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Moderating role of green innovation between sustainability strategies and firm performance in Tanzania

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ABSTRACT

This journal article investigates the moderating role of green innovation in the relationship between sustainability strategies and firm performance within the manufacturing sector in Tanzania. With increasing global emphasis on environmental sustainability, this study seeks to understand how green practices influence the performance of firms striving for a competitive edge. A quantitative research design was adopted, with data collected from a structured questionnaire distributed and 340 responses received for analysis from mid-level and senior managers across 10 public and private manufacturing companies in Tanzania. The study utilized SMART PLS 4 for data analysis, testing the proposed hypotheses grounded in Resource-Based Theory (RBT). The findings reveal a significant positive relationship between sustainability strategies and firm performance, highlighting the importance of integrating sustainable practices into business operations. However, while green innovation directly influences firm performance, it does not significantly moderate the relationship between sustainability strategies and performance outcomes. These findings suggest that manufacturing firms in Tanzania can improve performance by adopting sustainable strategies, even in the absence of a moderating effect from green innovation. The study concludes by offering actionable recommendations for industry practitioners and policymakers to encourage sustainable business practices, thereby supporting the broader goal of sustainable development in Tanzania.

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1. Introduction

Green innovation is increasingly recognized as essential for promoting high-quality economic development on a national scale. It serves as a critical strategy for businesses to convert external pressures into opportunities for change, thereby securing strategic competitive advantages amid increasing environmental instability and rapid organizational transformation. Many companies recognize the importance of addressing climate change, reducing greenhouse gas emissions, and implementing sustainable practices. However, concerns about rising costs and the challenges in achieving environmental objectives can threaten their competitiveness. As such, green innovation has become crucial for companies navigating these transformative shifts, emphasizing the need for agile decision-making and adaptability in the face of frequent disruptions.

While green innovation is rooted in technological advancements, it has evolved to encompass broader changes in corporate strategy, organizational structure, and operational processes (Yin & Zhao, 2024). This evolution reflects the growing recognition that effective sustainability strategies must align with a firm's overall mission and operational practices. Notably, research has demonstrated that energy consumption is a significant factor in shaping sustainability strategies and firm performance. For instance, Pham et al. (2024) found that dirty energy consumption adversely impacts firm profitability, highlighting

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the need for companies to shift towards cleaner energy sources to enhance financial outcomes. Additionally, Sitompul et al. (2024) discussed the complexities firms face in balancing renewable energy investments with immediate financial viability, suggesting that while such investments may offer long-term benefits, the initial costs can be a barrier. Moreover, studies by Simionescu et al. (2020) and Westerman et al. (2020) indicate that energy-efficient practices lead to improved profitability and operational performance, reinforcing the argument for adopting green practices and integrating energy management into sustainability strategies. However, a paradox arises in sustainability strategies: while they are intended to enhance firm performance, empirical evidence shows mixed outcomes (Alam et al., 2024; Soomro et al., 2024; Yaputra et al., 2024). Understanding the mechanisms that drive firm performance is key to overcoming this paradox (Nasution et al., 2024). Successful sustainability strategies depend on how well organizations adapt to technological changes (Núñez et al., 2024), requiring agility to mitigate disruptive impacts.

Brand managers utilize strategic measures to promote environmentally friendly products and enhance brand identity, which is crucial for establishing individual identification. Research by Watson et al. (2024) indicates that brand loyalty significantly influences decision-making, particularly when there is a strong connection between brand image and consumer trust. The concept of green trust, defined as 'the willingness to rely on a product, service, or brand based on perceptions of its credibility, benevolence, and competence in environmental performance' (Javed et al., 2024), is vital in this context. Social identity research shows that individuals seek to validate their identification, especially when it is challenged (Dangaiso, 2024). Brand trust has become a key factor, enhanced firm performance and supporting sustainability initiatives (Isac et al., 2024). Competitive advantage enables firms to adjust organizational structures and refine processes flexibly in response to changing environments (Purwanto, 2024). Sharing information and collaborating across departments and with external partners are crucial for fostering innovation and breaking down silos (Alam et al., 2024). Despite challenges, competitive advantage can mitigate paradoxical phenomena associated with green innovation, improving overall firm performance (Damayanti & Waskito, 2024; Hammoud et al., 2024; & Farahat, 2024). While the direct impact of competitive advantage on firm performance is not fully explored (Kazemi & Soltani, 2024), its role in crisis management is increasingly recognized.

Consumer demand for environmental responsibility has led to a surge in products marketed as green, eco-friendly, or sustainable. Despite extensive labeling efforts, consumers often experience confusion regarding the actual environmental attributes of these products (Seberini et al., 2024). While research has explored consumer perceptions and motivations towards environmentally friendly products, there has been limited focus on the impact of eco-label claims specifically in the manufacturing industry. Consumers' desire for transparency and reliability drives the investigation of claims that vary in familiarity, specificity, and quality. Eco-labeling is a critical tool in green marketing communication, highlighting product attributes for consumers (Kumar et al., 2021). These claims aim to provide valuable information, emphasizing the presence or absence of specific attributes or ingredients. However, the credibility of eco-label claims varies; specific claims are seen as more objective and informative, while general claims may be perceived as subjective and could undermine credibility (Hou & Wu, 2021). Eco-labels significantly influence consumer perceptions and can directly impact firm performance in the marketplace. Firm performance is multifaceted and influenced by various factors, including brand trust, eco-labeling claims, competitive advantages, sustainable strategies, and green innovation, all of which evolve over time (Rusyani et al., 2021).

This journal article aims to explore these factors influencing firm performance within the context of the manufacturing industry in public and private companies. The key research question guiding this study is: What role does green innovation play in the relationship between sustainability strategies and firm performance? The research framework will establish these connections and test hypotheses to confirm them. The journal article begins with a comprehensive review of relevant literature in Section 2, while Section 3 outlines the study's methodology, including details on the sample, data sources, and how variables were measured. Section 4 analyzes the necessity and minimization of truth tables. Finally, Section 5 concludes by discussing theoretical implications, practical insights, limitations, and suggestions for future research directions. This journal article enhances our understanding of how adopting green innovation practices influences firm performance in Tanzania's specific economic context.

2. Literature review

2.1. Firm performance

The relationship between sustainability strategies and firm performance has garnered considerable attention in recent years. Ahmad et al. (2020) demonstrates that both green promotion marketing strategies and shaded green marketing strategies have a significant and positive impact on marketing performance. This finding aligns with Resource-Based Theory (RBT), which posits that firms can achieve competitive advantages by leveraging unique resources such as effective marketing strategies that promote sustainability. Similarly, Rauf et al. (2024) highlight the crucial role of corporate social responsibility (CSR) reporting in enhancing corporate value and addressing system inefficiencies, noting a significant moderation effect of the enterprise life cycle on firm performance in China. This suggests that the impact of CSR on performance may vary depending on the stage of a firm's development, which aligns with the Life Cycle Theory. This theory posits that firms evolve through distinct stages, each requiring different strategic approaches to optimize performance.

El-Menawy and El-Sayed (2024) emphasize that CSR programs provide competitive advantages for organizations in developing countries like Egypt. Their findings support the Stakeholder Theory, which posits that businesses must consider the interests of all stakeholders, including society and the environment, to enhance their long-term success. By effectively engaging with stakeholders through CSR, firms can improve their reputation and operational performance. Wang (2024) found that product effectiveness and novelty mediate the effects of green and digital innovations on firm performance. This highlights the role of innovation as a critical resource that can improve both product offerings and market positioning. This is supported by the Dynamic Capabilities Framework, which emphasizes the ability of firms to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments.

Mudrika et al. (2024) indicate that green marketing significantly affects consumer satisfaction, loyalty, social responsibility, environmental safety, product innovation, and development. These findings underscore the importance of building strong brand equity through sustainable practices, which can enhance customer loyalty and, consequently, firm performance. Mahsina and Soewarno (2024) reveal that a composite independent board positively influences firm performance and green innovation, although individual contributions of independent commissaries and directors are not significant. This observation relates to Agency Theory, which highlights the importance of governance structures in aligning the interests of management with those of shareholders, ultimately influencing performance outcomes. Moraa et al. (2024) support Hart's (1995) theory that green packaging is a critical resource, showing that investments in green packaging yield tangible benefits. This aligns with the notion that sustainability-oriented resources can create competitive advantages by meeting the growing consumer demand for environmentally friendly products. Abbas et al. (2024) identify product market competitiveness and digital financial innovation as positive determinants of firm performance, with digital financial innovation partially mediating this relationship. This reflects the increasing importance of digitalization in enhancing operational efficiency and market responsiveness, which are critical for sustained performance in today's dynamic business environment.

Hudaibiya and Raza (2024) report a positive correlation between sustainable firm performance (SFP1) and corporate green strategy, CSR, green innovation, and sustainable firm performance, emphasizing the need to integrate environmental and social considerations into business strategies. This supports the premise that firms that prioritize sustainability are likely to perform better both economically and socially. Alzghoul et al. (2024) provide empirical evidence that the implementation of green marketing significantly enhances a company's environmental consciousness and performance. This finding reinforces the idea that effective communication of sustainability efforts can bolster a firm's reputation and foster consumer trust. Despite the substantial contributions of existing studies, several critical gaps remain in the literature regarding firm performance and sustainability strategies. Firstly, while many studies have explored the direct effects of green marketing and CSR on performance, there is insufficient focus on the interaction effects between these variables. Understanding how green marketing, CSR, and innovation collectively influence firm performance could provide deeper insights into effective sustainability

strategies. Secondly, the current literature often lacks a comprehensive examination of the specific mechanisms that mediate the relationships between green practices and firm performance. For example, while Wang (2024) identifies product effectiveness as a mediator, further exploration of how other factors, such as brand trust or consumer perceptions, influence these dynamics remains underexplored. Additionally, there is a need for more empirical studies focusing on diverse industries, particularly in emerging markets. Most existing research has been conducted in specific contexts, such as developed economies or particular sectors, leaving a gap in understanding how sustainability strategies affect firm performance across different cultural and economic environments. Finally, while the role of corporate governance in influencing sustainability practices is acknowledged, more research is needed to understand how different governance structures impact the adoption and effectiveness of green strategies. This understanding could help firms design more effective governance frameworks that align with their sustainability objectives.

2.2. Sustainability strategies and firm performance

Sustainability strategies are increasingly recognized for their potential to enhance firm performance by integrating economic, environmental, and social considerations. Green marketing practices reveal a significant relationship between these dimensions, emphasizing the need to account for both environmental and social impacts. Alam et al. (2024) highlight discrepancies between actual and expected green marketing adoption among industrial firms, particularly concerning waste management and water pollution. This gap points to the challenges firms face in implementing sustainable practices and the importance of aligning marketing strategies with sustainability goals. Nasution et al. (2024) found that green marketing strategies positively influence purchasing decisions, reinforcing the notion that effective communication of sustainability efforts can enhance consumer engagement. Núñez et al. (2024) further demonstrated that women are likely to purchase sustainable products irrespective of their education level, while young people show a strong interest in environmental care. These findings suggest that demographic factors significantly influence consumer behavior towards sustainability, indicating that targeted marketing strategies can effectively promote green products.

The significance of government policies in shaping sustainability initiatives within firms is underscored by the findings of Gao et al. (2024a). Their study on the innovative city policy reveals that strengthening the integration of innovation and green practices is essential for sustainable urban development. They found that the innovative city policy significantly enhances urban total factor carbon emission efficiency (TFCEE) and demonstrates positive spatial spillover effects on surrounding regions. This aligns with the notion that effective sustainability strategies require supportive regulatory environments to thrive. Furthermore, Gao et al. (2024b) identified that the mechanisms for improving TFCEE stem from enhanced green technology adoption and better resource allocation, highlighting the critical role of innovation in promoting sustainability. Moreover, Gao et al. (2024a) noted that the spillover effects of innovative city policies are more pronounced in developed regions, particularly coastal areas and those with advanced industrial structures. This suggests that the context in which firms operate significantly influences the effectiveness of sustainability strategies. Similarly, Deshmukh and Tare (2023) explain how government regulations and incentives such as legal frameworks, tax breaks, and public-private partnerships impact green marketing and corporate social responsibility (CSR) practices, reinforcing the findings of Gao et al. (2024a). Soomro et al. (2024) found that green marketing factors such as green products, design, supply chains, and production significantly contribute to sustainable development. They emphasize the need for comprehensive green marketing strategies that incorporate recycling, reuse practices, and competitive pricing to meet customer expectations. Apaza-Panca et al. (2024) suggested that green marketplace strategies should focus on reverse logistics or circular economy principles to avoid environmental harm during commercialization and preserve scarce resources. They also highlighted the importance of leveraging social networks in green promotion strategies to optimize resource use.

Rahman and Nguyen-Viet, (2023) identified significant discrepancies between actual and expected green marketing adoption among industrial firms, particularly in waste management and water

pollution control. Alam et al. (2024) noted that despite rapid socio-economic growth and technological advancements, social-level performance has minimal impact on green marketing strategies in the ready-made apparel industry. This underscores the need to bridge the gap between the expected and actual adoption of green practices, particularly in sectors with substantial environmental footprints. These studies collectively underscore the positive impact of green marketing and regulatory policies on sustainable development and highlight the necessity for organizations to implement comprehensive strategies that address recycling, fair pricing, and effective use of social networks while tackling the gaps in green marketing adoption among industries. Based on these findings, the following hypothesis can be posed:

H1: Sustainability strategies have a positive significance with firm performance.

2.3. Brand trust and sustainability strategies

Brand trust plays a crucial role in influencing consumer behavior, particularly in the context of sustainability strategies. Shafiq et al. (2023) demonstrated that green marketing, service quality, and brand reputation significantly positively influence brand trust and purchase decisions. This relationship can be explained through the Brand Equity Theory, which posits that a strong brand reputation enhances consumer trust and loyalty, ultimately affecting purchasing behavior. Pancić et al. (2023) found that green marketing positively impacts green outcomes, including green advertising, brand loyalty, brand equity, and brand innovativeness, which in turn enhance repurchase intentions. This finding aligns with the Theory of Planned Behavior (TPB), suggesting that consumers' intentions to repurchase are shaped by their attitudes towards the brand, subjective norms, and perceived behavioral control regarding sustainable practices. However, they noted that green satisfaction and green awareness do not significantly moderate these relationships, indicating that the direct influence of brand loyalty may be more critical than these factors in shaping purchase intentions.

Isac et al. (2024) reported that greenwashing negatively affects purchase intentions and diminishes green brand trust, particularly among consumers with higher environmental knowledge. This finding underscores the Signaling Theory, which posits that consumers rely on signals (such as brand claims) to gauge the credibility of brands. When consumers perceive greenwashing, their trust diminishes, resulting in negative purchase intentions. Hepsiba (2024) found that apparent green information does not moderate the relationship between the marketing mix and eco-trust. This suggests that while marketing efforts aimed at promoting eco-friendly attributes are essential, they must be perceived as genuine to influence consumer trust effectively. In the context of organic foods in Zimbabwe, Dangaiso (2024) highlighted that green satisfaction fosters green trust, green brand image, and green brand equity, indicating a positive influence of green brand image on green trust. This supports the Brand Image Theory, which posits that a positive brand image can enhance consumer trust and loyalty. Javed et al. (2024) showed that perceived greenwashing negatively impacts brand credibility, both directly and indirectly through green skepticism. This aligns with the notion that consumer skepticism towards brands can arise from misleading green claims, leading to diminished trust.

Watson et al. (2024) established a critical link between consumers' environmental values and brand loyalty, mediated by green brand image. This highlights the importance of aligning brand messaging with consumer values to foster loyalty and trust. Rahman and Nguyen-Viet, (2023) emphasized that green advertising receptivity, non-deception, green brand image, and transparency positively influence green brand trust, which subsequently impacts consumers' purchasing intentions. This reinforces the idea that genuine communication about sustainability initiatives is vital for building trust. Qayyum et al. (2023) found that excessive product packaging predicts greenwashing and green confusion, with greenwashing negatively impacting green brand equity (GBE). However, brand credibility moderates this negative relationship, suggesting that strong brand credibility can mitigate the adverse effects of greenwashing on brand equity. Salehzadeh et al. (2023) revealed that green brand image directly influences green brand attitude, love, and trust, indicating that a positive brand image is essential for fostering consumer loyalty. Nguyen-Viet et al. (2024) showed that green trust positively affects word-of-mouth, willingness to pay,

and green purchase intentions, emphasizing the importance of trust and commitment to sustainability. Wu and Liu (2022) concluded that the relationship between green marketing and brand trust varies based on spontaneity and compulsion, with brand image playing a mediating role. They also found that greenwashing significantly negatively regulates this relationship. These studies collectively highlight the complex interplay between green marketing, brand trust, and green brand equity. Excessive product packaging can lead to greenwashing and confusion, undermining green brand equity unless mitigated by strong brand credibility. Positive green brand image and trust are crucial for fostering brand love, word-of-mouth, and green purchase intentions. However, the negative effects of greenwashing need to be carefully managed to maintain consumer trust and brand credibility. Based on these findings, the following hypothesis can be posed:

H2: Brand trust has a positive significance with sustainability strategies.

Despite the extensive research on brand trust and sustainability strategies, several critical gaps remain in the literature. First, while existing studies emphasize the positive impact of green marketing on brand trust, there is a lack of comprehensive examination of the underlying mechanisms through which these relationships operate. For example, while Shafiq et al. (2023) and Pancić et al. (2023) identify various factors influencing brand trust, the specific role of consumer demographics and psychographics in shaping these relationships has not been adequately explored. Second, the effects of greenwashing on brand trust warrant further investigation. Although studies like Isac et al. (2024) and Javed et al. (2024) have addressed the negative impacts of greenwashing, there is insufficient understanding of how different types of greenwashing (e.g. misleading claims versus genuine mistakes) affect consumer trust differently. This distinction is crucial for brands seeking to navigate the challenges posed by increasing consumer skepticism. Moreover, while the literature discusses the importance of government regulations and incentives (Deshmukh & Tare, 2023), there is limited research on how these external factors interact with brand strategies to influence consumer trust and purchasing decisions. Understanding the role of regulatory frameworks in shaping consumer perceptions of brand sustainability is an area ripe for exploration. Finally, existing studies predominantly focus on specific sectors, such as organic foods or apparel, leaving a gap in understanding how brand trust and sustainability strategies manifest across diverse industries. Expanding research to include a broader range of sectors can provide a more comprehensive understanding of the dynamics at play.

2.4. Eco-labeling claims and sustainability strategies

Eco-labeling claims are integral to sustainability strategies, acting as crucial signals for consumers seeking environmentally friendly products. Nguyen et al. (2020) identified three dimensions of consumer perceptions of eco-friendly packaging: packaging materials, manufacturing technology, and market appeal. Consumers primarily associate eco-friendly packaging with materials like biodegradability and recyclability, as well as market appeal factors such as attractive design and competitive pricing. However, their overall knowledge of these concepts remains limited. This aligns with Signaling Theory, which posits that eco-labels serve as signals of a product's environmental quality, influencing consumer perceptions and purchasing decisions. Yaputra et al. (2024) found that green marketing and sustainable advertising significantly and positively influence green purchase intentions and behaviors. However, they noted that eco-packaging and labeling only positively impact green purchase intention. This suggests that while eco-labels play a vital role in promoting sustainability, their effectiveness may depend on broader green marketing efforts. This relationship can be interpreted through the Theory of Planned Behavior (TPB), indicating that consumers' intentions to purchase green products are influenced not only by the packaging but also by their attitudes towards green marketing and the perceived behavioral control they have in making sustainable choices.

Borah et al. (2023) revealed that green market orientation does not directly affect new product success in manufacturing firms; instead, this relationship is mediated by the firms' green innovation capability. This highlights the importance of innovation as a critical resource and aligns with the Dynamic Capabilities Framework, which emphasizes that firms must continuously adapt and innovate to maintain

competitive advantage in rapidly changing environments. In this context, eco-labeling can enhance the perceived value of new products by signaling their environmental benefits, thereby supporting market orientation. Kumar et al. (2021) indicated that green brand credibility mediates the impact of green information quality on green brand evaluation, with consumer knowledge moderating this relationship. Their findings suggest that the effectiveness of eco-labels in enhancing brand evaluation is contingent upon the credibility of the claims made. Moreover, they found that credible eco-labels enhance the processing of green information, indicating that consumers are more likely to trust and act upon information that is supported by recognized eco-labels. This underscores the importance of maintaining high standards of transparency and accuracy in eco-labeling to build consumer trust. These studies collectively suggest that while consumers' understanding of eco-friendly packaging is primarily limited to materials and market appeal, green marketing and advertising play crucial roles in promoting green purchase intentions and behaviors. The effectiveness of green market orientation in achieving new product success is mediated by green innovation capability. Additionally, green brand credibility and consumer knowledge are essential in enhancing green brand evaluation and information processing.

Despite the extensive research on eco-labeling and sustainability strategies, several critical gaps remain in the literature. As highlighted by Nguyen et al. (2020) consumers' knowledge regarding eco-friendly packaging is primarily limited to materials and market appeal. More research is needed to explore how consumer education and awareness initiatives can enhance understanding of eco-labels and their sustainability benefits. While Yaputra et al. (2024) found that eco-packaging positively impacts purchase intention, further investigation is necessary to understand the specific conditions under which eco-labeling becomes a decisive factor in consumer purchasing decisions. Research should delve into how different types of eco-labels and their visibility influence consumer behavior. Borah et al. (2023) indicate that green market orientation's effectiveness in achieving new product success is mediated by green innovation capability. However, the interplay between eco-labeling, green innovation, and market success remains underexplored. More studies are needed to identify how eco-labels can enhance the innovation processes within firms.

Most existing research predominantly focuses on specific regions or industries, limiting the generalizability of findings. Understanding how cultural and contextual factors affect the perception and effectiveness of eco-labels across different markets is essential for developing universally applicable sustainability strategies. The effects of perceived greenwashing on consumer trust in eco-labels have not been sufficiently addressed in the literature. Future research should examine how consumers differentiate between genuine eco-labeling efforts and misleading claims, particularly in a market where greenwashing is prevalent.

2.5. Competitive advantage and sustainability strategies

The integration of sustainability strategies into business operations has increasingly been recognized as a source of competitive advantage. de Oliveira Lima et al. (2024) found that green marketing serves as a competitive advantage for organizations by embedding environmental concerns into their market strategies. This approach not only leads to differentiation and operational efficiency but also promotes more sustainable production processes. The adoption of sustainable practices attracts environmentally conscious consumers, ultimately enhancing profitability. This relationship aligns with Porter's Competitive Advantage Theory, which posits that firms can achieve superior performance by pursuing cost leadership or differentiation strategies. Certifications such as ISO 14001 further demonstrate a firm's commitment to sustainability, providing a competitive edge by signaling credibility to consumers and stakeholders. Green marketing not only enhances a company's image but also engages consumers in sustainable practices, positioning the organization as socio-environmentally responsible. Kazemi and Soltani (2024) emphasized that competitive intelligence, as a strategic marketing tool, enables organizations to differentiate themselves and become industry leaders in sustainability. This reflects the importance of Resource-Based View (RBV), which suggests that unique resources and capabilities such as strong green marketing strategies can be leveraged for competitive advantage.

Metta (2024) highlighted that organizations with a strong internal green marketing orientation experience market share growth, underscoring the importance of aligning internal operations with strategic

green initiatives. This internal alignment is critical, as it ensures that sustainability efforts are integrated throughout the organization, enabling firms to optimize market share through effective environmental marketing. Damayanti and Waskito (2024) found that green competitive advantage significantly affects purchase intention, while green innovation does not directly influence purchase intentions. Their study indicates that green marketing orientation significantly impacts green competitive advantage and green innovation but does not directly influence purchase intention. However, green competitive advantage mediates the relationship between green marketing orientation and purchase intention. This finding illustrates the complex interplay between marketing strategies and consumer behavior, emphasizing the need for firms to foster competitive advantages through effective green marketing initiatives.

Hammoud et al. (2024) observed that environmentally friendly practices, particularly in the context of green tourism, can have unintended negative impacts on the natural environment of tourist destinations. The evolving desires and considerations of tourists, driven by global challenges and adverse environmental consequences, also influence their choice of tourism destinations. This highlights the need for firms to balance sustainability initiatives with potential environmental impacts, ensuring that competitive advantages are sustainable in the long term. Purwanto (2024) reviewed the literature on green innovation strategies, highlighting how both internal and external factors influence the achievement of sustainable competitive advantage. The study explored the roles of organizational green learning and green technological turbulence in implementing green innovation strategies to enhance the company's sustainability goals and competitive advantage. This underscores the importance of Dynamic Capabilities Theory, which emphasizes the ability of firms to adapt to changing environments through innovation and learning. These studies collectively indicate that green marketing and the strategic integration of environmental concerns not only improve operational efficiency and profitability but also enhance market positioning and competitiveness. Certifications and internal alignment with green initiatives play crucial roles in achieving these outcomes. Based on these findings, the following hypothesis can be proposed:

H4: Competitive advantage has a positive significance with sustainability strategies.

Despite the insights provided by existing studies, several critical gaps remain in the literature regarding competitive advantage and sustainability strategies. While the impact of green competitive advantage on purchase intentions is noted Damayanti and Waskito (2024), there is a lack of in-depth exploration of how different consumer segments perceive and respond to green marketing strategies. Understanding the nuances of consumer behavior could help firms tailor their sustainability initiatives more effectively. Although studies like de Oliveira Lima et al. (2024) highlight the importance of integrating sustainability into business strategies, there is insufficient research on the comprehensive frameworks that can guide firms in effectively leveraging sustainability for competitive advantage across different industries. The literature currently lacks an examination of how perceived greenwashing impacts consumer trust and competitive advantage. Understanding the consequences of misleading environmental claims is essential for firms striving to maintain credibility and loyalty among consumers. While Kazemi and Soltani (2024) emphasize competitive intelligence, there is limited research on how external factors such as regulatory changes, market conditions, and technological advancements affect the sustainability strategies of firms and their resultant competitive advantages. Most research has been conducted in specific sectors, with limited focus on how sustainability strategies and competitive advantages manifest in various contexts, particularly in emerging markets. Broader research could provide insights that are relevant across diverse industries and geographical locations.

2.6. Moderating effects of green innovation

Recent research has elucidated several critical factors that significantly impact the performance and sustainability of businesses through green innovation. Yin and Zhao (2024) have shown that digital green value co-creation behavior and digital green network embedding play vital roles in enhancing digital green innovation performance. This finding emphasizes the importance of leveraging digital technologies and collaborative networks to foster innovation in the green sector. The Resource-Based View (RBV) supports this, as it suggests that firms can gain competitive advantage by effectively utilizing unique

resources, such as digital technologies and collaborative networks. Similarly, Ahmed et al. (2023) highlighted that both product and process innovations are pivotal in driving green innovation. This underscores the necessity for companies to continually innovate their offerings and operations to achieve sustainable growth. The Dynamic Capabilities Framework further supports this notion, positing that firms must develop and adapt their capabilities in response to changing environmental demands to sustain competitive advantage.

In line with this, Malik et al. (2023) provided empirical evidence indicating that environmental disclosure not only directly enhances firm financial performance but also promotes green innovation, particularly within Chinese firms. This suggests that transparency and accountability in environmental practices can lead to better financial outcomes and foster a culture of innovation. The Stakeholder Theory underscores this relationship, emphasizing that firms must consider the interests of all stakeholders, including consumers and regulators, to enhance their performance through sustainable practices. The age of a business also plays a role in benefiting from green innovations. Asad et al. (2024) found that older businesses gain more from green invention and utility-model innovations compared to younger enterprises. This indicates that established businesses, with their more extensive experience and resources, have greater potential to invest in and benefit from green technologies and practices.

Eco-innovation is especially crucial for small and medium-sized enterprises (SMEs), as emphasized by Achmad et al. (2023). Their research indicates that environmental collaboration significantly improves both environmental and social outcomes for Indonesian SMEs. This highlights the importance of collaborative efforts in achieving sustainable business practices in smaller enterprises, supporting the Collaborative Advantage Theory, which posits that partnerships can enhance capabilities and performance. Qu et al. (2022) revealed that green core competence has a positive impact on green innovation performance, with green absorptive capacity acting as a mediator. This finding underscores the importance of developing core competencies in green practices and the ability to absorb and implement new knowledge to enhance innovation performance. The Absorptive Capacity Theory suggests that a firm's ability to recognize the value of new information and integrate it into its operations is crucial for fostering innovation. Additionally, Shahbaz et al. (2024) identified that green intellectual capital significantly boosts green innovation within SMEs, leading to improved environmental performance. They also found that green creativity serves as a crucial moderator, suggesting that fostering an environment that promotes creativity is essential for leveraging intellectual capital to achieve environmental goals. This finding is consistent with Creative Capital Theory, which posits that creative capabilities are vital for innovation and competitive advantage. Al-Swidi et al. (2024) demonstrated that green technology turbulence positively moderates the relationship between green entrepreneurial orientation and green innovation. This suggests that dynamic technological environments can enhance the impact of entrepreneurial orientation on green innovation, aligning with Innovation Diffusion Theory, which posits that the rate of adoption of new technologies is influenced by the surrounding technological environment.

Employee engagement is another critical factor influencing green innovation. Li et al. (2023) found that employees' green initiatives ensure the organization's sustainable performance through eco-friendly products. Furthermore, employee green behavior moderates the relationship between green product innovation and sustainable performance, emphasizing the need for organizations to foster green behavior among employees. This aligns with Social Exchange Theory, which posits that positive interactions and relationships within the workplace can enhance overall organizational performance. Institutional pressures also play a significant role in driving corporate green innovation. Wu et al. (2024) showed that institutional investor ESG activism is more likely to stimulate exploratory green innovation in family firms, particularly in second-generation family firms. Zhang et al. (2024) found that institutional pressures can drive corporate green innovation, suggesting that external factors significantly influence firms' sustainability efforts. However, they also noted that a high entrepreneurial orientation can undermine sustainable performance in firms with insufficient green innovation due to increased risk. This highlights the nuanced relationship between entrepreneurial orientation, innovation, and performance. Lastly, Mittal and Kaur (2023) indicated the positive and significant mediating role of green innovation (both product and process) between Green Human Resource Management (GHRM) and environmental performance. They also found that servant leadership moderates this relationship, thereby strengthening the positive

influence of GHRM on environmental performance. This suggests that leadership styles play a crucial role in facilitating green practices and enhancing innovation within organizations.

Based on these findings, the following hypothesis can be posed:

H5: Green innovation moderates the relationship between sustainability strategies and firm performance.

Despite the valuable insights from existing studies on the moderating effects of green innovation, several critical gaps remain in the literature. While several studies highlight the relationship between green innovation and firm performance, there is insufficient exploration of the specific mechanisms through which green innovation influences sustainability strategies. For instance, the interplay between different types of green innovation (product vs. process) and their distinct impacts on performance needs further investigation. Most existing research predominantly focuses on specific regions or industries, limiting the generalizability of findings. There is a need for studies that explore how green innovation strategies can be applied across various sectors and geographical contexts, particularly in emerging markets. The influence of organizational culture on the effectiveness of green innovation initiatives has not been thoroughly examined. Understanding how cultural factors shape the adoption and implementation of green practices could provide deeper insights into achieving sustainable performance. While the importance of employee engagement in promoting green initiatives is recognized, the role of consumer engagement in driving green innovation remains underexplored. Future research should examine how consumer feedback and involvement can enhance green innovation processes. The relationship between institutional pressures and green innovation needs more nuanced exploration. Understanding how varying types of institutional pressures interact with firm-level strategies can provide insights into enhancing green innovation practices. This study aims to address these gaps by exploring the relationships between green innovation, sustainability strategies, and firm performance, particularly within the context of the Tanzanian manufacturing sector. By addressing these unexamined areas, this research seeks to provide a more comprehensive understanding of how green innovation can effectively enhance sustainability initiatives and improve firm performance.

In Figure 1 the conceptual framework, the independent variables include Brand Trust, Eco-Labeling Claims, and Competitive Advantage. These variables are hypothesized to influence Sustainability Strategies. This means that factors like the trust consumers place in a brand, the use of eco-labeling claims, and the competitive advantage a firm hold are expected to shape or impact the sustainability strategies a company adopts. Once the Sustainability Strategies are influenced by the independent variables, they, in turn, have an effect on the Firm Performance. This suggests that the strategies a company employs to promote sustainability (e.g. green initiatives, responsible practices) are likely to improve or alter the performance of the firm. Furthermore, Green Innovation acts as a moderator in this framework. This means that Green Innovation influences the strength or weakness of the relationship between Sustainability Strategies and Firm Performance. For example, if a company has strong green innovation practices, the

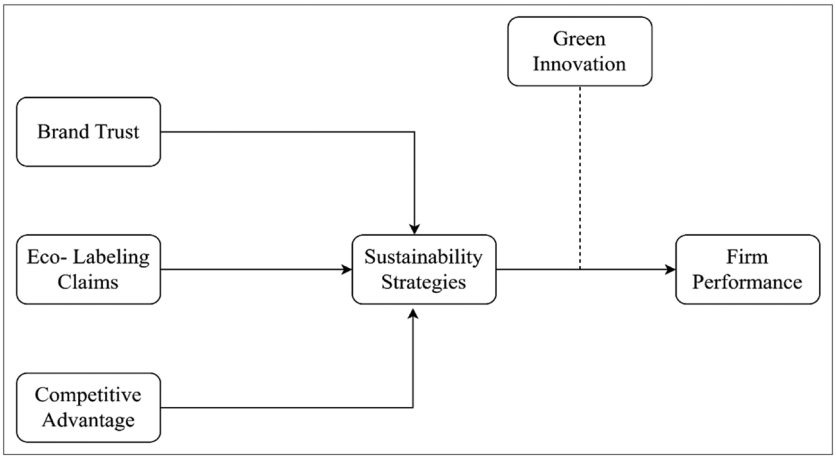

Figure 1. Conceptual framework.

positive effect of sustainability strategies on firm performance might be enhanced. Conversely, if green innovation is weak or absent, the impact of sustainability strategies on firm performance might be less significant.

3. Research methodology

3.1. Research design

This journal article presents a quantitative study aimed at exploring the factors influencing firm performance. Utilizing a questionnaire-based approach for data collection, the study selected this methodology for its capability to conduct a detailed analysis of the complex nature of firm performance. The primary objective of the study was to test the Resource-Based Theory (RBT), which posits that firm performance hinges on its valuable, rare, inimitable, and non-substitutable (VRIN) resources. Therefore, adopting a deductive approach, the article verifies existing theoretical frameworks rather than proposing new ones.

The study utilized SMART PLS 4 software for quantitative analysis, distributing questionnaires to selected private and public manufacturing industries to gather empirical data. Highlighting RBT as the foundational theory, the article underscores its prevalence and applicability across various manufacturing industries. For instance, a study by Wasim et al. (2024) documented a significant increase in the use of RBT within marketing research, emphasizing its role in fields such as international marketing, branding, innovation, strategic management, and human resources. This theoretical framework supports investigations at both organizational and individual levels of analysis (Khuwaja et al., 2019).

3.2. Sample selection

Sample enterprises were selected in Tanzania based on robust support from prior studies examining the relationship between green marketing and firm performance through insights from mid-level and senior managers. The chosen samples had to meet specific criteria: The companies had to be well-established, listed enterprises with over 10 years of operational history. They had to belong to the manufacturing sector, encompassing a variety of types to enable comprehensive and detailed analysis and to enhance the generalizability of the research. The availability and accessibility of data and materials were essential, with a preference for publicly listed companies that attract significant social interest. Information about these companies was gathered from various sources including websites, media, journals, and other outlets, ensuring the data's diversity and authenticity. Consequently, 10 diverse enterprises were selected to ensure heterogeneity and maximize variance within the sample. These enterprises include Tanzania Breweries Public Limited Company, Vertigo Trading Company Limited, Tanzania Portland Cement Public Limited Company, Tanzania Cigarette Public Limited Company, A To Z Textile Mills Limited, Tanga Cement Public Limited Company, Red Earth Limited, Aviv Tanzania Limited, Lake Cement Limited, and Superdoll Trailer Manufacture Co. (T) Limited.

3.3. Data sources

This journal article utilizes a blend of primary and secondary data to gather information from various sources. The Directorate of Research and Postgraduate Studies (DRPS) at Mzumbe University, through its ethical and research committee, granted ethical approval for this study before data collection commenced. Written consent to participate in the survey was also obtained from respondents at the beginning of the survey. The study duly acknowledged all data sources and ensured the confidentiality and anonymity of the participants. Primary data were collected through questionnaires sent to mid-level and senior managers. 400 questionnaires were distributed and only 340 were returned and analyzed. The response rate was 85%. Secondary data were primarily obtained from the official websites and annual reports of the sample enterprises in Tanzania. The study aims to investigate the relationship between firm performance (dependent variable) and brand trust, eco-labeling, and competitive advantage (independent variables), moderated by green innovation (moderating variable) and mediated by sustainability

strategies. The unit of analysis is the 'manufacturing industries,' represented by mid-level and senior managers from both public and private sector manufacturing industries in Tanzania.

The survey method, known for its adaptability to various research settings, was employed to explore relationships between certain variables. Surveys are particularly effective in testing hypotheses, describing populations, developing measurement scales, and suggesting methodological improvements in business research (Sarstedt et al., 2024). Consequently, a cross-sectional quantitative survey method was adopted for this study. The survey method is not only swift, economical, and time-saving but also effective in collecting data from larger sample sizes compared to the interview method (Cheah et al., 2024). The confidentiality of respondents' backgrounds was ensured during data collection. The survey method facilitates data collection and allows researchers to perform statistical analyses, as well as reliability and validity tests on the instrument, it is feasible for large samples, allows for responses to numerous questions on a given topic, and is reliable. The collected data were carefully reviewed and organized, with key data analyzed using SMART PLS 4 to ensure the reliability and authenticity of the research findings.

3.4. Measurement of variables

3.4.1. Firm performance

The measurement of firm performance is primarily based on the research by Abbas et al. (2024). The scale comprises six items, each examined using a five-point Likert scale. Green innovation is evaluated through two dimensions: financial profit (fp) and firm fund access (ff).

3.4.2. Green innovation

The measures of green innovation are primarily derived from the research by Ahmed et al. (2023). The scale used consists of six items within a single dimension, with an AVE of 0.680. These items include: 'I know about the features of green products', 'When buying a product, I consider the environmentally friendly features of the product', 'Eco-friendly products are innovative products', 'The eco-friendlier the features in the product, the more innovative it is', 'Green features increase the cost of the product, so you have to pay more because there is a difference between the features of green products and ordinary products', and 'I am happy with environmentally friendly products despite the price increase'.

3.4.3. Sustainability strategies

The measurement of sustainability strategies is primarily informed by the research conducted by Mudrika et al. (2024). This scale includes six items within a single dimension, with an AVE of 0.858 and Cronbach Alpha of 0.959. The items are: 'Use of raw materials (selection of low-impact materials, non-hazardous materials, non-exhaustible materials, low energy content materials, recycled materials, and recyclable materials)', 'Manufacture to use (optimization of production techniques, alternative production techniques, fewer production processes, low/clean energy consumption, low generation of waste, and few/clean production consumables)', 'Application of less/clean packaging, optimized weight and volume of product and package, efficient transportation and transport mode', 'Product use (reduction of the environmental impact in the user stage, low energy consumption, clean energy source, few consumables needed during use, clean consumables during use, and no energy/auxiliary material use)', and 'Design for end of life (optimization of end-of-life system, Life-Cycle Assessment on environmental compatibility of packaging materials, reuse of product, remanufacturing, recycling of materials, and clean incineration like depolymerization of PET waste)'.

3.4.4. Brand trust

The measurement of brand trust is based on the findings of Wu and Liu (2022). It consists of six items within a single dimension, with an AVE of 0.834 and Cronbach Alpha of 0.951. These items are: 'I feel more comfortable using environmentally friendly products compared to regular products', 'I prefer environmentally friendly brand products over regular products', 'I prefer to buy brand products that show concern for customers and the environment through their promotions', 'Environmentally friendly brand

products give a positive message to customers and make customers interested in the product', 'Brand trust can be achieved through green marketing', 'I trust green products more than regular products', and 'I recommend others to buy environmentally friendly brand products'.

3.4.5. Eco-labeling claims

The measurement of eco-labeling claims is primarily drawn from the research by Moraa et al. (2024). It consists of six items within a single dimension. The items include: 'Adopted Eco-Labeling to describe the information of a product about the environmental impact associated with its use', 'Eco-Labeling criteria consider the general overall life cycle of a product', 'Considers Eco-Labeling to be a valuable tool for purposes of communicating its products' qualities as well as the firm's concern for the environment', 'Adopted Eco-Labeling to represent a tool for governments, manufacturers, and consumers to address environmental problems associated with the firm's products', 'Supports the idea of private Eco-Labeling schemes for soft drink manufacturing firms worldwide', and 'Carrying out business process changes to continuously improve and expand Eco-marketing helps save the environment'.

3.4.6. Competitive advantage

The measurement of competitive advantage is primarily based on the research by Damayanti and Waskito (2024). It consists of six items within a single dimension, with an AVE of 0.527 and Cronbach Alpha of 0.775.

4. Analysis of variable data

This study employs quantitative data for two main reasons. First, firm performance is a multidimensional and complex concept, and quantitative data can effectively analyze the role of green innovation in moderating the relationship between firm performance and sustainability strategies, as well as the three independent variables influencing firm mechanisms and performance. Second, the context-specific nature of these variables necessitates a robust understanding, and quantitative research methods can uncover the strategies by which organizations in various settings or stages strategically adapt based on external and internal factors to enhance firm performance. Consequently, a manual assessment of green innovation implementation and firm performance was conducted for 10 enterprises.

A dedicated team was established for the assignment process, consisting of one associate professor, one lecturer, and four master's students. The team members, who have a strong theoretical background in green innovation and firm performance, met weekly to ensure the reliability and validity of the assignments. Throughout the variable assignment process, information from the selected companies was continuously integrated to finalize the assignment scheme. In the event of any disagreement after completing the assignments, the team members would collectively review the findings, re-evaluate the study values by integrating theory and practice, and work towards a consensus. Following these assignment guidelines, the team assigned values to each of the 10 companies regarding green innovation implementation, performing analysis using SMART PLS 4 to ensure objective data on firm performance.

4.1. Outlier detection and removal

Outliers in the dataset were identified using Mahalanobis distance (D^2), with 60 observations considered in total. The degrees of freedom (df) were calculated to be 59, and the corresponding Chi-square value for df = 59 at a significance level of $p = 0.001$ was 98.34. Any Mahalanobis value greater than 98.34 was regarded as an outlier in this study. To ensure the accuracy of the data analysis and mitigate the potential adverse effects of these outliers, 49 observations exceeding the threshold were removed.

Consequently, the final dataset for analysis contained 340 observations after eliminating the 49 outliers. The respondent IDs and their corresponding Mahalanobis values are presented in Table 1. A Mahalanobis distance with a low p-value in the Chi-square distribution suggests the rejection of the null hypothesis, meaning that these outliers likely do not originate from the same population as the rest of the responses. Unlike univariate outliers, which typically have a smaller impact on the means, multivariate outliers can have significant effects on the analysis and cannot be easily disregarded.

Table 1. Mahalanobis values.

S/No	Respondent ID	Mahalanobis (D2)
1	318	98.73607
2	133	99.05426
3	12	99.55641
4	309	99.6877
5	331	99.76038
6	216	101.0468
7	276	101.5121
8	281	101.5185
9	324	101.9362
10	311	102.5013
11	338	103.6567
12	334	105.4622
13	332	105.7325
14	24	105.7848
15	307	106.9043
16	321	107.8355
17	337	108.8629
18	153	109.6693
19	224	110.3265
20	268	110.5763
21	174	111.1745
22	35	111.9567
23	338	112.2388
24	245	112.4989
25	323	112.6332
26	108	113.9988
27	196	114.747
28	21	115.2486
29	308	116.3844
30	334	117.9582
31	340	117.9777
32	343	118.2868
33	104	118.5783
34	173	119.4331
35	150	119.7413
36	366	121.1994
37	312	121.2497
38	333	121.9915
39	76	124.6119
40	321	124.7203
41	316	125.9636
42	326	132.8244
43	239	133.7235
44	34	134.7949
45	272	135.1313
46	313	137.3749
47	252	147.129
48	82	147.8585
49	330	201.4289

Table 2. Descriptive statistics of variables.

Variables	Mean	Variance	Std. Deviation
Firm Performance	3.74	2.753	1.659
Green Innovation	3.30	2.471	1.572
Sustainability Strategies	4.85	3.715	1.928
Brand Trust	3.23	2.646	1.627
Eco-Labeling Claims	4.15	1.866	1.366
Competitive Advantage	4.42	3.265	1.807

In Table 2 the variable Firm Performance had a mean of 3.74 (SD = 1.66), suggesting that respondents generally rated firm performance positively, though with some variability. Green Innovation showed a mean of 3.30 (SD = 1.57), indicating a slightly lower average rating, with a similar level of dispersion in the responses. The highest mean value was observed for Sustainability Strategies (M = 4.85, SD = 1.93), which indicates that sustainability strategies were perceived more favorably by respondents compared to other variables. Eco-Labeling Claims had a mean of 4.15 (SD = 1.37), demonstrating relatively high perceptions of eco-labeling, though with lower variance compared to sustainability strategies. Brand Trust (M = 3.23, SD = 1.63) and Competitive Advantage (M = 4.42, SD = 1.81) showed moderate means, with

Table 3. Factor loadings.

	Brand trust	Competitive advantage	Eco-labeling claims	Green innovation	Sustainability strategies	ff	fp
bt1	0.919						
bt2	0.936						
bt3	0.903						
bt4	0.928						
bt5	0.871						
bt6:	0.901						
ca 4		0.909					
ca 6		0.871					
ca1		0.890					
ca2		0.908					
ca3		0.897					
ca5		0.847					
elc1			0.844				
elc2			0.878				
elc3			0.905				
elc4			0.812				
elc5			0.891				
elc6			0.863				
ff 1						0.857	
ff 2						0.882	
ff 4						0.824	
ff 5						0.867	
ff3						0.890	
fp1							0.922
fp2							0.898
fp3							0.948
fp4							0.906
fp5							0.854
gin1				0.768			
ginv2				0.814			
gnv3				0.872			
gnv4				0.861			
gnv5				0.855			
gnv6				0.825			
ss1					0.876		
ss5					0.852		

In Table 3 bt = brand trust, ca = competitive advantage, elc = eco labelling claims, gnv = green innovation ss = sustainability strategies, gin = green innovation, fp = financial profit, ff = firm fund access. In Table 1 Factor Loadings range from −1.0 to +1.0 so the threshold was meet.

competitive advantage receiving a somewhat higher rating. The variance for these variables suggests some degree of heterogeneity in the responses. The descriptive statistics show that the variables related to sustainability and competitive advantage tend to have higher mean values, while variables like green innovation and brand trust exhibit more moderate evaluations.

4.2. Measurements model: Lower order constructs (LOC) analysis

The quality of the constructs in the journal article is assessed through the evaluation of the measurement model. This begins with evaluating the factor loadings, followed by establishing construct reliability and validity.

In Table 4 the Variance Inflation Factor (VIF) statistic is used to evaluate multicollinearity among the indicators (Cha, 1994). According to Hair and Alamer (2022) multicollinearity is not a significant concern if the VIF value is below 5. Table 5 in the journal article presents the VIF values for the indicators, showing that each VIF value is below the recommended threshold.

In Table 5 Cronbach's Alpha values ranged from 0.762 to 0.958, and Composite Reliability statistics ranged from 0.855 to 0.967. Both of these reliability indicators surpass the necessary threshold of 0.7 (Crocetta et al., 2021), confirming that construct reliability is established.

In Table 6 the AVE value is greater than or equal to the recommended threshold of 0.50, items converge to measure the underlying construct, thus establishing convergent validity (Fornell & Larcker, 1981). Therefore, convergent validity is confirmed.

In Table 7 bold and Italics represent the square root of AVE. he square root of AVE for each construct is greater than the correlations between that construct and the others, which meets the Fornell and Lacker criterion for discriminant validity. Discriminant validity is confirmed because, for each construct,

Table 4. Multicollinearity statistics (VIF) for indicators.

	VIF
bt1	3.000
bt2	2.721
bt3	2.172
bt4	3.233
bt5	3.201
bt6:	2.861
ca 4	2.748
ca 6	2.358
ca1	2.712
ca2	2.021
ca3	3.181
ca5	2.159
elc1	3.174
elc2	2.180
elc3	2.112
elc4	2.321
elc5	3.383
elc6	2.940
ff 1	3.205
ff 2	3.209
ff 4	2.230
ff 5	3.295
ff3	3.682
fp1	2.346
fp2	3.692
fp3	2.117
fp4	4.001
fp5	2.844
gin1	2.053
ginv2	2.252
gnv3	2.029
gnv4	2.688
gnv5	2.499
gnv6	3.241
ss1	1.324
ss5	1.324

bt = brand trust, ca = competitive advantage, elc = eco labelling claims, gnv = green innovation ss = sustainability strategies, gin = green innovation, fp = financial profit, ff = firm fund access.

Table 5. Construct reliability analysis (Cronbach alpha and composite reliability).

	Cronbach's alpha	Composite reliability (rho_c)
Brand trust	0.958	0.967
Competitive advantage	0.946	0.957
Eco-labeling claims	0.933	0.947
Green innovation	0.915	0.932
Sustainability strategies	0.762	0.855
Firm fund access	0.915	0.937
Financial profit	0.945	0.958

Table 6. Construct convergent validity (AVE).

	Average variance extracted (AVE)
Brand trust	0.828
Competitive advantage	0.787
Eco-labeling claims	0.750
Green innovation	0.694
Sustainability strategies	0.747
Firm fund access	0.747
Financial profit	0.821

Table 7. Discriminant validity Follen and Lacker criterion.

	Brand trust	Eco-labeling claims	Sustainability strategies	ff	fp
Brand trust	***0.910***				
Competitive advantage	0.567				
Eco-labeling claims	0.544	***0.866***			
Green innovation	0.680	0.672			
Sustainability strategies	0.441	0.623	***0.864***		
Firm fund access	0.397	0.623	0.686	***0.864***	
Financial profit	0.665	0.465	0.594	0.680	***0.906***

the square root of AVE (diagonal values) is greater than the correlations between that construct and other constructs (off-diagonal values). This suggests that the constructs are distinct and measure different dimensions, meeting the requirements of the Fornell and Lacker criterion. The table confirms that the discriminant validity of the constructs is well-established according to the Fornell and Larcker (1981). This is an important step in ensuring that the constructs in the model are unique and do not overlap excessively, which strengthens the overall validity of the model.

In Table 8 all items in the table strongly load onto their respective parent constructs rather than onto other constructs in the study. Therefore, based on the evaluation of cross-loadings, discriminant validity is achieved (Crocetta et al., 2021).

Table 9 meet the criteria of discriminant validity as for measures of different concepts are distinct or not correlate too highly. Discriminant Validity is considered acceptable for most constructs as HTMT

Table 8. Discriminant validity – cross loadings.

	Brand trust	Competitive advantage	Eco-labeling claims	Green innovation	Sustainability strategies	ff	fp
bt1	0.919	0.543	0.505	0.615	0.438	0.346	0.589
bt2	0.936	0.558	0.454	0.646	0.432	0.358	0.647
bt3	0.903	0.505	0.531	0.615	0.411	0.375	0.611
bt4	0.928	0.526	0.526	0.651	0.407	0.397	0.630
bt5	0.871	0.421	0.471	0.558	0.304	0.327	0.562
bt6:	0.901	0.520	0.483	0.622	0.392	0.360	0.583
ca 4	0.460	0.909	0.587	0.686	0.622	0.422	0.385
ca 6	0.390	0.871	0.681	0.715	0.601	0.480	0.371
ca1	0.643	0.890	0.688	0.701	0.606	0.510	0.529
ca2	0.623	0.908	0.742	0.719	0.641	0.494	0.488
ca3	0.494	0.897	0.717	0.650	0.597	0.530	0.441
ca5	0.391	0.847	0.535	0.672	0.533	0.404	0.329
elc1	0.567	0.567	0.844	0.535	0.473	0.551	0.449
elc2	0.514	0.653	0.878	0.611	0.527	0.589	0.439
elc3	0.459	0.655	0.905	0.578	0.522	0.545	0.384
elc4	0.419	0.617	0.812	0.500	0.437	0.492	0.342
elc5	0.410	0.673	0.891	0.596	0.557	0.525	0.352
elc6	0.467	0.684	0.863	0.642	0.668	0.537	0.440
ff 1	0.386	0.465	0.572	0.540	0.549	0.857	0.688
ff 2	0.400	0.491	0.599	0.567	0.606	0.882	0.613
ff 4	0.348	0.467	0.513	0.486	0.586	0.824	0.547
ff 5	0.251	0.445	0.493	0.467	0.605	0.867	0.535
ff3	0.334	0.443	0.519	0.481	0.616	0.890	0.566
fp1	0.656	0.472	0.423	0.675	0.604	0.587	0.922
fp2	0.612	0.441	0.429	0.683	0.550	0.596	0.898
fp3	0.608	0.440	0.445	0.700	0.551	0.635	0.948
fp4	0.530	0.369	0.394	0.610	0.484	0.665	0.906
fp5	0.591	0.445	0.413	0.615	0.487	0.610	0.854
gin1	0.424	0.700	0.537	0.768	0.665	0.424	0.385
ginv2	0.447	0.749	0.644	0.814	0.667	0.518	0.450
gnv3	0.689	0.627	0.533	0.872	0.446	0.422	0.738
gnv4	0.676	0.607	0.543	0.861	0.437	0.519	0.755
gnv5	0.661	0.582	0.517	0.855	0.415	0.537	0.762
gnv6	0.615	0.494	0.515	0.825	0.404	0.512	0.716
ss1	0.399	0.486	0.586	0.513	0.876	0.670	0.563
ss5	0.362	0.695	0.488	0.604	0.852	0.511	0.460

bt = brand trust, ca = competitive advantage, elc = eco labelling claims, gnv = green innovation ss = sustainability strategies, gin = green innovation, fp = financial profit, ff = firm fund access.

Table 9. Discriminant validity – HTMT.

	Brand trust	Competitive advantage	Eco-labeling claims	Green innovation	Sustainability strategies	ff	fp
Brand trust							
Competitive advantage	0.588						
Eco-labeling claims	0.577	0.786					
Green innovation	0.745	0.804	0.702				
Sustainability strategies	0.547	0.802	0.777	0.778			
Firm fund access	0.424	0.574	0.675	0.639	0.806		
Financial profit	0.695	0.503	0.493	0.813	0.744	0.737	

values are mostly below 0.85, indicating that the constructs are distinct and measure different aspects (Fornell & Larcker, 1981).

4.3. Validating higher order constructs (HOC)

The higher-order constructs were also validated as part of the measurement model assessment. Each construct was evaluated for reliability and convergent validity. Additionally, as recommended by Sarstedt et al. (2024) the higher-order constructs were tested for discriminant validity against lower-order constructs. The results demonstrated that both reliability and validity for the higher-order constructs were established. For all constructs, reliability was confirmed with values greater than 0.70, and convergent validity was confirmed with an AVE greater than 0.50, as shown in the table. Furthermore, discriminant validity between higher-order and lower-order constructs was assessed. The results using (Fornell & Larcker, 1981) criterion indicated that the square root of the AVE for each construct was higher than its correlation with all other constructs. Additionally, the HTMT values were below 0.90, further establishing discriminant validity (Table 10).

In Table 10 shows the constructs Reliability and Convergent Validity. An AVE value of 0.843 is well above the threshold of 0.50, indicating that the Firm Performance construct has very good convergent validity. This means that the indicators used to measure Firm Performance explain a substantial portion of the variance in the construct. Firm Performance shows: Good internal consistency (Cronbach's alpha = 0.815), Very strong reliability (Composite reliability = 0.915), Excellent convergent validity (AVE = 0.843). These results suggest that the Firm Performance construct is well-measured, with its indicators reliably reflecting the underlying concept of firm performance and explaining a significant amount of the variance in the construct.

In Table 11 all the Fornell Lacker criterion meet the requirements. The diagonal values represent the square root of the AVE for each construct. These values show the AVE for each construct, and the values are all high (close to 1), which suggests that each construct is well-explained by its indicators. The Fornell-Lacker criterion is met because the diagonal values (AVE) for each construct are greater than the off-diagonal correlations. This indicates that each construct is distinct from the others, meeting the requirements for discriminant validity in higher-order constructs (Fornell & Larcker, 1981).

Table 12 shows discriminant validity. The HTMT criterion is another method used to assess discriminant validity. It measures the ratio of the correlation between heterotrait pairs (constructs that are theoretically distinct) to the correlation between monotrait pairs (same construct). Discriminant validity is considered adequate when the HTMT value is below 0.85, though some researchers use a threshold of 0.90 for stricter assessment. These values are all below the threshold of 0.85, indicating acceptable discriminant validity for these construct pairs. The HTMT values are all below 0.85, indicating that the constructs exhibit good discriminant validity. This supports the findings from Table 9 and further validates that the constructs are distinct from one another.

Table 13 shows the hypotheses of the study.

Table 10. Higher order construct reliability and convergent validity.

	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
Firm Performance	0.815	0.915	0.843

Table 11. Fornell and Larcker, (1981) criterion – higher order discriminant validity.

	Brand trust	Competitive advantage	Eco-labeling claims	Firm performance	Green innovation	Sustainability strategies
Brand Trust	***0.910***					
Competitive Advantage	0.571	***0.887***				
Eco-Labeling Claims	0.546	0.746	***0.866***			
Firm Performance	0.587	0.552	0.586	***0.918***		
Green Innovation	0.707	0.723	0.637	0.745	***0.841***	
Sustainability Strategies	0.634	0.769	0.679	0.670	0.629	***0.821***

Table 12. HTMT-higher order discriminant validity.

	Brand trust	Competitive advantage	Eco-labeling claims	Firm performance	Green innovation	Sustainability strategies
Brand trust						
Competitive advantage	0.588					
Eco-labeling claims	0.577	0.786				
Firm performance	0.652	0.626	0.679			
Green innovation	0.745	0.804	0.702	0.846		
Sustainability strategies	0.687	0.837	0.747	0.793	0.735	
Green innovation x Sustainability strategies	0.576	0.335	0.393	0.544	0.522	0.487

Table 13. Direct relationship results.

	Original sample (O)	Standard deviation (STDEV)	*T* statistics (|O/STDEV|)	*P* values
H_2: Brand Trust -> Sustainability Strategies	0.260	0.072	3.605	0.000
H_4: Competitive Advantage -> Sustainability Strategies	0.496	0.074	6.703	0.000
H_3: Eco-Labeling Claims -> Sustainability Strategies	0.167	0.058	2.849	0.000
Green Innovation -> Firm performance	0.498	0.071	7.062	0.000
H_1: Sustainability Strategies -> Firm performance	0.308	0.058	5.269	0.000
Green Innovation x Sustainability Strategies -> Firm performance	−0.073	0.027	2.664	0.008

4.3.1. Hypotheses testing

H_1: There is a significant impact on sustainability strategies and firm performance. The results revealed that that sustainability strategies have significant effect with firm performance:

$$(B = 0.308, t = 5.269, p = 0.000)$$

H_2: There is a significant impact on brand trust and sustainability strategies. The results revealed that that brand trust has significant effect with sustainability strategies:

$$(B = 0.260, t = 3.605, p = 0.000)$$

H_3: There is a significant impact on eco-labeling claims and sustainability strategies. The results revealed that that eco-labeling claims have significant effect with sustainability strategies:

$$(B = 0.167, t = 2.849, p = 0.000)$$

H_4: There is a significant impact on competitive advantage and sustainability strategies. The results revealed that that competitive advantage has e significant effect with sustainability strategies:

$$(B = 0.496, t = 6.703, p = 0.000)$$

Table 14 shows the moderation effects of the study.

H_5: The moderation effects between sustainability strategies and firm performance were not supported the model reveals that:

$$(B = -0.073, t = 2.664, p = 0.008)$$

4.3.2. Structural model

The next step in structural equation modeling is to assess the hypothesized relationships to substantiate the proposed hypotheses.

Figure 2 shows the structural model which also shows all independents, dependent variable, mediator and moderator of the study.

Table 14. Moderation effects.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	*T* statistics (|O/STDEV|)	*P* values
Brand Trust -> Firm performance	0.080	0.081	0.030	2.703	0.007
Brand Trust -> Sustainability Strategies	0.260	0.260	0.072	3.605	0.000
Competitive Advantage -> Firm performance	0.153	0.151	0.033	4.687	0.000
Competitive Advantage -> Sustainability Strategies	0.496	0.494	0.074	6.703	0.000
Eco-Labeling Claims -> Firm performance	0.051	0.052	0.021	2.454	0.014
Eco-Labeling Claims -> Sustainability Strategies	0.167	0.170	0.058	2.849	0.004
Green Innovation -> Firm performance	0.498	0.500	0.071	7.062	0.000
Sustainability Strategies -> Firm performance	0.308	0.308	0.058	5.269	0.000
H_5: Green Innovation x Sustainability Strategies -> Firm performance	−0.073	−0.071	0.027	2.664	0.008

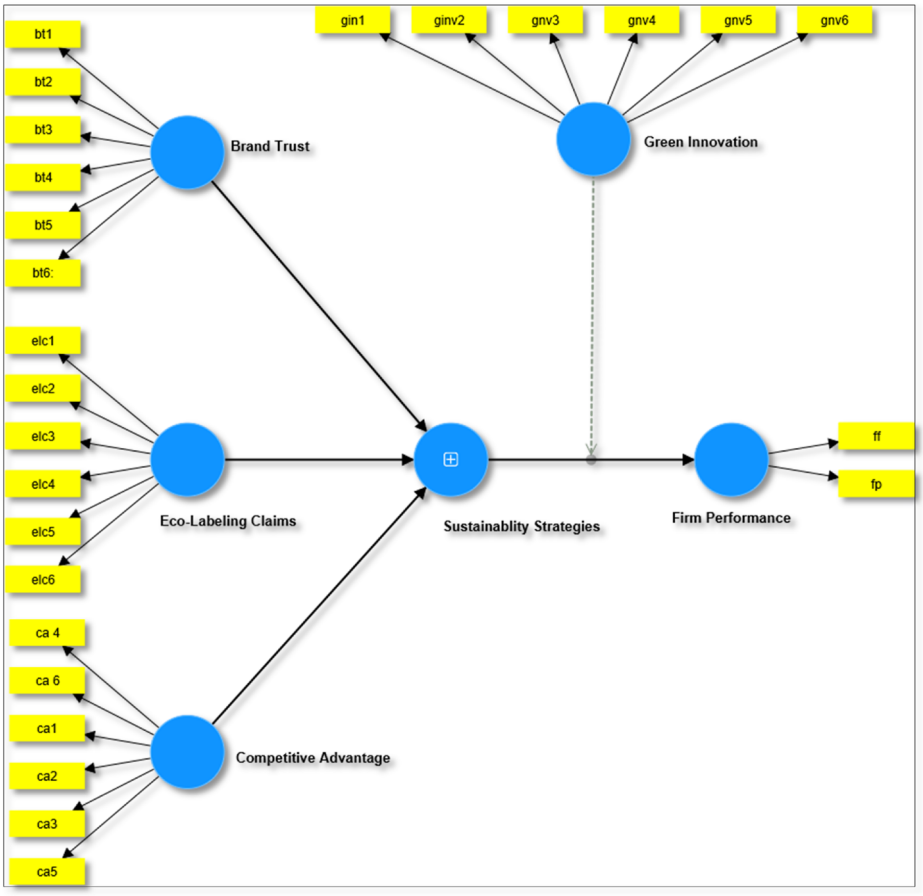

Figure 2. Structural model.

5. Discussion

This study investigates the moderating role of green innovation in the relationship between sustainability strategies and firm performance in Tanzania's manufacturing sector. The findings reveal a significant positive relationship between sustainability strategies and firm performance, aligning with previous studies that emphasize the benefits of adopting sustainable practices (Alam et al., 2024; Soomro et al., 2024). The direct impact of green innovation on firm performance is confirmed, but its moderating effect in the relationship between sustainability strategies and firm performance is found to be insignificant. This result presents a unique insight into the dynamics of green innovation in emerging markets, particularly within the Tanzanian context.

5.1. Comparison with previous studies

5.1.1. Sustainability strategies and firm performance

Our findings support previous studies that highlight the positive impact of sustainability strategies on firm performance. For instance, Ahmad et al. (2020) found that green marketing and sustainability strategies significantly enhance marketing performance. Similarly, Hudaibiya and Raza (2024) argue that sustainability strategies positively influence firm performance by improving operational efficiencies and brand reputation. These studies highlight the importance of adopting sustainability practices for gaining a competitive advantage and improving overall performance. Our results further confirm these assertions, demonstrating that firms in Tanzania benefit from adopting comprehensive sustainability strategies. However, Soomro et al. (2024) and Yaputra et al. (2024) caution that the success of these strategies is contingent on various external factors, such as market conditions and regulatory frameworks. Our study further reinforces this notion, highlighting the contextual differences that might explain the mixed results found in some other regions. For example, while firms in developed countries may experience significant financial gains from sustainability strategies due to consumer awareness and stringent regulations, firms in Tanzania may face challenges in translating these strategies into immediate financial benefits.

5.1.2. Green innovation and firm performance

The direct positive impact of green innovation on firm performance found in this study is consistent with research by Hudaibiya and Raza (2024) and Isac et al. (2024), which argue that green innovations can improve operational efficiency and create a competitive edge. These studies suggest that green innovations reduce resource consumption, enhance brand image, and attract environmentally conscious consumers, which ultimately leads to improved financial outcomes. Our findings contribute to this literature by confirming that green innovation itself plays a crucial role in driving firm performance. However, in contrast to some studies that emphasize the moderating role of green innovation (Boons & Lüdeke-Freund, 2013), our results reveal that green innovation does not significantly moderate the relationship between sustainability strategies and firm performance. This finding is somewhat surprising, as Pham et al. (2024) and Salguero Núñez et al. (2024) suggest that green innovation amplifies the benefits of sustainability strategies by introducing new technologies and practices that enhance both environmental and economic performance. The lack of a moderating effect in this study may be explained by the unique challenges faced by firms in Tanzania, such as limited access to advanced green technologies and the high costs associated with their implementation. These challenges could reduce the potential moderating effect of green innovation, particularly in a developing market context.

5.1.3. Implications of energy consumption

The study also addresses the critical issue of energy consumption in sustainability strategies. Pham et al. (2024) found that energy consumption, particularly from non-renewable sources, negatively impacts firm profitability. Similarly, Sitompul et al. (2024) highlighted that energy efficiency improvements can significantly enhance firm performance. While our study did not directly investigate energy consumption, it aligns with these findings by underscoring the importance of green practices, such as energy-efficient technologies, in enhancing sustainability strategies. Firms that invest in energy-efficient practices may see long-term cost savings and performance improvements, despite the initial high costs associated with such investments.

5.2. The role of green innovation in emerging markets

The findings of this study contribute to the growing body of literature on green innovation in emerging markets. While many studies focus on developed countries, this research sheds light on the Tanzanian context, where firms may face unique barriers to the adoption of green innovation, such as limited access to capital, technological infrastructure, and skilled labor. Our results suggest that while green innovation can directly enhance firm performance, its role in moderating the relationship between sustainability strategies and firm performance is less pronounced in Tanzania compared to more developed economies. This discrepancy can be attributed to the different stages of green innovation adoption in developing countries. According to Simionescu et al. (2020) and Westerman et al. (2020), developing countries are still in the early stages of adopting energy-efficient and eco-friendly technologies, which could explain why green innovation does not yet fully enhance the impact of sustainability strategies in Tanzania. As green technologies become more accessible and affordable, their moderating effect may become more pronounced in the future.

5.3. Practical implications for policy and practice

The study's findings offer important implications for both industry practitioners and policymakers in Tanzania. For businesses, the results suggest that adopting sustainability strategies can lead to improved firm performance, even without a significant moderating effect from green innovation. Firms should focus on implementing sustainable practices that reduce waste, improve energy efficiency, and promote eco-friendly products, as these can improve operational efficiency and market positioning. For policymakers, the study underscores the need for greater support for green innovation. Providing incentives for firms to invest in green technologies, such as subsidies for energy-efficient equipment or tax breaks for sustainable practices, could help enhance the moderating effect of green innovation. Additionally, fostering an ecosystem of innovation through partnerships between private and public sectors can help overcome the barriers to green technology adoption faced by firms in Tanzania.

5.4. Limitations and future research directions

While this study provides valuable insights, it is not without limitations. First, the sample size is relatively small, limited to 10 firms in Tanzania, which may not be fully representative of the broader manufacturing sector. Future studies could expand the sample to include more firms from different industries or regions to increase the generalizability of the findings. Second, the study focuses on the Tanzanian context, which may differ from other emerging markets due to unique economic, political, and cultural factors. Future research could examine green innovation and sustainability strategies in other developing countries to compare the moderating effects of green innovation across different contexts. Lastly, future studies could explore additional variables that may influence the relationship between sustainability strategies, green innovation, and firm performance, such as consumer behavior, market conditions, and regulatory frameworks. Investigating these factors could provide a more comprehensive understanding of the dynamics at play and help refine strategies for enhancing firm performance through sustainability.

Non-author contributors

I acknowledged individuals of a study's data and conclusions.

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Data availability statement

Data available on request from the author.

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