

What do we know about the role of sustainable management in the context of innovativeness and firm performance?

Joanna Duda, Marcin Suder, Marzena Smol, Rafal Kusa and David Juárez Varón

Abstract

Purpose – This study aims to deepen the authors' knowledge about sustainable management in the relationship between innovativeness and two dimensions of firm performance: firm competitiveness and firm growth. In particular, the mediating role of sustainable management is tested and analysed.

Design/methodology/approach – This study used structural equation modelling to examine a sample that consisted of 150 small and medium-sized enterprises that operated in the furniture industry in Poland.

Findings – The role of sustainable management depended on the dimension of performance. In the case of firm growth sustainable management played a mediating role. Innovativeness affected both firm growth and firm competitiveness and simultaneously affected sustainable management. The results also showed that sustainable management did not affect firm competitiveness but rather firm growth.

Originality/value – This work extends the authors' knowledge about sustainable management in the context of innovation performance. In addition, the study focuses on small firms representing low-tech industry. The study revealed the mediating role of sustainable management in the relationship between innovativeness and firm growth. This finding contributes to entrepreneurship theory by extending the authors' understanding of the impact of innovativeness on firm performance as well as the role of sustainable management in this relationship. The latter also adds value to the emerging field of sustainable entrepreneurship.

Keywords Sustainable management, Sustainability, Innovativeness, Firm performance, Firm growth, Firm competitiveness, Mediation, PLS-SEM, SMEs, Furniture industry, ESG, Poland

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Highlights

- Innovativeness positively impacts both firm competitiveness and firm growth.
- Innovativeness positively affects sustainable management.
- Sustainable management positively influences firm growth but does not affect firm competitiveness.
- Sustainable management partly mediates the impact of innovativeness on firm growth.

1. Introduction

Understanding the relationship between sustainable management, innovation and firm performance has become increasingly important in a complex and competitive environment. Companies face growing external pressures that require them to expand their knowledge base and adopt advanced managerial practices. In particular, the rising demand for sustainability has pushed firms to integrate environmental considerations into strategic

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decision-making. In response, organizations must implement innovations in products, services, or processes (Li-Ying *et al.*, 2023). Continuous innovation enables firms to differentiate themselves, meet changing customer needs and maintain competitive advantage, while collaboration within innovation ecosystems supports joint value creation (Park *et al.*, 2022). Investment in research and development (R&D) plays a crucial role in identifying trends and leveraging new technologies. It fosters creativity and adaptability while improving efficiency and reducing costs (Tavassoli and Karlsson, 2016). By optimizing processes and adopting advanced technologies, firms can enhance productivity and profitability while integrating environmental considerations (Hilden *et al.*, 2014). Innovation also supports product differentiation and market competitiveness (Milesi *et al.*, 2013). However, it requires supportive environments that encourage risk-taking, collaboration and continuous learning, as well as employee development and openness to diverse perspectives (Oborn *et al.*, 2019).

At the same time, globalization and environmental regulations have made sustainable development (SD) a central concern. Organizations are expected to integrate economic, social and environmental dimensions to ensure long-term sustainability (United Nations General Assembly, 2015). Sustainable practices prevent resource depletion and environmental degradation, safeguarding future growth (Franze *et al.*, 2024). Knowledge of SD supports compliance with regulations and the integration of environmental, social and governance (ESG) criteria, enhancing resilience and reputation (Sabauri and Kvatahidze, 2023). Firm performance, understood as the achievement of organizational goals, should therefore be assessed across multiple dimensions. This study focuses on firm competitiveness and firm growth (Chikán *et al.*, 2022). Reducing environmental impact requires coordinated actions in energy, materials, technologies and management (Iritani *et al.*, 2015; Smol *et al.*, 2024). Green innovation has emerged as a key approach to addressing these challenges, driven by technological, organizational and regulatory factors (Thuyen and Bich, 2024). However, eco-innovation entails costs (Høgevold, 2011), raising questions about its effects on competitiveness and growth (Labella-Fernández *et al.*, 2021). Although some studies report positive impacts of sustainable innovation on performance (Boons *et al.*, 2013; Le and Ikram, 2022), findings remain mixed. Sustainable management is increasingly recognized as a strategic priority, particularly in SMEs facing regulatory and social pressures (Kannan and Gambetta, 2025), though such firms often face resource and capability constraints (Kumar *et al.*, 2023).

In addition, knowledge management processes may be distorted by selective disclosure, manipulation or group bias (Merkl-Davies and Brennan, 2007; Flyverbom, 2016; Tenbrunsel and Messick, 2004). Teams may construct narratives that distort decision-making (Lackey, 2018; Kocher *et al.*, 2017), leading to superficial sustainability practices. Understanding these mechanisms is important for analysing the links between innovation, sustainable management and performance. Despite growing research, most studies examine direct relationships between sustainable innovation and performance, overlooking the mediating role of sustainable management. This study addresses this gap by analysing how sustainable management mediates the relationship between innovativeness and firm performance, focusing on competitiveness and growth. Using structural equation modelling (SEM), the study examines data from 150 SMEs in the Polish furniture industry. The study contributes by focusing on low-tech industries and highlighting the mediating role of sustainable management. The findings show that sustainable management supports firm growth but does not directly enhance competitiveness, instead exerting a long-term, growth-oriented effect.

2. Innovation and sustainable management

Innovation has traditionally been associated with generating new revenue streams; however, recent research emphasizes that it should also be evaluated in terms of environmental and social outcomes (D'Adamo *et al.*, 2023). As a result, innovation is increasingly assessed

through its contribution to broader sustainability goals. Nevertheless, the relationship between innovation and SD is not always straightforward. Some studies indicate that innovation may diverge from sustainability principles, particularly in linear and highly competitive economic systems where efficiency and growth can come at the expense of environmental and social well-being (Keeler *et al.*, 2019; Nenni *et al.*, 2024). Despite these tensions, substantial evidence supports a positive relationship between innovation and sustainability. In this context, sustainable management plays a key role by aligning innovation processes with long-term environmental and societal objectives, enabling firms to balance economic performance with ecological responsibility.

To implement innovation sustainably, companies must foster organizational cultures that promote continuous improvement, creativity and adaptability. This involves investing in R&D, encouraging cross-functional collaboration and leveraging emerging technologies (Ozgit, 2022). Effective governance systems and monitoring mechanisms are essential to ensure that innovation aligns with sustainability strategies. Maintaining open communication with customers also helps firms better understand evolving needs and preferences, guiding innovation towards more relevant and responsible solutions. Similarly, supplier selection has become a critical aspect of sustainability, as evaluating suppliers based on environmental and social criteria improves the overall sustainability of value chains (Acerbi *et al.*, 2023). Incorporating environmental considerations into innovation processes leads to eco-innovation, which focuses on reducing resource consumption, energy use and pollution (Smol *et al.*, 2017). Eco-innovation is widely recognized as a strategic tool for achieving SD, as it generates economic, environmental and social benefits simultaneously (Park *et al.*, 2017). Knowledge embedded in sustainable management practices supports long-term innovation by helping firms identify opportunities aligned with sustainability objectives. Green innovation, in particular, has emerged as a key approach to addressing global environmental challenges, driven by technological, regulatory and market factors (Thuyen and Bich, 2024).

An important contemporary perspective involves sustainability-oriented innovation systems, which integrate multiple elements to support the development and implementation of innovations aimed at achieving sustainability goals (Manzoor *et al.*, 2023). These systems enable firms to adapt strategies, create sustainable value and respond effectively to global challenges (Rocha *et al.*, 2022; Testa *et al.*, 2022). Moreover, sustainability-oriented innovation enhances stakeholder relationships, as the value derived from sustainable practices increases customer satisfaction and loyalty (Marín-García *et al.*, 2025). Integrating sustainability into core strategies also strengthens reputation and brand equity, particularly as consumers increasingly favour socially responsible companies (Al Owais, 2024; Marín-García *et al.*, 2025). Within the broader context of green transformation, innovation must address environmental and social challenges alongside economic objectives. This reflects the principles of SD (United Nations General Assembly, 2015), which gained prominence with the *Our Common Future* report (Brundtland, 1987a) and were later operationalized through the 17 Sustainable Development Goals (SDGs) (Intergovernmental Panel on Climate Change, 2018). These frameworks have driven the adoption of policies and strategies promoting sustainable behaviour among organizations and individuals (Abrahamse and Matthies, 2018; Abrahamse *et al.*, 2005; Burger *et al.*, 2015; Steg and Vlek, 2009).

In small and medium-sized enterprises (SMEs), green innovation often focuses on practical measures such as energy efficiency, water conservation, resource recovery, digitalization and improvements in working conditions (Vieira *et al.*, 2025; Solovida *et al.*, 2025; Arsawan *et al.*, 2024; Mrad and Belgaroui, 2025; Wicaksari *et al.*, 2024). These initiatives align ESG principles and demonstrate how sustainability can be operationalized in business practice. A key dimension of this transition is the circular economy (CE), which emphasizes efficient resource use and waste valorisation. The European Commission highlights the importance of CE in addressing resource scarcity and supply risks (Hool *et al.*, 2024). Implementing

CE requires collaboration among businesses, policymakers and society, as well as the development of new business models focused on resource efficiency and waste reduction (Tsironis and Tsagarakis, 2023). Examples include industrial symbiosis, material reuse, energy-efficient technologies and pollution reduction (Buda and Ricz, 2023; Ramm and Smol, 2024).

Business model innovation focused on sustainability and circularity is increasingly recognized as a source of competitive advantage, particularly for SMEs (Pieroni *et al.*, 2019; Joy-Camacho and Thornhill, 2024). However, research in this area remains fragmented, and the relationships between circular and sustainable business models are not yet fully understood (Diaz Lopez *et al.*, 2019; Foss and Saebi, 2017; Lüdeke-Freund and Dembek, 2017; Geissdoerfer *et al.*, 2017a). Despite the availability of various sustainable solutions (Demirel *et al.*, 2024), their impact on firm performance remains unclear. Firm performance is a multidimensional construct influenced by numerous factors (Kusa *et al.*, 2024a), and this study focuses on two key dimensions: firm competitiveness and firm growth. In conclusion, sustainable innovation requires an integrated approach that aligns economic, environmental and social objectives. Sustainable management plays a central role by guiding innovation towards responsible and value-creating outcomes. It not only reduces risks and costs but also creates opportunities for growth and long-term competitiveness, enabling firms to remain resilient in a dynamic environment.

3. Hypothesis development

3.1 Impact of innovativeness on sustainable management

Innovativeness is a broad concept that can be analysed from multiple organizational perspectives. In recent years, pro-environmental innovations (eco-innovations) have gained prominence, aiming to introduce new products and processes while reducing environmental impact (Smol *et al.*, 2017). Their development is driven by stricter regulations and growing pro-environmental expectations among consumers and suppliers. Guidelines for implementing sustainable innovation are reflected in European and national policies (Smol, 2022), aligned with the global adoption of SD and the 17 SDGs (Ali *et al.*, 2023). Innovation plays a key role in achieving SDGs, particularly in improving resource, energy and human capital efficiency. Public funding, such as the EU Framework Programme, supports these efforts across the full innovation value chain (Nepelski and Van Roy, 2021).

Consumer trends further reinforce sustainable innovation. Research highlights the importance of pro-environmental behaviours (PEBs) and the factors influencing them (Bamberg and Moser, 2007; Gleim *et al.*, 2013; Huttel *et al.*, 2018; Kapoor *et al.*, 2014; Lange and Dewitte, 2019; Steg and Vlek, 2009). These include environmental concern, perceived consumer effectiveness and innovation (Carfora *et al.*, 2017; Laroche *et al.*, 2001; Alzubaidi *et al.*, 2021). As a result, firms increasingly invest in green technologies and sustainable production processes (Marcon *et al.*, 2017; Pickett-Baker and Ozaki, 2008). Supplier selection also plays a role, as sustainability-oriented evaluation improves overall product sustainability (Acerbi *et al.*, 2023). Focusing on sustainability enables firms to identify innovation opportunities aligned with environmental and social goals. Green innovation is particularly relevant for addressing global environmental challenges, driven by technological, regulatory and market factors (Thuyen and Bich, 2024). Despite extensive research, further investigation into PEBs is still needed (Alzubaidi *et al.*, 2021). Therefore, we hypothesize the following:

H1. Innovativeness positively impacts sustainable management.

3.2 Impact of innovativeness on firm performance

Innovativeness is a key driver of firm performance, a multidimensional concept shaped by internal and external factors (Kusa *et al.*, 2024a). It includes financial, operational and competitive outcomes, influenced by interactions with customer portfolios, internationalization

and learning capacity (Falcone *et al.*, 2024; Freixanet and Federo, 2022). The innovation–performance relationship spans financial, market and operational dimensions (Egwu *et al.*, 2019), with innovative firms typically achieving stronger results. Innovation includes not only products but also processes and organizational practices, though empirical findings remain context dependent. Different innovation dimensions – process, market and supply chain – jointly influence performance. Technological orientation predicts outcomes, with innovation acting as a mediator (Yousaf *et al.*, 2021). This positive relationship is widely confirmed, including in family firms (Hatak *et al.*, 2016). Marketing effectiveness and customer interaction further mediate this link (Alpay *et al.*, 2012; Groza *et al.*, 2021). Organizational learning and customer orientation also strengthen innovation and performance (Ho, 2012, 2014). Overall, innovation drives growth and competitive advantage (Dibrell *et al.*, 2014). Thus, we propose:

H2a. Innovativeness positively impacts firm competitiveness.

H2b. Innovativeness positively impacts firm growth.

3.3 Impact of sustainable management on firm performance

Growing environmental awareness has transformed sustainability into a strategic factor influencing firm performance (Ammer *et al.*, 2020; Larran Jorge *et al.*, 2015; Nogueira *et al.*, 2023; Ali *et al.*, 2021). Sustainable strategies are increasingly seen as a foundation for long-term competitiveness. For example, environmental practices have been shown to improve multiple performance dimensions, including financial, market and operational outcomes (Nogueira *et al.*, 2023). Similarly, investments in ESG practices are often associated with improved firm value, performance and shareholder returns (Kim *et al.*, 2015; Wen *et al.*, 2022; Ademi and Klungseth, 2022; Al Amosh *et al.*, 2023; Pu, 2022; Lueg and Pesheva, 2021). These findings suggest that sustainability can create both economic and reputational benefits. However, the literature remains inconclusive. Some studies report negative or insignificant relationships between ESG practices and firm performance, highlighting the costs associated with sustainability initiatives (Ali *et al.*, 2021; Schuler and Cording, 2006; Duque-Grisales and Aguilera-Caracuel, 2021; Semenova and Hassel, 2008; Richardson and Welker, 2001; Garcia-Castro *et al.*, 2010; Li *et al.*, 2018; Teng *et al.*, 2021). These conflicting results indicate that the sustainability–performance relationship is complex and context-dependent.

Given these mixed findings, further research is needed. Therefore, we propose:

H3a. Sustainable management positively impacts firm competitiveness.

H3b. Sustainable management positively impacts firm growth.

3.4 The role of sustainable management in the nexus of innovativeness and firm performance*

Innovativeness, sustainable management and firm performance are interrelated and mutually reinforcing. While prior research has examined these relationships separately, limited attention has been given to the potential mediating role of sustainable management. Existing studies suggest that these relationships may involve complex mechanisms, including mediation effects (Adomako, and Tran, 2022). Although many studies highlight the positive impact of proactive environmental strategies on firm performance (Nguyen and Adomako, 2021; Ševčíková and Knošková, 2021; Nogueira *et al.*, 2023; Elkington, 2013; Olkiewicz and Grzegorzewska, 2014; Iraldo *et al.*, 2020; Adomako *et al.*, 2021; Shu *et al.*, 2020), others report inconsistent or even negative effects (López-Gamero and Molina-Azorín, 2016; Porter and van der Linde, 1995). These inconsistencies highlight the need to explore indirect relationships. Testing mediation effects can help explain how innovation translates into performance outcomes through sustainability practices. Sustainable management may act

as a mechanism that channels innovative capabilities into improved competitiveness and growth. Therefore, we propose:

H4a. Sustainable management mediates the relationship between innovativeness and firm competitiveness.

H4b. Sustainable management mediates the relationship between innovativeness and firm growth.

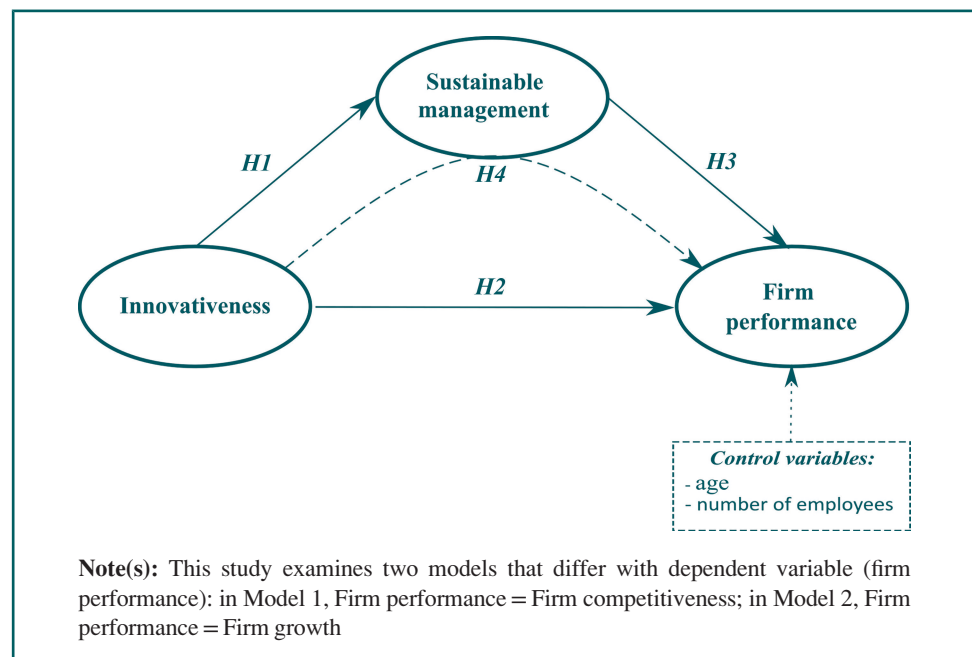
The proposed hypotheses are presented in the theoretical model in [Figure 1](#).

4. Methodology

4.1 Sample and data-collection procedure

The research sample included 150 SMEs from the Polish furniture industry, selected for its economic relevance, innovation potential and environmental challenges. Poland was the second-largest furniture exporter globally and the European leader in 2022, employing over 200,000 people across 32,000 firms, with exports of US\$15.35bn and 5.7% annual growth ([Polish Investment and Trade Agency PAIH, 2024](#)). The sector also shows strong innovation dynamics, with investments in automation, robotics and digitalization ([Kurier Drzewny, 2022](#); [DREMA 2025](#); [Lectra and B+R Studio, 2019](#)), alongside practices such as Lean Manufacturing and recycling ([Melaco, 2025](#)). At the same time, it faces environmental pressures, including high energy costs, resource scarcity, CO₂ reduction requirements, ESG reporting and CE transition ([Bednarz-Luczevska, 2024](#); [Knauf Industries, 2024](#); [Polish Investment and Trade Agency PAIH, 2024](#)). The sample was randomly selected from a Dun & Bradstreet database, and data were collected between August and October 2022 through structured interviews (PAPI and CAPI) with owners or managers. Firms varied in size and age, ensuring diversity. Although non-response bias cannot be excluded, no systematic distortions were observed. A post hoc power analysis using G*Power ([Faul et al., 2007](#); [Memon et al., 2020](#)) confirmed sample adequacy, with statistical power of 0.99 ($\alpha = 0.05$; $f^2 = 0.15$), exceeding the recommended 0.80 threshold ([Cohen, 1988](#)).

Figure 1 Theoretical model



4.2 Variables

The study analysed four constructs: innovativeness (IN), sustainable management (SUSM) and two performance dimensions – firm competitiveness (FC) and firm growth (FG). All variables were measured using multi-item indices on a seven-point Likert scale. Innovativeness captured firms' tendencies to introduce new products, adopt technologies and implement creative solutions (Kusa *et al.*, 2024b; Hughes and Morgan, 2007). Sustainable management reflected engagement in pro-environmental practices such as resource reduction, recycling, eco-efficient technologies and alignment with sustainability and CE principles (Kusa *et al.*, 2023; Conway, 2018; Elkington, 2013). Firm performance was assessed through competitiveness (e.g. market position, customer satisfaction) and growth (e.g. sales, expansion), based on established scales (Hughes and Morgan, 2007; Kusa *et al.*, 2024a; Suder *et al.*, 2025b). Both dimensions are widely used in entrepreneurship research (Suder, 2025a). All measures met reliability and validity standards. However, the use of perceptual, self-reported data may limit generalizability, despite ensuring consistency and comparability.

4.3 Methods

Due to the exploratory nature of the study and the non-normality of the analysed variables, the PLS-SEM (partial least squares – structural equation modelling) method was used for analysis. This method allows for the verification of models that include mediating effects (Nitzl *et al.*, 2016; Cepeda-Carrión *et al.*, 2017; Kusa *et al.*, 2024a; Suder *et al.*, 2024), and the variables in these models are treated as latent constructs (Hair *et al.*, 2022). The study used SmartPLS software (Version 4.1.0.3) (Ringle *et al.*, 2022).

5. Verification of measurement model and hypothesis testing

SEM was conducted in two phases following the guidelines that were provided by Hair *et al.* (2022). The first phase involved verifying the measurement model, which assessed the accuracy of the constructs. In the second phase, the structural model was used to test the specific research hypotheses.

5.1 Measurement model verification

The measurement model aimed to assess whether the considered constructs were accurately measured using the selected indicators (Klärner *et al.*, 2013). Therefore, the first step in verifying the model was to conduct a factor analysis, which allowed for evaluations of each indicator's contribution for building the construct and the collinearity of the applied items. The results of this analysis (including the outer loadings and VIF indicators) are provided in Table 1. In addition, the basic statistics for the used indicators are also included.

The minimum acceptable value for outer loadings was 0.5, with an expected threshold above 0.7 (Hair *et al.*, 2022). Most indicators exceeded 0.7, while only two were within the acceptable 0.5–0.7 range, so all were retained for further analysis. Collinearity was also assessed, with all VIF values below 3.3, indicating no issues (Diamantopoulos and Winklhofer, 2001). The measurement model was further evaluated for reliability and validity (Campbell and Fiske, 1959). Following Hair *et al.* (2022), all measures met recommended thresholds: Cronbach's alpha, reliability and composite reliability ranged from 0.7 to 0.95 and AVE exceeded 0.5. Discriminant validity was confirmed using the Fornell-Larcker criterion (Fornell and Larcker, 1981), as AVE square roots exceeded inter-construct correlations and the HTMT ratio was below 0.85 (Henseler *et al.*, 2015), confirming construct validity. Table 2. Reliability and validity metrics of constructs:

To assess the model fit, we additionally calculated the standardized root mean square residual (SRMR), which was in line with the guidelines provided by Henseler *et al.* (2015).

Table 1 Assessments of indicator properties in measurement model

Construct	Item	$\bar{x}$	σ	λ	VIF
Innovativeness (IN)	Our organisation seeks out new ways to do things.	5.133	1.832	0.636	1.355
	We actively introduce improvements and innovations in our organisation	5.347	1.527	0.864	2.538
	We are innovative in the way we run our business	4.680	1.489	0.885	2.588
	Innovation is the source of our success	4.247	1.661	0.751	1.430
Sustainable management (SUSM)	Pro-environmental activities hold an important place in our strategy	4.793	1.610	0.871	2.876
	Principles of the circular economy are significantly present in our development strategy and business model	4.080	1.719	0.793	2.174
	We aim to reduce waste and/or maximise its recycling	5.727	1.356	0.836	2.687
	We strive to reduce the use of products that are harmful to the environment and the emissions of pollutants	5.787	1.369	0.824	2.859
	We aim to reduce electricity consumption (e.g. by using energy-efficient technologies)	5.507	1.578	0.722	1.739
Firm competitiveness (FC)	We are One of the leading companies on our market in terms of our business	3.567	1.606	0.718	1.366
	Relative to competing products, our products are more successful in terms of sales	3.547	1.309	0.802	3.279
	Compared to our competitors, we achieve better economic results	3.667	1.209	0.800	3.184
	Our sales revenues are higher than those of our direct competitors	4.060	1.207	0.863	3.244
	Relative to competing products, our products achieve and maintain higher market shares	3.760	1.242	0.853	3.106
Firm growth (FG)	We are developing faster than our competitors	3.967	1.416	0.629	1.503
	We are strongly focused on the growth of our company (e.g. increasing turnover, employment, market share)	4.433	1.757	0.745	1.700
	We are developing much faster than expected	3.727	1.612	0.877	2.903
	Our profitability has increased	3.880	1.705	0.778	3.207
	Our sales are growing much faster than we expected	3.433	1.631	0.814	3.163

Note(s): $\bar{x}$ – mean; σ – standard deviation; λ – outer loadings; VIF – variance inflation factor

Table 2 Reliability and validity metrics of constructs

	Reliability and convergent validity				Discriminant validity						
					Fornell-Larcker criterion				HTMT criterion		
Variable	α	rho_A	CR	AVE	1	2	3	4	1	2	3
IN	0.794	0.814	0.867	0.624	0.790						
SUSM	0.870	0.881	0.905	0.657	0.430	0.811			0.509		
FC	0.868	0.874	0.904	0.655	0.428	0.249	0.809		0.485	0.269	
FG	0.898	0.905	0.920	0.624	0.590	0.361	0.664	0.790	0.675	0.390	0.735

Note(s): α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted; ρ_A = reliability coecient, Values on the diagonal in the Fornell–Larcker criterion matrix represent the square roots of the AVE for each construct. Discriminant validity is established when these diagonal values are greater than the correlations between constructs (off-diagonal elements)

An SRMR value that is below 0.10 indicates a good fit, with a more conservative threshold falling below 0.08 (as per [Hu and Bentler, 1999](#)). In our analysis, the SRMRs were found to be 0.087 (Model 1 with FC) and 0.084 (Model 2 with FG), thus signifying that the model achieved an acceptable fit.

5.2 Hypothesis testing

Bootstrapping was used to assess the significance of path coefficients in the measurement model ([Lee et al., 2011](#)), with results presented in [Figure 2](#) and [Table 3](#). These were

Figure 2 Structural model results in the relationships between innovativeness, sustainable management, and two dimensions of firm performance

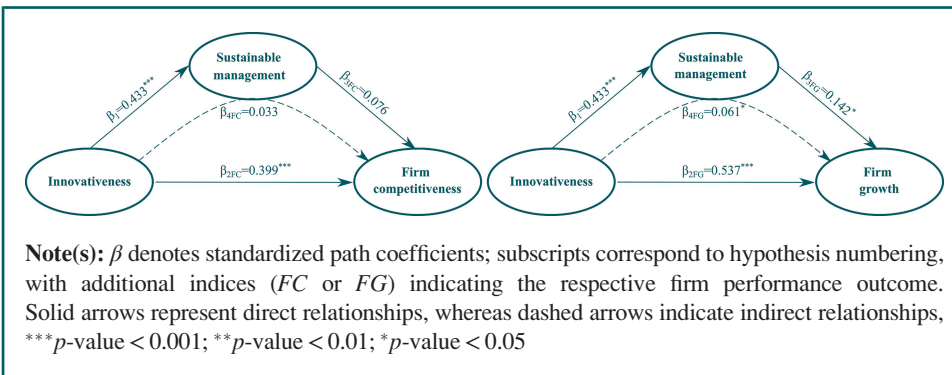


Table 3 Results of the structural model analysis and verification of research hypotheses

Bootstrapping								
Path	β	Sample mean	SD	t-statistics	p-values	Confidence interval bias-corrected		Remark
						2.50%	97.50%	
Direct effects								
IN $\rightarrow$ SUSM	0.433	0.443	0.07	6.153	0.000	0.259	0.547	H1 supported
IN $\rightarrow$ FC	0.399	0.408	0.068	5.844	0.000	0.254	0.522	H2 _{FC} supported
SUSM $\rightarrow$ FC	0.076	0.076	0.083	0.916	0.360	−0.085	0.238	H3 _{FC} not supported
IN $\rightarrow$ FG	0.537	0.540	0.052	10.235	0.000	0.425	0.631	H2 _{FG} supported
SUSM $\rightarrow$ FG	0.142	0.143	0.062	2.301	0.021	0.013	0.255	H3 _{FG} supported
Indirect effect								
IN $\rightarrow$ SUSM $\rightarrow$ FC	0.033	0.032	0.036	0.908	0.364	−0.039	0.104	H4 _{FC} not supported
IN $\rightarrow$ SUSM $\rightarrow$ FG	0.061	0.062	0.028	2.161	0.031	0.006	0.118	H4 _{FG} supported
Note(s): β = standardised path coefficient; CI = confidence interval; p -values are two-tailed. Significance was assessed using bias-corrected bootstrapping with 5,000 resamples. Hypotheses with the suffix FC or FG refer to firm competitiveness and firm growth models, respectively. Relationships are considered significant at $p < 0.05$								

supplemented with explanatory captions to improve interpretation, especially for readers less familiar with SEM. Both direct and indirect effects were analysed. Firm age and size (number of employees) were included as control variables, but neither showed significant effects nor altered the main structural relationships.

The results enabled the verification of the research hypotheses (Table 3). Innovativeness (IN) had a significant positive effect on sustainable management (SUSM) ($\beta_1 = 0.433$), supporting Hypothesis H1 and indicating that sustainable management is driven by innovative behaviour. Innovativeness also directly influenced firm performance. The relationships IN $\rightarrow$ FC ($\beta_{2FC} = 0.399$) and IN $\rightarrow$ FG ($\beta_{2FG} = 0.537$) were statistically significant ($p < 0.05$), confirming Hypotheses H2a and H2b. The role of SUSM varied depending on the performance dimension. It positively affected firm growth (FG) ($\beta_{3FG} = 0.142$; $p < 0.05$) but not firm competitiveness (FC) ($\beta_{3FC} = 0.076$; $p > 0.05$). Thus, Hypothesis H3b was supported, while H3a was not. This suggests that sustainable management contributes to growth but does not create competitive advantage.

Regarding mediation (H4), SUSM partially mediated the relationship between IN and FG ($\beta_{4FG} = 0.061$; $p < 0.05$), supporting H4b. However, no significant mediation was found for competitiveness ($\beta_{4FC} = 0.033$), so H4a was rejected. Model predictive power was assessed using R^2 and f^2 coefficients (Table 4).

Table 4 Endogenous construct assessment

Endogenous construct	Path	f^2	R^2
SUSM	IN → SUSM	0.226	0.184
FC	IN → FC	0.160	0.191
	SUSM → FC	0.006	
FG	IN → FG	0.375	0.374
	SUSM → FG	0.026	

Note(s): f^2 = effect size of the exogenous construct on the endogenous construct; R^2 = coefficient of determination indicating the variance explained in the endogenous construct

The values of the determination coefficient presented in Table 4 indicate that the IN variable explained more than 18% of the variance in the SUSM construct, which is acceptable in the context of social science research (Falk and Miller, 1992). The determination coefficient for FC was also moderate; IN and SUSM together explained slightly above 19% of the variance in FC. In the case of FG, the R^2 value was much higher, exceeding 37%, which can be considered a medium level of explained variance. After assessing the effect size, understood as the change in R^2 when a specific exogenous construct was omitted (Cohen, 1988), the interpretation of the f^2 coefficient values led to the following conclusions. For the IN→SUSM relationship, a medium effect size was obtained, as f^2 was greater than the 0.15 threshold but below 0.35. The effect size for the IN→FC relationship was also medium. Conversely, the f^2 value for the IN→FG relationship (0.375) indicated a large effect size, highlighting the significant role of IN in shaping FG. Based on the f^2 results obtained for the impact of SUSM on the considered types of performance, the effect size was small but significant in the case of FG ($f^2 > 0.02$), whereas no meaningful effect of SUSM was noted for FC ($f^2 < 0.02$). This means that SUSM could be omitted from Model 1, whereas it should be retained in Model 2, even though its effect size was relatively small.

Cultural differences in sustainability perceptions also represent a limitation, as attitudes may vary across regions, influencing implementation and outcomes. Future cross-cultural research could improve the applicability of results. The study also points to the need for robust yet flexible measurement tools. While the findings support the development of a general framework for sustainable management, such frameworks should account for contextual differences. Moreover, the knowledge-based operationalization of sustainable management may yield different results under alternative approaches, suggesting the need for more standardized scales.

Methodologically, the use of perceptual, self-reported data may introduce bias. Future studies could incorporate objective indicators or multi-source data. The cross-sectional design and use of a single informant also limit causal inference. Future research should adopt longitudinal approaches and extend analysis to other industries, incorporating factors such as organizational culture or digital maturity.

6. Discussion

This section discusses the findings in relation to prior literature, focusing on the role of sustainable management in shaping firm performance. The results extend research on innovativeness and performance (Alpay *et al.*, 2012; Hatak *et al.*, 2016; Yousaf *et al.*, 2021) by showing that, in small manufacturing firms, innovation effects emerge gradually through business model adjustments rather than immediately. This delayed impact aligns with studies indicating that business model innovation affects performance through complementary and substitutive interactions (Menter *et al.*, 2023). In SMEs, where resource constraints are common, innovation investments typically produce outcomes over time. The findings also highlight the importance of innovation strategy diversity. Firms may adopt simple approaches focused on a single type of innovation or more complex strategies combining multiple types (Tavassoli and

Karlsson, 2016). Prior research shows that complex strategies lead to higher productivity, particularly when supported by sufficient resources. This study suggests that such complexity increases the likelihood that innovativeness translates into firm growth, especially when supported by sustainable management practices that help structure innovation processes. This is particularly relevant in regulatory contexts where sustainability knowledge is increasingly required (COM No. 640, 2019).

The study confirms the positive relationship between innovativeness and sustainable management, consistent with previous research (Thuyen and Bich, 2024; Ozgit, 2022). Innovation capabilities provide the foundation for implementing sustainability practices. For instance, environmental design in furniture production can reduce resource use and waste (Iritani *et al.*, 2015), improving efficiency and lowering costs. This supports the observed positive effect of sustainable management on firm growth. Similar findings indicate that sustainable design enhances profitability and corporate image (Ševčíková and Knoškováthere, 2021), while evidence from Norway confirms financial benefits from environmentally friendly practices (Høgevoid, 2011). However, implementing sustainable innovation also involves challenges. A key issue is the gap between consumers' positive attitudes towards sustainability and their actual purchasing behaviour (Ševčíková and Knoškováthere, 2021), which limits the short-term market impact of sustainable products.

A central finding is that the impact of sustainable management on performance is not uniform. While it positively affects firm growth, it does not directly influence competitiveness. This suggests that treating performance as a single construct may obscure important differences. Sustainable practices – such as improving stakeholder relations or environmental performance – create long-term value and organizational stability, but their competitive effects are indirect and less visible in the short term, especially in low-tech sectors where advantages are often cost-based. This aligns with studies showing that environmental practices do not necessarily lead to immediate competitiveness gains (Alkhars *et al.*, 2024), although long-term benefits are possible. Other research highlights positive effects such as increased market share through eco-labelling (Iraldo *et al.*, 2020) or improved competitiveness in firms adopting sustainable design (Olkowicz and Grzegorzewska, 2014). Inconsistencies may also stem from traditional measurement approaches that overlook intangible benefits such as reputation and resilience (Nege and Abegaz, 2024; Oduro and Haylemariam, 2025). Finally, the study identifies a mediating role of sustainable management between innovativeness and firm growth. This suggests a sequential process in which innovation is stabilized and translated into growth through sustainability practices. Sustainable management thus acts as both an outcome and an enabling mechanism of innovation. Although not the primary driver of growth, it remains strategically important, particularly in contexts shaped by regulation and stakeholder expectations.

7. Conclusions

The present study examined the role of knowledge-based sustainable management in the relationship between innovation and firm performance. The findings show that the impact of sustainable management varies depending on the performance dimension. While it does not directly enhance firm competitiveness, it positively influences firm growth and partially mediates the relationship between innovativeness and growth. These results highlight the differentiated role of sustainability and its indirect contribution to transforming innovation into long-term development outcomes. Insights from traditional, low-tech sectors – often constrained by limited innovation capacity – are particularly valuable. In such contexts, sustainable management supports growth by improving resource efficiency, fostering innovation and creating long-term value. Sustainable practices help reduce costs, optimize processes and improve energy efficiency. Furthermore, integrating sustainability into business strategies enhances corporate reputation, strengthening customer trust and investor confidence, which ultimately contributes to revenue growth.

However, sustainable management does not directly increase competitiveness. Competitive advantage is typically based on unique, firm-specific resources such as innovation, cost leadership, or service quality. In contrast, sustainable practices are often standardized and widely adopted, limiting their differentiating potential. As a result, sustainability contributes more to long-term stability and development than to immediate competitive positioning. These findings have theoretical implications. They suggest extending frameworks such as the resource-based view (Barney, 1991) and stakeholder theory (Freeman, 1984) by incorporating sustainability as a core element of value creation. Sustainable management may not constitute a unique resource, but it enhances the effectiveness of other capabilities, particularly innovativeness. From a dynamic capabilities perspective (Teece *et al.*, 1997), it supports firms in adapting and reconfiguring resources in changing environments. The mediating role of sustainable management also extends Schumpeter's (1911) theory by integrating environmental and social dimensions into innovation-driven growth.

The results are consistent with SD theory (Brundtland, 1987a) and the Triple Bottom Line concept (Elkington, 1997), emphasizing the balance between economic, environmental and social goals. Innovation primarily drives economic performance, while sustainable management reinforces environmental and social dimensions, together supporting long-term business development. Similarly, the findings align with Stakeholder Theory (Freeman, 1984), showing that addressing stakeholder needs contributes to firm growth through responsible practices and efficient resource use. From a practical perspective, the study offers implications for policymakers and entrepreneurs. Policymakers should recognize that sustainable management enhances firm growth mainly by reinforcing innovation rather than acting as an independent source of competitiveness. Therefore, policies should support the integration of sustainability into innovation processes through incentives, subsidies and regulatory frameworks. Promoting transparency, education, and consumer awareness can further strengthen the effectiveness of sustainability initiatives.

For entrepreneurs, the findings highlight the importance of combining innovation and sustainability in business strategies. Innovation should be treated as the main driver of competitiveness, while sustainable management supports long-term growth and resilience. Managers are encouraged to invest in R&D, foster creativity, and implement environmentally responsible practices. These actions improve efficiency, strengthen corporate image and enhance stakeholder relationships. At the same time, firms should address the gap between positive consumer attitudes towards sustainability and actual purchasing behaviour by using effective communication and marketing strategies. Sustainable practices also contribute to operational efficiency and cost reduction. Measures such as reducing energy and material consumption, minimizing waste and adopting CE principles can improve profitability while supporting environmental goals. Compliance with environmental regulations reduces legal and financial risks, making sustainability a strategic necessity. Firms should therefore develop tailored sustainability and CE strategies aligned with policy frameworks such as COM no. 640 (2019), COM no. 98 (2020) and Directive (EU) 2022 / 2464.

Examples from the Polish furniture sector illustrate these practices. Companies such as Melaco Ltd., Ergo Store and VOX implement sustainability through certified materials, recycling systems, eco-design, renewable energy and digital production management. They also invest in supplier audits, education, and collaboration with research institutions, demonstrating how sustainability can be integrated into core business activities (Melaco, 2025; Ergo Store, 2024; Śliwińska-Wachowiak, 2025; Inwentry, 2025). Despite these benefits, sustainable management alone does not guarantee competitive advantage. Firms must combine it with other strategic factors such as innovation, pricing, and marketing. Thus, SMEs should view sustainability as an investment in long-term resilience, reputation and growth. Public policies and educational initiatives can further support this integration by facilitating knowledge transfer and skill development.

In conclusion, innovation and sustainable management play complementary roles in shaping firm performance. Innovation drives competitiveness, while sustainable management supports

growth and mediates the impact of innovation. Their integration is essential for achieving long-term success in a dynamic business environment.

7.1 Limitations and directions for future research

The findings of this study are subject to several limitations related to the sample and methodology. Firstly, the research focuses on a single industry and country, which may limit the generalizability of the results. The specific characteristics of the Polish furniture sector should therefore be considered when interpreting the findings. Differences across countries and industries – such as cultural norms, regulatory frameworks, resource availability or technological advancement – may significantly affect the implementation of sustainable management. This highlights the need for future studies to replicate the research in different contexts to identify both general patterns and context-specific dynamics. Although random sampling was applied, the data set includes only participating firms, so non-response bias cannot be excluded. In addition, the relatively small sample size may limit statistical power and reduce the precision of estimates.

Cultural differences in sustainability perceptions also represent an important limitation. Attitudes towards sustainable practices may vary across regions, influencing both implementation and outcomes. Future cross-cultural studies could provide deeper insights and improve the applicability of results. The study also underscores the need for measurement tools that are both robust and adaptable. While the findings support the development of a general framework for sustainable management, such frameworks should remain flexible enough to account for contextual differences. Moreover, the operationalization of sustainable management in this study is based on knowledge-driven practices; alternative approaches may lead to different results, indicating the need for more standardized measurement scales. Methodologically, the use of perceptual, self-reported data may introduce biases, including social desirability effects. Future research could address this by incorporating objective indicators or multi-source data. The use of a single informant per firm and a cross-sectional design also limits causal inference and raises the possibility of common method variance.

Future research should therefore adopt longitudinal designs to better capture causal relationships and dynamic changes over time. Expanding analyses to other industries – especially those with high environmental impact – and including contextual factors such as organizational culture, digital maturity or ownership structure would contribute to more comprehensive models of sustainable management and firm performance.

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