliance, green packaging, and environmental commitment when overemphasized. Thus, the findings highlight the need for manufacturing firms to strategically balance sustainability initiatives, compliance, and adaptability in order to achieve lasting profitability and competitive advantage.

This study contributes to theory by establishing a significant link between green packaging and the profitability of manufacturing firms, while also highlighting the moderating role of market responsiveness in this relationship. By employing modified measurements of latent constructs, the research ensures contextual relevance and provides a more accurate understanding of the interplay among variables. The conceptualization of market responsiveness as a moderator introduces a new direction for scholarly inquiry, emphasizing how responsiveness can influence the profitability outcomes of sustainable practices. Drawing on stakeholder theory, the findings reinforce the importance of aligning business strategies with diverse stakeholder interests to foster innovation, enhance corporate reputation, and promote sustainable growth. From the RBV, the study underscores the strategic value of leveraging unique, VRIN resources to improve efficiency, product quality, and long-term profitability. Additionally, the DCT emphasizes the necessity of organizational adaptability, resource development, and collaborative cultures to secure a sustainable competitive advantage in rapidly evolving market environments. Collectively, these theoretical insights expand the body of knowledge on sustainability, profitability, and strategic responsiveness in manufacturing firms.

The findings present several managerial implications, emphasizing that investment in green packaging should be viewed not merely as regulatory compliance but as a strategic opportunity to enhance profitability, strengthen brand reputation, and attract environmentally conscious consumers. Managers are encouraged to integrate sustainability into core business strategies, balancing short-term market responsiveness with long-term green objectives through innovative, eco-friendly packaging solutions. To achieve this, firms should invest in market intelligence systems, leverage advanced technologies such as data analytics and automation, and establish cross-functional collaboration across research, marketing, and supply chains. Effective communication of the environmental benefits of green packaging is also vital for building consumer trust and loyalty. Furthermore, implementing performance metrics and key performance indicators, including sales growth, customer satisfaction, and sustainability outcomes, will enable managers to monitor progress, make informed adjustments, and ensure that responsiveness enhances rather than undermines long-term profitability and competitive advantage.

This study is limited by its focus on manufacturing firms in Ghana, which restricts the generalizability of findings to other contexts with different cultural, economic, and regulatory environments. Future research should expand geographically and conduct cross-country comparisons to identify context-specific influences on the relationship between green packaging, profitability, and market responsiveness. Additionally, the exclusive focus on manufacturing overlooks potential insights from other sectors, such as retail, services, food and beverage, and consumer electronics, where the impact of green packaging may differ. The use of a cross-sectional design also constrains the ability to capture the dynamic nature of market responsiveness over time, suggesting the need for longitudinal studies to better establish causality. Measurement challenges arising from self-reported data and inconsistent definitions further highlight the importance of developing robust tools and employing mixed methods to enhance reliability and validity. Finally, while market responsiveness is identified as a key moderator, future studies should explore additional moderating and mediating factors, including regulatory frameworks, consumer education, and technological advancements, to provide a more comprehensive understanding of how green packaging influences profitability.

REFERENCES

Adela, A. A., Ayalewu, B. B., & Rahman, M. A.-U. (2024). Effect of green products and green packaging on business performance with the mediating effect of competitive advantage: A case of manufacturing firms in Ethiopia. *African Journal of Business and Economic Research, 19*(1), 417–437. https://doi.org/10.31920/1750-4562/2024/v19n1a19

Agyabeng-Mensah, Y., Afum, E., & Baah, C. (2024). Stakeholder pressure and circular supply chain practices: Moderating roles of environmental information exchange capability and circular innovation orientation. *Business Strategy and the Environment, 33*(6), 5703–5720. https://doi.org/10.1002/bse.3779

Akuma, J. K., Akude, D. N., Kwaning, E. A., & Amoah-Ahinful, I. K. (2025). Green innovation and the profitability of manufacturing firms: The moderating role of intelligence generation. *International Review of Management and Marketing, 15*(2), 146–156. https://doi.org/10.32479/irmm.17646

Ali, F., Rasoolimanesh, S. M., Sarstedt, M., Ringle, C. M., & Ryu, K. (2018). An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research. *International Journal of Contemporary Hospitality Management, 30*(1), 514–538. https://doi.org/10.1108/IJCHM-10-2016-0568

AlKhars, M., Masoud, M., AlNasser, A., & Alsubaie, M. (2024). Sustainable practices and firm competitiveness: An empirical analysis of the Saudi Arabian energy sector. *Discover Sustainability, 5*, Article 146. https://doi.org/10.1007/s43621-024-00347-7

Al-Nimer, M. (2024). Unpacking the complexity of corporate sustainability: Green innovation's mediating role in risk management and performance. *International Journal of Financial Studies, 12*(3), Article 78. https://doi.org/10.3390/ijfs12030078

Asiedu, E., Alhassan, S., Majeed, M., & Malcalm, E. (2025). Green dynamic capability and sustainability performance: The roles of green innovation and green sustainability of manufacturing firms. *Discover Sustainability, 6*, Article 961. https://doi.org/10.1007/s43621-025-01445-w

Atta-Delgado, M. X., Velazquez, G., Welti-Chanes, J., & Torres, J. A. (2024). Assessing consumer perceptions of sustainable packaging solutions. *CyTA — Journal of Food, 22*(1), Article 2425403. https://doi.org/10.1080/19476337.2024.2425403

Baah, C., Opoku-Agyeman, D., Acquah, I. S. K., Agyabeng-Mensah, Y., Afum, E., Faibil, D., & Abdoulaye, F. A. M. (2021). Examining the correlations between stakeholder pressures, green production practices, firm reputation, environmental and financial performance: Evidence from manufacturing SMEs. *Sustainable Production and Consumption, 27*, 100–114. https://doi.org/10.1016/j.spc.2020.10.015

Barbosa, B., Shojaei, A. S., & Miranda, H. (2023). Packaging-free practices in food retail: The impact on customer loyalty. *Baltic Journal of Management, 18*(4), 474–492. https://doi.org/10.1108/BJM-10-2022-0386

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Bondar, A., Tolchieva, H., Bilyk, M., Slavkova, O., & Symonov, V. (2024). The role of digitization in management and strategic decision-making in modern management. *Financial and Credit Activity: Problems of Theory and Practice, 2*(55), 214–227. https://doi.org/10.55643/fcaptp.2.55.2024.4349

Bornay-Barrachina, M., López-Cabrales, Á., & Salas-Vallina, A. (2023). Sensing, seizing, and reconfiguring dynamic capabilities in innovative firms: Why does strategic leadership make a difference? *BRQ Business Research Quarterly, 28*(2), 399–420. https://doi.org/10.1177/23409444231185790

Bour, K. B., Adu, K., & Amoah, A., Kassum, B., Gameli Hodoli, C., & Awua-Boateng, P. A. K. (2024). Profit as a predictor variable for environmental sustainability practices (ESPs) of manufacturing companies for achieving green manufacturing in contemporary Ghana. *Cogent Economics & Finance, 12*(1), Article 2364362. https://doi.org/10.1080/23322039.2024.2364362

Çelik, A. K., Yildiz, T., Aykanat, Z., & Kazemzadeh, S. (2025). Green innovation adoption in Turkish and Iranian SMEs: The effect of dynamic capabilities and the mediating role of absorptive capacity. *Journal of the Knowledge Economy, 16*, 1824–1859. https://doi.org/10.1007/s13132-024-01990-1

Clarke, M. A., Fruhling, A. L., Sitorius, M., Windle, T. A., Bernard, T. L., & Windle, J. R. (2020). Impact of age on patients' communication and technology preferences in the era of meaningful use: Mixed methods study. *Journal of Medical Internet Research, 22*(6), Article e13470. https://doi.org/10.2196/13470

Cohen, J. (1988). Set correlation and contingency tables. *Applied Psychological Measurement*, *12*(4), 425–434. https://doi.org/10.1177/014662168801200410

Dzage, E. J., Hussain, M. R., Dapaah, P. O., & Mustapha, Y. (2024). Corporate social responsibility, sustainable environmental practices and green innovation; perspectives from the Ghanaian manufacturing industry. *International Journal of Corporate Social Responsibility, 9,* Article 4. https://doi.org/10.1186/s40991-024-00090-2

Espineda, M. N., Banocnoc, A. H., & Bautista, I. B. B. (2025). A phenomenological study of consumer perceptions and industry challenges in the transition to sustainable packaging. *Discover Sustainability 6*, Article 762 https://doi.org/10.1007/s43621-025-01707-7

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & de Colle, S. (2010). *Stakeholder theory: The state of the art*. Cambridge University Press. https://doi.org/10.1017/CBO9780511815768

Hair, J. F., Babin, B. J., Ringle, C. M., Sarstedt, M., & Becker, J.-M. (2025). Covariance-based structural equation modeling (CB-SEM): A SmartPLS 4 software tutorial. *Journal of Marketing Analytics, 13,* 709–724. https://doi.org/10.1057/s41270-025-00414-6

Hair, J. F., Risher, J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hair, J. F., Jr., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2023). *Advanced issues in partial least squares structural equation modelling* (2nd ed.). Sage.

Hanafiah, M. H. (2020). Formative vs. reflective measurement model: Guidelines for structural equation modeling research. *International Journal of Analysis and Applications*, *18*(5), 876–889. https://doi.org/10.28924/2291-8639-18-2020-876

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*, 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hossain, S., Fernando, M., & Akter, S. (2025). Digital leadership: Towards a dynamic managerial capability perspective of artificial intelligence-driven leader capabilities. *Journal of Leadership & Organizational Studies, 32*(2), 189–208. https://doi.org/10.1177/15480518251319624

Huang, S., & Jiang, Y. (2024). Fewer but better: Chinese consumers' responses to luxury brands using green demarketing. *Journal of Marketing Communications*. https://doi.org/10.1080/13527266.2024.2335567

Jalu, G., Dasalegn, G., Japee, G., Tangl, A., & Boros, A. (2024). Investigating the effect of green brand innovation and green perceived value on green brand loyalty: Examining the moderating role of green knowledge. *Sustainability, 16*(1), Article 341. https://doi.org/10.3390/su16010341

Jin, X., Yang, D., & Rhee, M. (2024). How do dynamic capabilities enable a firm to convert the external pressures into environmental innovation? A process-based study using structural equation modeling. *Systems, 12*(12), Article 561. https://doi.org/10.3390/systems12120561

Kaplan, R. S., & Norton, D. P. (2005). The balanced scorecard: Measures that drive performance. *Harvard Business Review*. https://hbr.org/2005/07/the-balanced-scorecard-measures-that-drive-performance

Khalufi, N. A. M., Sheikh, R. A., Khan, S. M. F. A., & Onn, C. W. (2025). Evaluating the impact of sustainability practices on customer relationship quality: An SEM-PLS approach to align with SDG. *Sustainability, 17*(2), Article 798. https://doi.org/10.3390/su17020798

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, *11*(4), 1–10. https://surl.li/kynxfh

Kohli, A. K., Jaworski, B. J., & Kumar, A. (1993). Markor: A measure of market orientation. *Journal of Marketing Research, 30*(4), 467–477. https://doi.org/10.1177/002224379303000406

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Kumamaru, H., & Takeuchi, K. (2025). Less plastic, more profits? Estimating the effect of firms' efforts for plastic reduction on their financial performance. *Environmental Economics and Policy Studies, 27*, 511–525. https://doi.org/10.1007/s10018-025-00449-0

Li, C., Ahmad, S. F., Bani Ahmad Ayassrah, A. Y. A., Irshad, M., Telba, A. A., Awwad, E. M., & Majid, M. I. (2023). Green production and green technology for sustainability: The mediating role of waste reduction and energy use. *Heliyon, 9*(12), Article e22496. https://doi.org/10.1016/j.heliyon.2023.e22496

Li, C., Hassan, H., Murad, M., & Mirza, F. (2023). Role of green dynamic capabilities on environmental and social innovation behaviour: Mediating of green creativity and moderating of innovation proclivity. *Sustainability, 15*(20), Article 14996. https://doi.org/10.3390/su152014996

Liang, Y., Lee, M. J., & Jung, J. S. (2022). Dynamic capabilities and an ESG strategy for sustainable management performance. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.887776

Liu, S., Yu, J. J., & Feng, T. (2025). The impact of green innovations on firm's sustainable operations: Process innovation and recycling innovation. *Omega, 130*, Article 103170. https://doi.org/10.1016/j.omega.2024.103170

Mahmoud, M. A., Tsetse, E. K. K., Tulasi, E. E., & Muddey, D. K. (2022). Green packaging, Environmental awareness, willingness to pay and consumers' purchase decisions. *Sustainability, 14*(23), Article 16091. https://doi.org/10.3390/su142316091

Narver, J. C., & Slater, S. F. (1990). The effect of a market orientation on business profitability. *Journal of Marketing*, *54*(4), 20–35. https://doi.org/10.1177/002224299005400403

Omowole, B. M., Olufemi-Phillips, A. Q., Ofodile, O. C., Eyo-Udo, N. L., & Ewim, S. E. (2024). Conceptualizing green business practices in SMEs for sustainable development. *International Journal of Management & Entrepreneurship Research, 6*(11), 3778–3805. https://doi.org/10.51594/ijmer.v6i11.1719

Osei-Bonsu, R., Kwabena Mintah, D., Appiah, J., & Mensah, L. O. (2023). Assessment of policy guidelines, strategies, and operational processes associated with plastic waste management in Ghana. *American Journal of Environment and Climate, 2*(3), 33–40. https://doi.org/10.54536/ajec.v2i3.1868

Ostadi, B., Barrani, L., & Aghdasi, M. (2024). Developing a strategic roadmap towards integration in Industry 4.0: A dynamic capabilities theory perspective. *Technological Forecasting and Social Change, 208*, Article 123679. https://doi.org/10.1016/j.techfore.2024.123679

Rabnawaz, M. (2024). Sustainable packaging systems using renewable materials. *ACS Sustainable Resources Management, 2*(1), 1–3. https://doi.org/10.1021/acssusresmgt.4c00453

Rettie, R., Burchell, K., & Riley, D. (2012). Normalising green behaviours: A new approach to sustainability marketing. *Journal of Marketing Management, 28*(3–4), 420–444. https://doi.org/10.1080/0267257X.2012.658840

Ringle, C. M., Wende, S., & Becker, J.-M. (2022). *SmartPLS 4*. SmartPLS. https://www.smartpls.com/

Shimul, A. S., & Cheah, I. (2023). Consumers' preference for eco-friendly packaged products: Pride vs guilt appeal. *Marketing Intelligence & Planning*, *41*(2), 186–198. https://doi.org/10.1108/MIP-05-2022-0197

Sun, H., Dai, Y.-Y., Jeon, S.-S., Lee, R., Wang, H., Shi, X., Sun, L., & Wang, Y. (2024). The impact of brand authenticity on brand attachment, brand loyalty, willingness to pay more, and forgiveness: For Chinese consumers of Korean cosmetic brands. *Heliyon, 10*(16), Article e36030. https://doi.org/10.1016/j.heliyon.2024.e36030

Supramono, S., Damayanti, T. W., & Adhitya, D. (2025). Dynamic capabilities and financial behaviour to accelerate MSME performance recovery and its impacts on business sustainability. *Journal of Innovation and Entrepreneurship, 14*, Article 10. https://doi.org/10.1186/s13731-024-00456-7

Teece, D. J. (2016). Dynamic capabilities and entrepreneurial management in large organizations: Toward a theory of the (entrepreneurial) firm. *European Economic Review, 86*, 202–216. https://doi.org/10.1016/j.euroecorev.2015.11.006

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Tham-Agyekum, E. K., Nimoh, F., Boakye, D., Yeboah, A., & Abubakar, U. A. B. (2023). Perceptions, profitability and determinants of granulated cassava packaging in Kumasi Metropolis, Ghana. *Applied Studies in Agribusiness and Commerce, 17*(1). https://doi.org/10.19041/APSTRACT/2023/1/1

Ullah Khan, S., Afridi, F., & Amin, K. (2024). Impact of entrepreneurial orientation on small and medium enterprises performance. *Journal of Asian Development Studies, 13*(1), 686–698. https://doi.org/10.62345/jads.2024.13.1.57

Ullah, S., Kukreti, M., Sami, A., & Shaukat, M. R. (2024). Leveraging technological readiness and green dynamic capability to enhance sustainability performance in manufacturing firms. *Journal of Manufacturing Technology Management, 36*(3), 714–730. https://doi.org/10.1108/JMTM-05-2024-0268

Van Hoang, D., Thi Hien, N., Van Thang, H., Nguyen Truc Phuong, P., & Thi-Thuy Duong, T. (2025). Digital capabilities and sustainable competitive advantages: The case of emerging market manufacturing SMEs. *Sage Open, 15*(2). https://doi.org/10.1177/21582440251329967

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *The Academy of Management Review, 11*(4), 801–814. https://doi.org/10.2307/258398

Vispoel, W. P., Lee, H., & Chen, T. (2024). Multivariate structural equation modeling techniques for estimating reliability, measurement error, and subscale viability when using both composite and subscale scores in practice. *Mathematics, 12*(8), Article 1164. https://doi.org/10.3390/math12081164

Wang, L., Peng, G., Yang, Y., & Li, X. (2024). Industrial robot application and enterprise financialization: Empirical evidence from the Chinese manufacturing firm level. *Journal of the Knowledge Economy, 15*, 15365–15389. https://doi.org/10.1007/s13132-023-01671-5

Wu, S., Si, Y., & Wang, X. (2025). Navigating technological innovation and rising costs: Assessing economic performance in Chinese manufacturing. *PLoS ONE, 20*(1), Article e0316556. https://doi.org/10.1371/journal.pone.0316556

Yang, X., Dai, X., & Bin, H. (2024). The dynamics of rewards and penalties: Governmental impact on green packaging adoption in logistics. *Sustainability, 16*(11), Article 4835. https://doi.org/10.3390/su16114835

Yu, D., Tao, S., Hanan, A., Ong, T. S., Latif, B., & Ali, M. (2022). Fostering green innovation adoption through green dynamic capability: The moderating role of environmental dynamism and big data analytic capability. *International Journal of Environmental Research and Public Health, 19*(16), Article 10336. https://doi.org/10.3390/ijerph191610336

Zhang, C., & Li, S. (2024). Involving purchasing and supply management in open ecological innovation: The moderating role of digital technologies. *International Journal of Logistics Research and Applications, 27*(7), 1047–1070. https://doi.org/10.1080/13675567.2024.2316647

Zhu, M., Liang, C., Yeung, A. C. L., & Zhou, H. (2024). The impact of intelligent manufacturing on labor productivity: An empirical analysis of Chinese listed manufacturing companies. *International Journal of Production Economics, 267*, Article 109070. https://doi.org/10.1016/j.ijpe.2023.109070

Zhu, Y., Zhang, H., Siddik, A. B., Zheng, Y., & Sobhani, F. A. (2023). Understanding corporate green competitive advantage through green technology adoption and green dynamic capabilities: Does green product innovation matter? *Systems, 11*(9), Article 461. https://doi.org/10.3390/systems11090461

APPENDIX. VALIDATED INSTRUMENTS

Section A: Green packaging

No.	*Statements*
	Environmental commitment
GP1	Our company is committed to reducing the environmental impact of our packaging.
GP2	We have clear policies in place to promote the use of environmentally friendly packaging materials.
GP3	Our company regularly conducts environmental audits of our packaging processes.
	Innovation in Green packaging
IGP1	We actively invest in research and development for innovative green packaging solutions.
IGP2	Our company collaborates with suppliers and partners to develop eco-friendly packaging materials.
IGP3	We have introduced new packaging designs that minimize waste and are easier to recycle.
	Regulatory compliance
RC1	Our packaging practices comply with all relevant environmental regulations and standards.
RC2	We proactively seek to exceed regulatory requirements for environmentally friendly packaging.
RC3	Our company regularly updates its packaging practices to remain compliant with new environmental laws.
	Consumer perception and communication
CPC1	Our customers recognize and appreciate our efforts to use green packaging.
CPC2	We effectively communicate the environmental benefits of our packaging to our customers.
CPC3	Green packaging has enhanced our brand image and reputation.

Source: Adapted from Rettie et al. (2012).

Section B: Profitability

No.	*Statements*
	Profitability
P1	Our company has achieved its profitability goals over the past three years.
P2	Our return on assets (ROA) has consistently met or exceeded industry standards.
P3	Our net profit margin has shown a positive trend over the past three years.

Source: Adapted from Venkatraman and Ramanujam (1986), and Kaplan and Norton (2005).

Section C: Market responsiveness

No.	*Statements*
	Responsiveness
RE1	It takes us forever to decide how to respond to our competitors' price changes.
RE2	We periodically review our product development efforts to ensure they are in line with what customers want.
RE3	Our company is slow to respond to changes in our customers' product or service needs.

Source: Adapted from Narver and Slater (1990) and Kohli et al. (1993).