

# Innovation, green management and SME performance: evidence from Latin American manufacturing firms

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## Abstract

**Purpose** – This study explores the mediating role of innovation output in the relationship between green management and the performance of small and medium-sized enterprises (SMEs).

**Design/methodology/approach** – This research is based on a dataset collected by the Ibero-American SME Observatory, comprising 3,966 manufacturing SMEs in Latin America. Data were gathered between February and May 2022 and analyzed using partial least squares structural equation modeling.

**Findings** – Innovation output, as a strategic resource or capability, mediates the relationship between green management and SME performance, which implies that the impact of green management on SME performance is bolstered by innovation output.

**Originality/value** – Grounded in the resource-based view, this study contributes to the field of innovation by identifying innovation output as a mechanism that strengthens the relationship between green management and SME performance. The findings are therefore relevant for manufacturing SMEs seeking to address environmental challenges and ensure market survival through innovation, as well as for policymakers.

**Keywords** Innovation output, Green management, SME performance, Manufacturing companies

**Paper type** Research article

## 1. Introduction

Firms are increasingly adopting proactive environmental management as a business strategy to stand out in the market, boost revenue and reduce costs (Ong *et al.*, 2019) while operating in a context that entails environmental challenges such as the water crisis, pollution and loss of biodiversity in physical, chemical and biological terms (OECD, 2024). An understanding of how firms can contribute to the economy and society while safeguarding natural resources and ensuring the well-being of local communities is an ongoing challenge (Shu *et al.*, 2020).

Green management involves practices that protect, preserve and restore the environment in key areas such as energy, water, waste and supply chains (Shu *et al.*, 2016; Ambec and Lanoie, 2008). At the same time, it has been classified as a driver of economic performance by reducing operational costs and enhancing product quality and diversity, thereby improving overall performance (Lin *et al.*, 2013). Nevertheless, how the adoption of green management practices impacts firm performance is still subject to debate. Some authors argue that green management is a dynamic capability (Rodrigo-Alarcón *et al.*, 2018), and the effects on firm performance vary depending on the company's age. In young firms ( $\leq 4$  years), the effects are immediate, while in later stages (5–10 years), the results diminish as firms mature (Neumann, 2021). Other authors claim that the impact of green management on financial performance

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is less significant due to the high investments that environmental practices entail (Shu *et al.*, 2020).

On the other hand, innovation is viewed as a key driver for achieving unique, sustainable and inimitable competitive advantages (Leiva and Brenes-Sanchez, 2018) that are crucial for business survival (Barney, 1991, 2001; Falahat *et al.*, 2020). Innovation can also be seen as a driver of performance, enabling firms to dynamically manage resources in challenging environments (Meroño-Cerdán *et al.*, 2018).

However, no consensus has yet been reached in the literature regarding the relationship between innovation and firm performance. Gök and Peker (2017) contend that innovation alone does not guarantee financial success; rather, it must be complemented by strong market performance to yield tangible benefits. Furthermore, the financial returns from innovation are often delayed. In the early stages, costs may outweigh benefits but positive financial outcomes may appear over time (Hai *et al.*, 2022). This relationship is likewise debated, as innovation can lead to higher costs or uncertain returns if not supported by robust market capabilities (Gök and Peker, 2017).

Some authors, drawing on dynamic capabilities theory (Teece *et al.*, 1997), have proposed that innovation is a key mechanism for firms to adapt to and shape the environment where they operate (Zhou *et al.*, 2019). From this perspective, innovation can mediate the link between dynamic capabilities and firm performance (Zhou *et al.*, 2019).

Despite the growing body of research on green practices and innovation through the lens of dynamic capabilities theory (Teece *et al.*, 1997), empirical evidence remains limited regarding the specific causal pathways through which green management improves firm performance, particularly because few studies have thoroughly examined the mediating role of innovation, especially within resource-constrained environments (Gök and Peker, 2017; Zhou *et al.*, 2019).

Moreover, the limited existing literature is heavily concentrated in European and Asian contexts, leaving other regions underexplored despite their significant contribution to both employment and environmental impact (Sabando-Vera *et al.*, 2025). This study addresses this gap by theoretically arguing and empirically examining how green management influences firm performance through innovation output among manufacturing small and medium-sized enterprises (SMEs) in Latin America.

Theoretically, this study builds on Zairbani and Kumar (2025) by confirming the mediating role of innovation in the relationship between green management and sustainable performance, but in the previously underexplored context of Latin American SMEs. From a practical standpoint, it provides region-specific insights to help managers and policymakers design effective strategies to leverage green practices as drivers of both innovation and competitive advantage.

Considering the foregoing, this study seeks to answer the following questions:

Does green management have a positive impact on SME performance? Does innovation output mediate the relationship between green management and SME performance?

In summary, the aim of this study is to explore the existing relationship between green management, innovation output and the performance of manufacturing SMEs using a sample of Latin American firms.

The study draws on a dataset collected by the Ibero-American SME Observatory (ISO), an academic alliance led by the Foundation for the Strategic Analysis and Development of SMEs (FAEDPYME) and which comprises 153 universities across 22 countries (see <http://faedpyme.upct.es/>). This non-profit network generates scientific knowledge on SME strategies, expectations and dynamics in the region (García *et al.*, 2022). In total, the dataset contains 3,966 observations. However, after removing missing values, the final sample contains information of 3,733 firms.

This research theoretically argues and empirically confirms that green management has a significant positive effect on the performance of manufacturing SMEs in Latin America, thus informing the ongoing discussion in the literature on this topic. It also makes an

important contribution by identifying innovation as a mechanism whereby green management generates greater SME performance, confirming that this effect is significant, albeit of low intensity.

The remainder of the paper is structured as follows: [Section 2](#) presents the literature review and hypotheses, [Section 3](#) describes the methodology used in the empirical analysis, [Section 4](#) presents an assessment of the findings and [Section 5](#) outlines the main conclusions and offers suggestions for future research.

## 2. Literature review

The role of competitive edge in the success of SMEs has been widely studied in the literature, with the resource-based view (RBV) suggesting that a firm can develop competitive advantages by possessing unique resources that are difficult to imitate ([Barney, 1991, 2001](#)). These advantages might include cost reduction ([Ambec and Lanoie, 2008; Kerin et al., 1992](#)), innovative products that improve market positioning ([Kerin et al., 1992](#)) and greater differentiation from competitors, all expected to lead to improvements in financial performance ([Bigliardi, 2013](#)).

Green management, within dynamic capabilities theory ([Teece et al., 1997](#)), allows companies to integrate, build and reconfigure internal and external competences to address rapidly changing environments. It encompasses strategies to minimize environmental impact and promote sustainability through practices such as green production, research and eco-friendly product development ([Peng and Lin, 2008](#)). Nevertheless, the impact of such strategies on firm performance remains debated.

Whether and how dynamic capabilities generate the competitive advantage and enhance performance is a central topic of academic discussion. While some scholars posit a direct effect ([Teece et al., 1997](#)), others argue that they do not necessarily lead to better outcomes ([Eisenhardt and Martin, 2000](#)). Thus, the mechanisms through which dynamic capability influences performance remain unclear ([Zhou et al., 2019](#)).

Green management can be considered a predictor of performance, with certain studies particularly examining its effect on environmental performance ([Rehman et al., 2021](#)), technological innovation ([Ren et al., 2022](#)) and financial performance ([Hart and Ahuja, 1996](#)). However, in their own study, [Shu et al. \(2020\)](#) found that while green management does indeed influence financial performance, its impact on innovation output is even greater. This is because green management requires considerable investments in equipment upgrades and other expenses, placing a substantial financial burden on firms.

Regarding innovation, some scholars argue that it is critical for firms, as it requires the constant and dynamic deployment and integration of resources and capabilities to create competitive advantage ([Liao et al., 2009](#)). Hence, innovation can serve as a mediating mechanism between dynamic capabilities (in this case, green management) and firm performance ([Zhou et al., 2019](#)).

Several studies have focused on the relationship between innovation output and SME performance, albeit without considering green management ([Hai et al., 2022; Le et al., 2023; Silwal, 2022](#)). Other authors have investigated the relationship between green management and innovation output ([Rojas-Cabezas et al., 2024a, b; Zhou et al., 2023](#)), demonstrating that the demand for green products among customers, society and regulatory bodies ([Jabbour et al., 2019](#)) can stimulate innovation and boost competitive advantage by driving the creation of products to satisfy those demands ([Ambec and Lanoie, 2008](#)).

Although research on innovation and green management has grown, no theoretical consensus exists regarding their effects on SME performance. Considering the foregoing, this article seeks to analyze the effect of green management on the performance of manufacturing SMEs and determine whether innovation output mediates this relationship.

### 2.1 Green management practices and firm performance

Environmental performance, defined as the reduction of emissions, waste management and and related activities, significantly predicts the development of innovative products and processes (Ong *et al.*, 2019), while innovative eco-products have been shown to boost a company's market position, profits and reputation (Lin *et al.*, 2013).

By incorporating green values and a green corporate culture, businesses can raise awareness of the importance of creating environmentally-friendly strategies (Wang *et al.*, 2024) and these green activities can enhance an organization's market competitiveness while contributing to the sustainable development of society at large (Lafuente and Vaillant, 2023; Wang *et al.*, 2024). An example of this is how an organization can stand out in the market at a low cost by introducing green innovations to its products and processes, both of which impact business performance (Liao, 2016).

While the issues of environmental protection, natural resources and climate change represent new challenges for achieving sustainability, firms can also experience economic benefits when integrating eco-friendly practices (Lin *et al.*, 2013), such as access to new markets, since environmental sustainability generates resources and capabilities for green exports (Chishty and Sayari, 2024); standout products; the sale of emission and pollution management technologies; and reduced costs in terms of materials, energy and services, among others (Ambec and Lanoie, 2008). For example, companies that offer product-related services (servitization) gain a competitive edge when they integrate eco-strategies (Lafuente and Vaillant, 2023); firms that develop green innovations significantly improve their financial performance (Liu *et al.*, 2024); and those that incorporate eco-friendly technological practices into their products and services benefit from enhanced efficiency, profitability and competitiveness (Wang *et al.*, 2023; Valdivieso-Uvidia *et al.*, 2025).

However, the positive effects are not always immediate. Performance indicators such as return on assets, return on sales and return on equity may take up to two years to surface after adopting green practices (Hart and Ahuja, 1996) due to factors including contract renegotiations, restructuring of internal processes and the time required to establish a reputation as a green company. In addition, the costs associated with implementing green management may not be immediately offset due to the need to invest repeatedly in technology upgrades (Shu *et al.*, 2016).

Similarly, while the development of green products and processes has a significant positive impact on business performance, this effect diminishes as environmental efforts intensify, in the form of an inverted U-shaped relationship (Neumann, 2021).

Baah *et al.* (2021) found that green production practices have a significantly positive relationship with environmental performance and corporate reputation. Nonetheless, they also have a significant negative effect on financial performance, probably because of the costs associated with implementing these practices.

Notwithstanding the foregoing, green innovation management has been demonstrated to be a potentially effective strategy for boosting customer loyalty, retaining clients, increasing sales and expanding market share (Meng *et al.*, 2016) and being more attractive to investors and public finance institutions (Neumann, 2021). Additionally, studies indicate that green innovations are positively and significantly linked to both a firm's financial (Castillo-Esparza *et al.*, 2024) and environmental performance (Salvadó *et al.*, 2012), and that such innovations inherently integrate green management processes (Salvadó *et al.*, 2012). Based on this reasoning, the following hypothesis is proposed:

*H1.* Green management practices are positively correlated with the performance of manufacturing SMEs.

### 2.2 Green management practices and innovation output

The adoption of green practices has proven to be a key driver of innovation output, especially in SMEs. According to Sabando-Vera *et al.* (2025), eco-innovation not only enhances the

environmental image of SMEs but also fosters the development of new products, processes and business models that provide competitive advantages in dynamic environments. By aligning with environmental and sustainability demands, this approach enables firms to respond to external pressures and seize new market opportunities (Çelik *et al.*, 2024).

Moreover, some firms adopt green innovation practices in response to regulatory and institutional pressures, which stimulate the development of innovation-oriented organizational capabilities. Çelik *et al.* (2024) note that pressures stemming from international sustainability commitments and growing social expectations compel SMEs to revise and adapt their internal processes. In doing so, they act as catalysts for the development of dynamic capabilities, such as identifying green technological opportunities, reconfiguring internal resources and adopting innovations to mitigate environmental impact (Çelik *et al.*, 2024; Singh *et al.*, 2021).

Stakeholder pressure further drives SMEs to adopt green dynamic capabilities, which, in turn, promote environmental innovation, itself acting as a mediator of improved organizational performance (Singh *et al.*, 2021). Green dynamic capabilities facilitate the development of green innovations that are directly linked to stronger financial and competitive performance. In brief, a clear path exists from strategic environmental management to innovation, and from there to enhanced firm performance (Zairbani and Kumar, 2025; Appiah *et al.*, 2025; Çelik *et al.*, 2024).

Appiah *et al.* (2025) reinforce this link by finding that green process innovations, when supported by resource integration and co-creation with customers, significantly improve the financial performance of SMEs in developing countries. Specifically, they observe that green process innovation emerges as a critical driver of financial outcomes when firms align their capabilities with both green strategies and customer orientation. This supports the notion that well-designed green management fosters not only innovation but also tangible competitiveness gains (Singh *et al.*, 2021; Zairbani and Kumar, 2025; Sabando-Vera *et al.*, 2025).

Finally, Zairbani and Kumar (2025) show that sharing green knowledge within organizations builds a culture of green innovation that has a direct and significant impact on sustainable business performance. They conclude that green innovation mediates the relationship between environmental knowledge sharing and organizational outcomes, suggesting that an internal green culture encourages continuous learning and innovation. Thus, by fostering knowledge flows and ecological culture, green management consistently stimulates innovation as a pathway toward sustainable advantage (Sahoo *et al.*, 2023).

Based on the foregoing, the following hypothesis is proposed:

- H2. Green management practices are positively correlated with the innovation output of manufacturing SMEs.

### 2.3 Innovation output and firm performance

Innovation output directly drives firm performance by strengthening the capacity to generate differentiated products and adapt to changing environments. When innovation capabilities are translated into effective products, processes and strategies, they significantly impact financial, market and innovation performance in service-sector firms (Rajapathirana and Hui, 2018). Likewise, product and process innovation capabilities, when boosted by collaboration networks, contribute substantially to new product performance, highlighting how innovation translates into tangible competitive advantage (Najafi-Tavani *et al.*, 2018). Ferreira *et al.* (2024) confirmed that innovation positively mediates the relationship between digital capabilities and business performance, revealing a structural effect whereby innovation acts as a channel for improving competitiveness.

Especially in sustainable or ecological contexts, innovation in turn has a positive effect on financial performance. Xie *et al.* (2022) found that green process innovation has a U-shaped impact on financial outcomes. Benefits may be slow to appear, but once a maturity threshold is

reached, they become strongly positive. Environmental innovation, especially when complemented by organizational change, generates synergies that can enhance financial performance by reducing costs (Vasileiou *et al.*, 2022). Similarly, a review of 100 studies by Hermundsdottir and Aspelund (2021) concludes that most research supports a positive association between sustainable innovation and corporate competitiveness, albeit moderated by contextual factors.

From a strategic perspective, innovation also serves as a response mechanism to external pressures, generating private business benefits. Building on the Porter hypothesis, Ramanathan *et al.* (2017) argue that firms adopting innovation as a proactive response to environmental regulations improve both economic and sustainability performance. This is because innovation transforms regulations into a competitive opportunities. In a similar vein, service innovation in digital environments enables firms to adapt to volatility and improve performance through dynamic capabilities such as organizational resilience (Garrido-Moreno *et al.*, 2024).

Finally, firms that adopt environmental innovations achieve gains in both environmental and financial performance, reinforcing the notion that responding to external pressures through innovation can lead to a sustainable competitive advantage (Xie *et al.*, 2022; Ramanathan *et al.*, 2017; Andersén, 2021).

Based on the foregoing, the following hypothesis is proposed:

*H3.* Innovation output is positively correlated with the performance of manufacturing SMEs.

#### *2.4 Green management and SME performance: the mediating effect of innovation*

The incorporation of stakeholder needs and demands into business strategy is the key to a company's success (Freeman, 1984). This can be achieved through innovation, namely the ability to introduce new products, services, or ideas to an organization or to make improvements to an existing product, service, or process (OECD, 2018). Innovation is not limited to the creation of new products and services; it further includes the continuous improvement of existing ones to satisfy changing consumer needs (Cohen and Levinthal, 1990).

One example is the demand for green products not only among customers but also from society and regulatory bodies (Jabbour *et al.*, 2019). The need to cater to these market demands can drive innovation and enhance competitive edge (Ambec and Lanoie, 2008). At the same time, eco-aware consumers often spread information about certain companies' products, pressuring them to respond with more eco-friendly options, either through radical innovation or by modifying their existing range (Shu *et al.*, 2016). In other words, as companies address customer needs and expectations through innovation, they can likewise improve their operations, reduce their carbon footprint and boost their competitiveness (Lafuente and Vaillant, 2023).

Environmental innovation has been studied as a mediator between environmental and financial performance, with the former being defined as a reduction in environmental accidents, less use of hazardous materials, waste management and lower emissions (Shuwaikh *et al.*, 2023; Ong *et al.*, 2019). However, firms may not immediately feel the benefits of innovation. When launching a new product or service, they may incur major investment costs because of the efforts to gain legitimacy and to quickly position such a product or service in the market, due to the U-shaped relationship identified between innovation and financial performance (Hai *et al.*, 2022). Indeed, a study of 2,500 SMEs in Vietnam found a positive association between innovation in existing products and business performance, while the effect was not statistically significant when introducing entirely new products to the market (Le *et al.*, 2023).

Additionally, [Al-Tuwaijri et al. \(2004\)](#) provide evidence that companies engaged in environmental programs achieve better economic performance, although an inverted U-shaped relationship exists, whereby overinvestment in green innovations can lead to lower financial profits ([Neumann, 2021](#)).

On the other hand, green investments can signal that a firm is enthusiastically embracing social responsibility, which can boost its external reputation and lead to improved financial results ([Tang et al., 2018](#)). For example, in Malaysia, environmentally proactive manufacturing companies were able to gain a competitive edge and positively impact their finances while, at the same time, achieving their environmental targets through green innovations ([Ong et al., 2019](#)). These authors view eco-efficiency as the driver that connects environmental strategies to business performance, as it promotes the best possible use of resources to maintain strong environmental performance.

[Bag et al. \(2022\)](#) suggest that institutional pressures (coercive, normative and mimetic) stimulate the adoption of eco-innovation practices, which, in turn, strengthen green supply chain management and circular economy capabilities, leading to better organizational performance in manufacturing SMEs. [Lin et al. \(2013\)](#) add that green innovation driven by market demand directly enhances firm performance. Similarly, [Xie et al. \(2022\)](#) note that green process innovation, when aligned with green social capital and customers' tacit needs, simultaneously boosts environmental and financial outcomes.

The link between green management and firm performance is reinforced by the mediating role of innovation output. For example, [Andersén \(2021\)](#) finds that green product innovation enables manufacturing SMEs to achieve differentiation advantages that strengthen competitiveness. More specifically, [Sahoo et al. \(2023\)](#) argue that the acquisition and assimilation of green knowledge are essential for developing technological innovation capabilities, thereby improving operational efficiency and enhancing firms' responses to environmental pressures.

[Ferreira et al. \(2024\)](#) demonstrated that innovation serves as the channel through which many sustainability-oriented digital capabilities are translated into stronger organizational performance. This mediating role is confirmed by [Meroño-Cerdán et al. \(2018\)](#), who found that innovation has a significantly stronger effect on the performance of family firms, thus supporting its strategic role as a bridge between practices and outcomes. Therefore, innovation not only amplifies the effects of green management but also strategically implements them.

Sustainable innovation improves business competitiveness although its effectiveness depends on the institutional context and strategic orientation ([Hermundsdottir and Aspelund, 2021](#)).

In addition, active market demand for green products drives green innovation and consequently better firm performance ([Lin et al., 2013](#)). Taken together, these findings support the hypothesis that green management influences SME performance and that this relationship is significantly mediated by the level of innovation output achieved.

Based on the foregoing arguments, the following hypothesis is proposed:

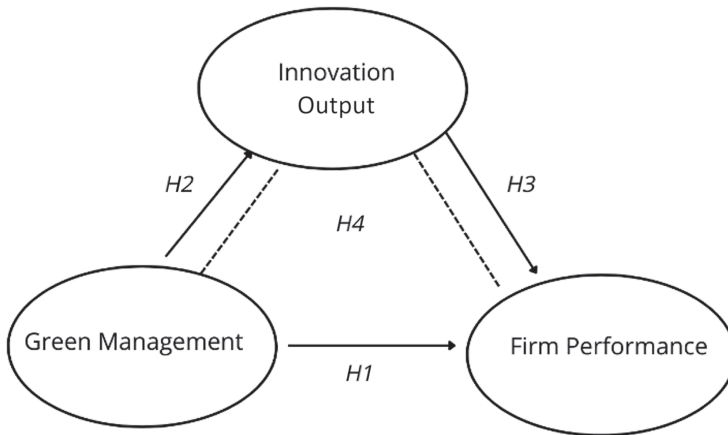
*H4.* Innovation positively mediates the relationship between green management and the performance of manufacturing SMEs.

[Figure 1](#) presents the proposed theoretical model and hypotheses.

### 3. Method

#### 3.1 Sample and data

This study is based on data collected in 2022 by the ISO, a private, non-profit organization formed by 153 Ibero-American universities from 22 countries, which aims to provide up-to-date information on the strategies and expectations of Ibero-American SMEs that can be used to facilitate and support decision-making, contribute scientifically and offer useful solutions across different activity sectors to foster competitiveness ([García et al., 2022](#)). It is important



**Figure 1.** Proposed model and hypotheses. **Source(s):** Authors' own elaboration

to note that the researchers responsible for this study are members of this organization and participated in data collection.

Information was gathered from SMEs using stratified sampling based on the criteria of sector, size and country (García *et al.*, 2022). Simple random sampling was applied within each stratum. Population sizes for each stratum were obtained from official statistical sources in each participating country. Data collection targeted at SME executives and was conducted via an online platform, with telephone follow-up. Additionally, research teams in each country entered and coded data in a shared platform to ensure consistency. The overall sampling error was 1.1% at a confidence level of 95% (García *et al.*, 2022).

A total of 16,454 executives completed the questionnaire. However, this article focuses on data from SMEs in the manufacturing sector, for which 3,966 observations were recorded. After removing missing values, the final sample consisted of 3,733 observations.

It was noted that 60% of the sampled executives were men, while 40% were women, and 61.9% had university degrees. Regarding firm size, 46.9% were micro-enterprises, 29.5% were small enterprises and 15.5% were medium-sized enterprises. The geographical distribution of the sample was as follows: Mexico (20.3%), Central America (12.8%), South America (65.9%) and the Caribbean (0.9%).

### 3.2 Variables

**3.2.1 Endogenous latent variables.** Firm performance is the primary latent variable. Items were derived from the ISO questionnaire, where respondents evaluated their company's position relative to its competitors based on the following criteria: efficiency of production processes, sales growth rate and profitability. This construct was measured using a five-point Likert scale ranging from 1 = poorest performance compared to competitors to 5 = best performance compared to competitors.

Furthermore, four items were taken from the ISO questionnaire that are based on the Oslo Manual (OECD/Eurostat, 2018) to measure different changes and improvements to products and processes. These items were used as a mediating endogenous variable called innovation output. Respondents were asked about the following: (1) changes or improvements to existing products/services, (2) launch of new products/services, (3) changes or improvements to production processes and (4) acquisition of new equipment. This construct was measured using a five-point Likert scale ranging from 1 = not important to 5 = very important.

3.2.2 *Exogenous latent variable.* The ISO-developed scale that conceptualizes green management in a similar manner to this study was used, based on the literature review (Ambec and Lanoie, 2008; Shu *et al.*, 2020). Respondents assessed the following statements in terms of their relevance to their own companies' use of environmental criteria: (1) environmental criteria in supplier selection, (2) environmental criteria in plastic and packaging management, (3) environmental criteria in process design, (4) environmental criteria in energy management, (5) environmental criteria in water management, (6) environmental criteria in waste management and (7) environmental certifications. This construct was measured on a six-point Likert scale ranging from 0 = not used and 1 = used but not important, to 5 = used and very important.

The scale from the ISO questionnaire has been employed in previous research, including studies by Rojas-Cabezas *et al.* (2024a, b) and Begnini *et al.* (2024).

3.2.3 *Control variables.* To reduce bias and enhance the model's internal validity, firm size and firm age were included as control variables (Pérez-Orozco *et al.*, 2024). Larger firms tend to have more robust marketing capabilities, greater bargaining power and more resources to develop a competitive edge through innovation (Gopalakrishnan and Bierly, 2006). Research has also shown that the effects of green management on performance vary depending on firm age (Neumann, 2021). Firm size was measured using the natural logarithm of total employees (Harymawan, 2018), while firm age was measured using the natural logarithm of the number of years since the company was founded (Vithessonthi and Tongurai, 2015; Ezzi and Jarboui, 2016).

### 3.3 Method

To test the hypotheses of the theoretical model used in this study, structural equation modeling based on partial least squares structural equation modeling (PLS-SEM) (Hair *et al.*, 2018) was used. This methodology is more flexible as it does not require assumptions about data distribution and employs a predictive causal model that focuses on prediction when estimating statistical models (Hair *et al.*, 2018). It is well-suited for studies of social science phenomena, exploratory studies, secondary data analysis and archival research, among others (Hair *et al.*, 2018). As an additional justification for using PLS-SEM, the Shapiro–Wilk test was applied to the construct indicators (González-Estrada and Cosmes, 2019), due to the presence of multivariate normality violations in the model data. To test the hypotheses, the bootstrapping method was used with 5,000 subsamples, involving the replacement of missing values with the mean and the application of a two-tailed test.

The software used for the analysis was Smart PLS4. The unidimensionality and reliability of the data were analyzed by means of composite reliability (CR) and average variance extracted (AVE) indices. For all measures, both indices exceeded the cut-off values of 0.7 for CR (Dijkstra and Henseler, 2015) and 0.5 for AVE (Hair *et al.*, 2018). Convergent validity measures the extent to which a construct converges to explain the variance of its items. As illustrated in Table 1, all values fall within the recommended threshold, indicating internal consistency reliability and convergent validity (Hair *et al.*, 2014).

To assess discriminant validity—the degree to which constructs differ from one another—the criterion proposed by Fornell and Larcker (1981) was used, stating that the square root of the AVE of each construct (diagonal elements in the matrix) must be greater than the absolute value of the correlations between constructs (off-diagonal elements), as shown in Table 2. All constructs met this criterion, suggesting that the indicators share more variance with their respective constructs than with others. The Heterotrait-Monotrait (HTMT) ratio of correlations index was also used to assess discriminant validity (Henseler *et al.*, 2009). An HTMT value above 0.85 indicates a discriminant validity issue. As presented in Table 3, all construct HTMT values are below this threshold. Therefore, these results suggest that discriminant validity is not a concern in this study.

**Table 1.** Reliability and validity indices of scales

Construct	Items	Loadings	Cronbach's alpha	CR	AVE
Innovation output	Changes or improvements to existing products/services	0.84	0.848	0.852	0.687
	Launch of new products/services	0.825			
	Changes or improvements to production processes	0.873			
Firm performance	Acquisition of new equipment	0.775	0.78	0.781	0.695
	Efficiency of production processes	0.777			
	Sales growth rate	0.857			
Green management	Profitability	0.865	0.918	0.922	0.675
	Environmental criteria in supplier selection	0.792			
	Environmental criteria in plastic packaging management	0.823			
	Environmental criteria in process design	0.881			
	Environmental criteria in energy management	0.867			
	Environmental criteria in water management	0.863			
	Environmental criteria in waste management	0.837			
Environmental certifications (e.g. ISO 14001/EMAS)	0.668				

**Source(s):** Authors' own elaboration

**Table 2.** Discriminant validity (Fornell-Larcker criterion)

	Age	Innovation output	SME performance	Green management
Innovation output	-0.020	0.829		
Firm performance	-0.001	0.349	0.834	
Green management	0.043	0.407	0.250	0.822

**Source(s):** Authors' own elaboration

**Table 3.** Discriminant validity (Heterotrait-Monotrait ratio (HTMT))

	Age	Innovation output	SME performance	Green management
Innovation output	0.026			
Firm performance	0.012	0.430		
Green management	0.046	0.459	0.299	

**Source(s):** Authors' own elaboration

#### 4. Results

As part of the reliability analysis of the measurement model, Harman's single-factor test was conducted, whereby the variables were included in an exploratory factor analysis, and the "non-rotated factorial solution" was examined to determine whether variance in the data could be attributed to a single factor. The result of the variance obtained from Harman's test was

0.329, below 0.5, indicating that common method bias (CMB) had no significant impact (Kock, 2015). A test was also performed to rule out the presence of common method variance-bias, which arises when measurements originate from a single source, potentially distorting results by inflating or diminishing the relationships between variables (Podsakoff et al., 2023). As displayed in Table 1, all of the model’s reliability indices are within the recommended threshold, indicating internal consistency and convergent validity (Hair et al., 2014).

For the structural model, the variance inflation factor (VIF) was analyzed to identify multicollinearity issues. As illustrated in Table 4, multicollinearity is not an issue among the exogenous constructs, as all VIF values were below 5. Therefore, multicollinearity is not a threat in this study and hence, CMB is not a concern either.

Regarding the proposed hypotheses, and as shown in Table 4, green management is positively and significantly correlated with firm performance ( $\beta = 0.119$ ;  $t = 6.424$ ;  $p < 0.000$ ), supporting Hypothesis 1; green management is positively and significantly correlated with innovation output ( $\beta = 0.407$ ;  $t = 25.821$ ;  $p < 0.000$ ), supporting Hypothesis 2; innovation output is positively and significantly correlated with firm performance ( $\beta = 0.287$ ;  $t = 14.903$ ;  $p < 0.000$ ), supporting Hypothesis 3. As for Hypothesis 4, the bootstrapping procedure was conducted to test the mediating effect of innovation output, as this is the most recommended approach for testing mediation in PLS-SEM (Hair et al., 2014). The indirect relationships for hypothesis testing are reported in Table 5. The results confirm that innovation output positively and significantly mediates the relationship between green management and firm performance ( $\beta = 0.117$ ;  $t = 13.130$ ;  $p < 0.000$ ), thus confirming Hypothesis 4. As for the control variables, the results indicate that age does affect performance, with older firms exhibiting lower performance. Firm size has a positive effect on performance, as larger firms tend to perform better. The values obtained for both firm age and firm size were significant.

Based on the R-squared results, the research model explains 14.3% of the variance in firm performance and 16.5% of the variance in innovation output. As for the model’s predictive relevance, the general rule of  $Q^2 > 0$  is met for all values (Hair et al., 2014).

**Table 4.** Structural relationships and hypothesis testing

Paths	Coefficients ( $\beta$ )	Standard deviation (SD)	t-value	VIF	R-square	Decision
A $\rightarrow$ FP	-0.034	0.016	2.166*	1.142		
S $\rightarrow$ FP	0.098	0.015	6.554**	1.176		
GM $\rightarrow$ FP	0.119	0.018	6.424**	1.218	0.143	H1: Supported
GM $\rightarrow$ IO	0.407	0.016	25.821**	1.000	0.165	H2: Supported
IO $\rightarrow$ FP	0.287	0.019	14.913**	1.210		H3: Supported

**Note(s):** GM: green management; IO: innovation output; FP: firm performance; A: age; S: size, VIF < 5; \* $p < 0.005$ ; \*\* $p < 0.001$

**Source(s):** Authors’ own elaboration

**Table 5.** Mediation effect testing

Paths	Coefficients ( $\beta$ )	Std. error	t-value	Decision
GM $\rightarrow$ IO $\rightarrow$ FP	0.117	0.009	13.130**	H4: Supported

**Note(s):** GM: green management; IO: innovation output; FP: firm performance, \* $p < 0.005$ ; \*\* $p < 0.001$

**Source(s):** Authors’ own elaboration

## 5. Discussion

This study aimed to explore the existing relationship between green management, innovation output and the performance of manufacturing SMEs to respond to two questions: (1) Does green management have a positive impact on SME performance? and (2) Does innovation output mediate the relationship between green management and SME performance?

The findings reveal positive and significant relationships between green management and firm performance, between green management and innovation output and between innovation output and firm performance. Moreover, the mediating role of innovation output in the relationship between green management and firm performance is confirmed, validating innovation's strategic function as a channel that transforms environmental efforts into competitive advantages (Ferreira *et al.*, 2024; Sahoo *et al.*, 2023; Andersén, 2021).

This study was conducted in the Latin American context, where research on green management remains limited (Sabando-Vera *et al.*, 2025) despite its importance for sustainability, natural resource availability and organizational resilience. Previous studies have indicated that the relationship between green management, innovation and performance can be influenced by perceived costs and institutional contexts, potentially limiting the benefits of green practices (Shu *et al.*, 2016, 2020). It has also been argued that green innovation does not guarantee improved performance in all cases, since its effectiveness may depend on the degree of environmental turbulence (Zhou *et al.*, 2019).

These results suggest that manufacturing SMEs that integrate environmental criteria in supplier selection, properly manage plastic use, redesign processes with an environmental focus, optimize water and energy consumption and reduce waste achieve improvements in efficiency, productivity, profitability and sales growth. This confirms a positive and significant relationship between green management and firm performance (supporting Hypothesis 1).

This relationship can be explained by the positive effects on profit margins and productivity derived from the efficient use of materials, energy and natural resources. The implementation of clean energy helps reduce waste and directly enhances productivity (Zhou *et al.*, 2019). Similarly, adequate waste and emissions management boosts a company's corporate image, thus attracting more customers (Liao, 2016).

As Sarkar and Pansera (2017) indicate, efficient water and energy use is even achievable by small firms with limited financial resources, provided they maintain a strategic orientation toward sustainability, the results of which improve both financial performance and key organizational processes.

As for the effect of green management on innovation, the findings confirm a positive and significant impact (Hypothesis 2). Green management drives innovation-oriented capabilities by fostering organizational environments that encourage change and technological experimentation (Shu *et al.*, 2016). SMEs seeking to comply with environmental regulations through creative technological solutions are likely to promote innovation processes (Lazarou Tarraco *et al.*, 2023).

The results also suggest that innovation output has a positive and significant effect on firm performance (Hypothesis 3). The acquisition of green knowledge and its application to innovative technologies improve operational efficiency by reducing waste and optimizing resources (Sahoo *et al.*, 2023). Innovation, in turn, boosts productivity by facilitating process improvements, technology adoption and greater organizational flexibility (Zhou *et al.*, 2019), generating differentiation advantages that lead to better financial returns (Andersén, 2021).

Finally, the study findings demonstrate that SMEs with a strong environmental orientation achieve superior performance through innovation, acting as an adaptation and differentiation mechanism in response to external pressures, supporting Hypothesis 4 and aligning with studies such as Shu *et al.* (2020). This effect can be explained by how green management stimulates innovation by enriching information flows and broadening the scope of R&D, thereby supporting the development of sustainable products (Shu *et al.*, 2016).

However, innovation alone does not always produce financial improvements since its impact likewise depends on strategic objectives and market conditions (Gök and Peker, 2017).

This is especially relevant in light of the low intensity of the findings regarding [Hypothesis 4](#), concerning the mediating role of innovation in the relationship between green management and performance. Indeed, recent literature on the sustainability transition has proposed that a country's capacity to adopt sustainable pathways depends on its productive structure and technological foundations. As [Caldarola et al. \(2024\)](#) argue, based on an analysis of environmental patents, regions with greater "green fitness" not only exhibit higher levels of innovation but also diversify their technologies more efficiently and sustainably. Additionally, such transitions are neither automatic nor homogeneous but are profoundly shaped by local historical trajectories, institutional capacities and industrial structures.

In line with the foregoing, it is important to note that the study sample is drawn from a variety of Latin American countries with differing contexts, which may explain the weaker mediating effect of innovation on the relationship between green management and performance. Indeed, [Rojas-Cabezas et al. \(2024a, b\)](#) recently observed that both formal institutions (such as government policies and regulations) and informal ones (such as social norms and cultural values) positively impact the link between green management and innovative outcomes in SMEs from different Latin American countries. Nevertheless, the magnitude of this effect varies depending on country-specific conditions.

Structural limitations may further play a role. SMEs often have to deal with financial constraints, institutional instability and limited access to advanced technology or knowledge networks ([Çelik et al., 2024](#)). In this context, SMEs tend to be more reactive than proactive, often operating in settings with fewer environmental regulations or where enforcement is limited or inconsistent ([Zhou et al., 2019](#); [Shu et al., 2020](#)).

This study also complements [Sarkar and Pansera \(2017\)](#), who analyzed how grassroots entrepreneurs in resource-scarce environments can drive sustainability-oriented innovations with minimal inputs. They find that a lack of capital does not preclude the creation of meaningful environmental solutions, thus reinforcing the notion that green management can serve both as a strategic intent and a practical pathway to innovation, even under adverse conditions.

In sum, this study confirms that innovation acts as a key channel for operationalizing sustainability, whether by creating new products and processes or improving existing ones, with significant impacts on SME productivity and competitiveness, in line with authors such as [Sahoo et al. \(2023\)](#). These findings are consistent with previous studies showing that proactive green management, driven by strategic conviction beyond regulatory compliance, enables SMEs to improve both their environmental and financial performance ([Xie et al., 2022](#); [Bag et al., 2022](#); [Shu et al., 2020](#)).

### 5.1 Theoretical implications

This study provides two main contributions to theory. The findings reveal that green management, as a dynamic capability, is a significant factor among manufacturing SMEs in the studied region due to its direct link with performance. This result aligns with previous studies conducted in other contexts ([Tang et al., 2018](#); [Ren et al., 2022](#); [Lestari et al., 2024](#)).

The second major contribution is the role of innovation as an intermediary mechanism that enhances the effect of dynamic capability (green management) on the performance of manufacturing SMEs, in line with [Zhou et al. \(2019\)](#). This finding is consistent with the work of [Shah and Ivascu \(2024\)](#), who studied technological and managerial innovations as positive moderators of business performance.

The findings likewise corroborate studies that have observed that green management drives organizational competitiveness ([Lafuente and Vaillant, 2023](#); [Wang et al., 2024](#)), as explained by the RBV ([Barney, 1991](#)) and the dynamic capability theory ([Teece et al., 1997](#)). Furthermore, green management through innovation can be viewed as a source of competitive advantage, potentially positioning firms in markets beyond domestic ones ([Carchano et al., 2024](#)).

In summary, concern for the incorporation of environmental sustainability as a strategic priority in business management (Tang *et al.*, 2018) is not only necessary for regulatory compliance and environmental performance (Ren *et al.*, 2022) but also improves a firm's market positioning. This study highlights the link between these sustainable practices and business innovation activities to improve both productive and financial outcomes. Evidence of this was provided by Zhou *et al.* (2023) in their study on manufacturing firms, demonstrating how environmental, social and governance (ESG) performance significantly improves innovation output. They further confirmed that innovation acts as a full mediator between ESG practices and a firm's long-term sustainability performance. These authors additionally suggest that greater ESG efforts enhance innovation, thereby improving business sustainability, once again positioning innovation as a generator of competitive advantage (Barney, 1991).

While this study confirms the positive and significant relationship between green practices and firm performance, as previously noted by Hart and Ahuja (1996), these benefits may take up to two years to materialize. In addition, Neumann (2021) found that different green strategies impact firm performance, but makes a distinction between strategies that genuinely do drive product and process innovations (and hence impact performance) and those that are more superficial, such as public declarations of environmental commitment, which have little to no real effect on performance.

Similarly, actions aimed at environmental protection must be aligned with the company's corporate strategy if green practices are to have a real impact on organizational performance (Munodawafa and Johl, 2018). The company needs to be led by an executive who can foster a genuine corporate culture oriented toward sustainable practices, because the absence of such commitments and governance structures can pose a significant barrier to the adoption of green innovations (Munodawafa and Johl, 2018).

Moreover, the findings of this study are consistent with recent research in emerging economies, highlighting that SME innovation often takes the form of incremental improvements to existing products and processes rather than radical innovations (Le *et al.*, 2023). This pattern is particularly relevant for Latin American manufacturing SMEs, where financial and technological constraints condition the scope of innovation. In this context, innovation functions as a dynamic capability that enables firms to reconfigure limited resources into sustainable outcomes, thereby extending the original assumptions of the RBV.

### 5.2 Practical implications

The findings of this research are useful for business executives. First, alignment of environmental practices with strategic sustainable development goals can lead to substantive actions such as resource, water, energy, waste and packaging management, among others, all having a tangible impact on both firm innovation and performance. This research is particularly relevant to SMEs in Latin America, as while several studies have examined green management in emerging economies, most have been conducted in very different regions, such as Asia. Efforts to understand the drivers of resources and capabilities that enhance SME competitiveness are especially useful in this context.

The significantly positive results suggest that companies that integrate green practices not only contribute to environmental and resource conservation but also generate competitive advantages that lead to better outcomes. This is especially important in a competitive global environment with increasing stakeholder pressure.

Therefore, to promote both firm performance and reputation, it is essential to prioritize environmental actions that reduce the negative impacts of organizational operations on the environment. Green management can be viewed as an instrument for sustainability, regulatory compliance and corporate social responsibility while simultaneously fostering and promoting innovation.

As for public policy, the adoption of green practices that reduce companies' environmental footprints and accelerate the transition toward carbon neutrality needs to be promoted. Financial and tax subsidies could be effective strategies to encourage greater organizational commitment, which could be aligned with international commitments, helping companies meet global standards that facilitate internationalization processes.

Another important point is that innovation is not an exclusive strategy for large firms. The research findings confirm that SMEs, which often operate with limited resources, can gain substantial benefits from pursuing innovation and environmental management. These findings are comparable with [Le et al. \(2023\)](#), who revealed that in emerging economies such as Vietnam, SMEs that adopt innovation-driven strategies achieve greater operational efficiency and better financial performance.

Similarly, green management is not merely a reactive strategy. SMEs can integrate it proactively into the design and strategic orientation of new businesses. Start-ups that adopt green practices from the outset are better positioned in competitive markets ([Hermundsdottir and Aspelund, 2021](#)).

From a financial perspective, firms that implement eco-innovation improve both environmental and economic performance by optimizing processes, reducing costs and generating more sustainable products ([Bag et al., 2022](#)). This indicates that green innovation can also serve as a lever for enhancing market competitiveness.

Finally, the notion that green innovation requires substantial investment is challenged by studies such as [Sarkar and Pansera \(2017\)](#), who argue that grassroots innovations and efficient resource-use practices can generate significant environmental improvements, even in resource-constrained contexts. This perspective is especially relevant for Latin American SMEs, where financial limitations often condition the scope of sustainability initiatives.

### 5.3 Limitations and future research agenda

This study is not without its limitations. First, the cultural and regulatory factors that might influence the proposed model are not considered and neither are other causal elements that might drive the implementation of green practices. A second limitation is the absence of an analysis of the costs associated with green practices, while a third is the lack of historical data to examine construct behavior over time.

Therefore, future studies could incorporate contextual variables such as the environmental culture of each country and regulatory elements. Another potential research avenue would be to adopt longitudinal methodological designs to understand how the relationship between green management, innovation and performance evolves over time. Future studies could also explore the causal factors behind the integration of green management and the associated costs. Furthermore, research could seek to determine the impact of green practices on business internationalization in the Latin American context.

At the same time, the intersection of digitalization and sustainability represents a promising avenue for theoretical advancement. As [Munodawafa and Johl \(2018\)](#) show, technologies such as big data and Industry 4.0 can act as strategic enablers of green innovation. Future research could explore how these technologies integrate with green management to foster more flexible, data-driven environmental strategies, particularly in SMEs seeking to remain competitive in increasingly regulated and sustainability-sensitive markets.

While green management can promote environmental awareness and strategic alignment with sustainability goals, the translation of these efforts into innovation outputs, such as new or improved products and processes, may be hindered by limited technical capacity or an organizational culture that is not innovation-oriented. Future studies could examine more closely how sectoral, institutional and other factors might affect the efficacy of innovation as a driver of sustainable strategies.

Finally, although the present study's analysis confirms the mediating role of innovation output in the relationship between green management and firm performance, the modest intensity of this effect warrants further in-depth investigation in future research.

## 6. Conclusions

This study aimed to explore the existing relationship between green management, innovation output and the performance of manufacturing SMEs to respond to two questions: Does green management have a positive impact on SME performance? Does innovation output mediate the relationship between green management and SME performance? This topic has become particularly important in recent times due to the global environmental challenges faced by humankind, from which businesses cannot escape. On the contrary, companies must operate in the midst of this context and identify opportunities to remain in the market, without neglecting the other challenges for survival that SMEs commonly encounter.

Innovation has emerged as a key connecting element and a driver of competitive edge, enabling the development of new products, services and processes in response to the need to reduce the carbon footprint of business operations. Using a structural equation model, this study has analyzed data from 3,966 manufacturing SMEs across Latin America, confirming the theoretical assumption that green management has a positive and significant impact on firm performance and that innovation acts as a mediator in this relationship.

This research supports the notion that green management, when aligned with internal resources and capabilities, as proposed by the RBV, enables SMEs to build long-term sustainable competitive advantages (Barney, 1991). Its adoption within organizational environments that promote creativity, the exploration of new solutions and both internal and external collaboration leads to the development of innovative products and processes that positively affect firm performance (Singh *et al.*, 2021).

One of the main contributions of this study is that green management and innovation outputs act as channels that transform internal capabilities into superior outcomes, thus validating the logic of dynamic capability theory (Teece *et al.*, 1997). This is especially evident in SMEs, where resource scarcity demands innovative and sustainable strategies to remain competitive. Hence, adopting green management from its inception not only boosts external legitimacy but also consolidates an early trajectory toward sustainability and innovation (Neumann, 2021) and, according to the study findings, improves profitability and operational efficiency.

Similarly, external factors such as environmental regulations, international standards and rising social demands can act as indirect drivers of green innovation (Arfi *et al.*, 2018), particularly in manufacturing. However, in Latin America, institutional pressure, understood as the set of external norms and expectations that should encourage or push firms toward sustainable practices, is often weak or imbalanced, making it necessary to complement these motivations with economic and reputational incentives (Sarkar and Pansera, 2017).

It is also important to note that the benefits of green innovation are not always immediate. Some studies indicate high initial costs and financial outcomes that depend on alignment between innovation, organizational strategy and knowledge management (Hart and Ahuja, 1996; Singh *et al.*, 2022). Public policy design should therefore include targeted support to guide SMEs in their transition to more sustainable methods.

Nevertheless, despite possible delays, there is evidence that green management and innovation outputs significantly improve both environmental performance (e.g. emissions reduction) and business performance (ROA and ROE). This confirms that investing in environmental innovation enhances firm profitability (Shuwaikh *et al.*, 2023).

In conclusion, green management and innovation outputs should not be viewed as peripheral or voluntary, but as cornerstones of SME business strategy in emerging markets, with clear impacts on performance. The promotion of innovation through environmental commitment allows organizations to advance toward their sustainability goals while

bolstering performance and competitiveness. This dual orientation is essential not only for business success but also for the ecological and social resilience of Latin America.

### References

- Al-Tuwaijri, S.A., Christensen, T.E. and Hughes, K.E. (2004), "The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach", *Accounting, Organizations and Society*, Vol. 29 Nos 5-6, pp. 447-471, doi: [10.1016/S0361-3682\(03\)00032-1](https://doi.org/10.1016/S0361-3682(03)00032-1).
- Ambec, S. and Lanoie, P. (2008), "Does it pay to be green? A systematic overview", *Academy of Management Perspectives*, Vol. 22 No. 4, pp. 45-62, doi: [10.5465/amp.2008.35590353](https://doi.org/10.5465/amp.2008.35590353).
- Andersén, J. (2021), "A relational natural-resource-based view on product innovation: the influence of green product innovation and green suppliers on differentiation advantage in small manufacturing firms", *Technovation*, Vol. 104, 102254, doi: [10.1016/j.technovation.2021.102254](https://doi.org/10.1016/j.technovation.2021.102254).
- Appiah, L.O., Essuman, D., Forson, C.A., Boso, N. and Annan, J. (2025), "Green process innovation and financial performance in small and medium-sized enterprises in a developing country: role of resource orchestration", *Journal of Business Research*, Vol. 189, 115210, doi: [10.1016/j.jbusres.2025.115210](https://doi.org/10.1016/j.jbusres.2025.115210).
- Arfi, W.B., Hikkerova, L. and Sahut, J.M. (2018), "External knowledge sources, green innovation and performance", *Technological Forecasting and Social Change*, Vol. 129, pp. 210-220, doi: [10.1016/j.techfore.2017.09.017](https://doi.org/10.1016/j.techfore.2017.09.017).
- Baah, C., Opoku-Agyeman, D., Acquah, I.S.K., Agyabeng-Mensah, Y., Afum, E., Faibil, D. and Abdoulaye, F.A.M. (2021), "Examining the correlations between stakeholder pressures, green production practices, firm reputation, environmental and financial performance: evidence from manufacturing SMEs", *Sustainable Production and Consumption*, Vol. 27, pp. 100-114, doi: [10.1016/j.spc.2020.10.015](https://doi.org/10.1016/j.spc.2020.10.015).
- Bag, S., Dhamija, P., Bryde, D.J. and Singh, R.K. (2022), "Effect of eco-innovation on green supply chain management, circular economy capability, and performance of small and medium enterprises", *Journal of Business Research*, Vol. 141, pp. 60-72, doi: [10.1016/j.jbusres.2021.12.011](https://doi.org/10.1016/j.jbusres.2021.12.011).
- Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120, doi: [10.1177/014920639101700108](https://doi.org/10.1177/014920639101700108).
- Barney, J.B. (2001), "Resource-based theories of competitive advantage: a ten-year retrospective on the resource-based view", *Journal of Management*, Vol. 27 No. 6, pp. 643-650, doi: [10.1177/014920630102700602](https://doi.org/10.1177/014920630102700602).
- Begnini, S., Oro, I.M., Tonial, G. and Dalbosco, I.B. (2024), "The relationship between the use of technologies and digitalization strategies for digital transformation in family businesses", *Journal of Family Business Management*, Vol. 14 No. 4, pp. 710-726, doi: [10.1108/JFBM-06-2023-0087](https://doi.org/10.1108/JFBM-06-2023-0087).
- Bigliardi, B. (2013), "The effect of innovation on financial performance: a research study involving SMEs", *Innovation*, Vol. 15 No. 2, pp. 245-255, doi: [10.5172/impp.2013.15.2.245](https://doi.org/10.5172/impp.2013.15.2.245).
- Caldarola, B., Mazzilli, D., Napolitano, L., Patelli, A. and Sbardella, A. (2024), "Economic complexity and the sustainability transition: a review of data, methods, and literature", *Journal of Physics: Complexity*, Vol. 5 No. 2, 022001, doi: [10.1088/2632-072X/ad4f3d](https://doi.org/10.1088/2632-072X/ad4f3d).
- Carchano, M., Carrasco, I., González, Á. and Sáez-Martínez, F.J. (2024), "Analysis the nexus between internationalization and financial performance in wine industry: the effect of proactive environmental strategy and eco-innovation", *Corporate Social Responsibility and Environmental Management*, Vol. 31 No. 6, pp. 5954-5970, doi: [10.1002/csr.2894](https://doi.org/10.1002/csr.2894).
- Castillo-Esparza, M.M.G.C., Maldonado-Guzmán, G. and Mejía-Trejo, J. (2024), "Green business strategy and its effect on financial performance: the mediating role of corporate social responsibility", *Tec Empresarial*, Vol. 18 No. 2, pp. 1-17, doi: [10.18845/te.v18i2.7134](https://doi.org/10.18845/te.v18i2.7134).

- Çelik, A.K., Yildiz, T., Aykanat, Z. and Kazemzadeh, S. (2024), "Green innovation adoption in Turkish and Iranian SMEs: the effect of dynamic capabilities and the mediating role of absorptive capacity", *Journal of the Knowledge Economy*, Vol. 16 No. 1, pp. 1824-1859, doi: [10.1007/s13132-024-01990-1](https://doi.org/10.1007/s13132-024-01990-1).
- Chishty, S.K. and Sayari, S. (2024), "Does market oriented environmental sustainability determine the export performance? A study of leather products manufacturing SMEs in India", *Cogent Business and Management*, Vol. 11 No. 1, 2363427, doi: [10.1080/23311975.2024.2363427](https://doi.org/10.1080/23311975.2024.2363427).
- Cohen, W.M. and Levinthal, D.A. (1990), "Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 128-152, doi: [10.2307/2393553](https://doi.org/10.2307/2393553).
- Dijkstra, T.K. and Henseler, J. (2015), "Consistent partial least squares path modeling", *MIS Quarterly*, Vol. 39 No. 2, pp. 297-316, doi: [10.25300/misq/2015/39.2.02](https://doi.org/10.25300/misq/2015/39.2.02), available at: <https://www.jstor.org/stable/26628355>
- Eisenhardt, K.M. and Martin, J.A. (2000), "Dynamic capabilities – what are they?", *Strategic Management Journal*, Vol. 21, pp. 1105-1121.
- Ezzi, F. and Jarboui, A. (2016), "Does innovation strategy affect financial, social and environmental performance?", *Journal of Economics, Finance and Administrative Science*, Vol. 21 No. 40, pp. 14-24, doi: [10.1016/j.jefas.2016.03.001](https://doi.org/10.1016/j.jefas.2016.03.001).
- Falahat, M., Ramayah, T., Soto-Acosta, P. and Lee, Y.Y. (2020), "SMEs internationalization: the role of product innovation, market intelligence, pricing and marketing communication capabilities as drivers of SMEs' international performance", *Technological Forecasting and Social Change*, Vol. 152, 119908, doi: [10.1016/j.techfore.2020.119908](https://doi.org/10.1016/j.techfore.2020.119908).
- Ferreira, J.J.M., Fernandes, C.I. and Veiga, P.M. (2024), "The effects of knowledge spillovers, digital capabilities, and innovation on firm performance: a moderated mediation model", *Technological Forecasting and Social Change*, Vol. 200, 123086, doi: [10.1016/j.techfore.2023.123086](https://doi.org/10.1016/j.techfore.2023.123086).
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50, doi: [10.1177/002224378101800104](https://doi.org/10.1177/002224378101800104).
- Freeman, E.R. (1984), *Strategic Management: A Stakeholder Approach*, Prentice Hall, Marshfield.
- García, D., Gómez-Guillamón, A.D., Hansen, P.B., Leiva, J.C., Meroño, A., Sánchez, G. and Somohano, F.M. (2022), *Digitalización y Desarrollo Sostenible de La Mipyme En Iberoamérica*, FAEDPYME, Madrid.
- Garrido-Moreno, A., Martín-Rojas, R. and García-Morales, V.J. (2024), "The key role of innovation and organizational resilience in improving business performance: a mixed-methods approach", *International Journal of Information Management*, Vol. 77, 102777, doi: [10.1016/j.ijinfomgt.2024.102777](https://doi.org/10.1016/j.ijinfomgt.2024.102777).
- Gök, O. and Peker, S. (2017), "Understanding the links among innovation performance, market performance and financial performance", *Review of Managerial Science*, Vol. 11 No. 3, pp. 605-631, doi: [10.1007/s11846-016-0198-8](https://doi.org/10.1007/s11846-016-0198-8).
- González-Estrada, E. and Cosmes, W. (2019), "Shapiro–Wilk test for skew normal distributions based on data transformations", *Journal of Statistical Computation and Simulation*, Vol. 89 No. 17, pp. 3258-3272, doi: [10.1080/00949655.2019.1658763](https://doi.org/10.1080/00949655.2019.1658763).
- Gopalakrishnan, S. and Bierly, P.E. (2006), "The impact of firm size and age on knowledge strategies during product development: a study of the drug delivery industry", *IEEE Transactions on Engineering Management*, Vol. 53 No. 1, pp. 3-16, doi: [10.1109/TEM.2005.861807](https://doi.org/10.1109/TEM.2005.861807).
- Hai, B., Yin, X., Xiong, J. and Chen, J. (2022), "Could more innovation output bring better financial performance? The role of financial constraints", *Financial Innovation*, Vol. 8 No. 6, 6, doi: [10.1186/s40854-021-00309-2](https://doi.org/10.1186/s40854-021-00309-2).
- Hair, J.F., Sarstedt, M., Hopkins, L. and Kuppelwieser, V.G. (2014), "Partial least squares structural equation modeling (PLS-SEM): an emerging tool in business research", *European Business Review*, Vol. 26 No. 2, pp. 106-121, doi: [10.1108/EBR-10-2013-0128](https://doi.org/10.1108/EBR-10-2013-0128).

- Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2018), "When to use and how to report the results of PLS-SEM", *European Business Review*, Vol. 31 No. 1, pp. 2-24, doi: [10.1108/EBR-11-2018-0203](https://doi.org/10.1108/EBR-11-2018-0203).
- Hart, S.L. and Ahuja, G. (1996), "Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance", *Business Strategy and the Environment*, Vol. 5 No. 1, pp. 30-37, doi: [10.1002/\(sici\)1099-0836\(199603\)5:1<30::aid-bse38>3.0.co;2-q](https://doi.org/10.1002/(sici)1099-0836(199603)5:1<30::aid-bse38>3.0.co;2-q).
- Harymawan, I. (2018), "Why do firms appoint former military personnel as directors? Evidence of loan interest rate in militarily connected firms in Indonesia", *Asian Review of Accounting*, Vol. 26 No. 1, pp. 2-18, doi: [10.1108/ARA-07-2016-0086](https://doi.org/10.1108/ARA-07-2016-0086).
- Henseler, J., Ringle, C.M. and Sinkovics, R.R. (2009), "The use of partial least squares path modeling in international marketing", in Sinkovics, R.R. and Ghauri, P.N. (Eds.), *New Challenges to International Marketing*, Emerald Group Publishing, Bingley, pp. 277-319, doi: [10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014).
- Hermundsdottir, F. and Aspelund, A. (2021), "Sustainability innovations and firm competitiveness: a review", *Journal of Cleaner Production*, Vol. 280, 124715, doi: [10.1016/j.jclepro.2020.124715](https://doi.org/10.1016/j.jclepro.2020.124715).
- Jabbour, C.J.C., Sarkis, J., de Sousa Jabbour, A.B.L., Renwick, D.W.S., Singh, S.K., Grebnevych, O. and Godinho Filho, M. (2019), "Who is in charge? A review and a research agenda on the 'human side' of the circular economy", *Journal of Cleaner Production*, Vol. 222, pp. 793-801, doi: [10.1016/j.jclepro.2019.03.038](https://doi.org/10.1016/j.jclepro.2019.03.038).
- Kerin, R.A., Varadarajan, P.R. and Peterson, R.A. (1992), "First-mover advantage: a synthesis, conceptual framework, and research propositions", *Journal of Marketing*, Vol. 56 No. 4, pp. 33-52, doi: [10.1177/002224299205600404](https://doi.org/10.1177/002224299205600404).
- Kock, N. (2015), "Common method bias in PLS-SEM: a full collinearity assessment approach", *International Journal of E-Collaboration*, Vol. 11 No. 4, pp. 1-10, doi: [10.4018/ijec.2015100101](https://doi.org/10.4018/ijec.2015100101).
- Lafuente, E. and Vaillant, Y. (2023), "Greater co-innovation and innovation efficiency through greening", *Journal of Cleaner Production*, Vol. 428, 139516, doi: [10.1016/j.jclepro.2023.139516](https://doi.org/10.1016/j.jclepro.2023.139516).
- Lazarou Tarraco, E., Borini, F.M., Bernardes, R.C. and Navarrete, S.D.S. (2023), "The differentiated impact of the institutional environment on eco-innovation and green manufacturing strategies: a comparative analysis between emerging and developed countries", *IEEE Transactions on Engineering Management*, Vol. 70 No. 7, pp. 2369-2380, doi: [10.1109/TEM.2021.3068642](https://doi.org/10.1109/TEM.2021.3068642).
- Le, D.V., Le, H.T.T., Pham, T.T. and Vo, L.Van. (2023), "Innovation and SMEs performance: evidence from Vietnam", *Applied Economic Analysis*, Vol. 31 No. 92, pp. 90-108, doi: [10.1108/AEA-04-2022-0121](https://doi.org/10.1108/AEA-04-2022-0121).
- Leiva, J.C. and Brenes-Sanchez, R. (2018), "The influence of knowledge related to innovative performance", *Journal of Economics, Finance and Administrative Science*, Vol. 23 No. 45, pp. 138-149, doi: [10.1108/JEFAS-11-2017-0106](https://doi.org/10.1108/JEFAS-11-2017-0106).
- Lestari, K.C. and Soewarno, N. (2024), "Does green innovation improve firm performance? Testing the moderating effect of CEO tenure", *Contemporary Economics*, Vol. 18 No. 2, pp. 192-209, doi: [10.5709/ce.1897-9254.533](https://doi.org/10.5709/ce.1897-9254.533).
- Liao, Z. (2016), "Temporal cognition, environmental innovation, and the competitive advantage of enterprises", *Journal of Cleaner Production*, Vol. 135, pp. 1045-1053, doi: [10.1016/j.jclepro.2016.07.021](https://doi.org/10.1016/j.jclepro.2016.07.021).
- Liao, J., Kickul, J.R. and Ma, H. (2009), "Organizational dynamic capability and innovation: an empirical examination of Internet firms", *Journal of Small Business Management*, Vol. 47 No. 3, pp. 263-286, doi: [10.1111/j.1540-627X.2009.00271.x](https://doi.org/10.1111/j.1540-627X.2009.00271.x).
- Lin, R.J., Tan, K.H. and Geng, Y. (2013), "Market demand, green product innovation, and firm performance: evidence from Vietnam motorcycle industry", *Journal of Cleaner Production*, Vol. 40, pp. 101-107, doi: [10.1016/j.jclepro.2012.01.001](https://doi.org/10.1016/j.jclepro.2012.01.001).

- Liu, L., Feng, A. and Liu, M. (2024), "The effect of green innovation on corporate financial performance: does quality matter?", *Finance Research Letters*, Vol. 62 B, 105255, doi: [10.1016/j.frl.2024.105255](https://doi.org/10.1016/j.frl.2024.105255).
- Meng, X.H., Zeng, S.X., Xie, X.M. and Qi, G.Y. (2016), "The impact of product market competition on corporate environmental responsibility", *Asia Pacific Journal of Management*, Vol. 33 No. 1, pp. 267-291, doi: [10.1007/s10490-015-9450-z](https://doi.org/10.1007/s10490-015-9450-z).
- Meroño-Cerdán, A.L., López-Nicolás, C. and Molina-Castillo, F.J. (2018), "Risk aversion, innovation and performance in family firms", *Economics of Innovation and New Technology*, Vol. 27 No. 2, pp. 189-203, doi: [10.1080/10438599.2017.1325569](https://doi.org/10.1080/10438599.2017.1325569).
- Munodawafa, R.T. and Johl, S.K. (2018), "Eco-innovation and firm performance: is leadership the game changer?", *Technology in Society: A Multidisciplinary Pathway for Sustainable Development*, Vol. 40, pp. 1207-1221, doi: [10.15405/epsbs.2018.05.94](https://doi.org/10.15405/epsbs.2018.05.94).
- Najafi-Tavani, S., Najafi-Tavani, Z., Naudé, P., Oghazi, P. and Zeynaloo, E. (2018), "How collaborative innovation networks affect new product performance: product innovation capability, process innovation capability, and absorptive capacity", *Industrial Marketing Management*, Vol. 73, pp. 193-205, doi: [10.1016/j.indmarman.2018.02.009](https://doi.org/10.1016/j.indmarman.2018.02.009).
- Neumann, T. (2021), "Does it pay for new firms to be green? An empirical analysis of when and how different greening strategies affect the performance of new firms", *Journal of Cleaner Production*, Vol. 317, 128403, doi: [10.1016/j.jclepro.2021.128403](https://doi.org/10.1016/j.jclepro.2021.128403).
- OECD (2024), *Environment at a Glance Indicators*, OECD Publishing, Paris, doi: [10.1787/ac4b8b89-en](https://doi.org/10.1787/ac4b8b89-en).
- OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities*, OECD Publishing, Paris, doi: [10.1787/9789264304604-en](https://doi.org/10.1787/9789264304604-en).
- Ong, T.S., Lee, A.S., Teh, B.H. and Magsi, H.B. (2019), "Environmental innovation, environmental performance and financial performance: evidence from Malaysian environmental proactive firms", *Sustainability*, Vol. 11 No. 12, p. 3494, doi: [10.3390/su11123494](https://doi.org/10.3390/su11123494).
- Peng, Y.S. and Lin, S.S. (2008), "Local responsiveness pressure, subsidiary resources, green management adoption and subsidiary's performance: evidence from Taiwanese manufactures", *Journal of Business Ethics*, Vol. 79 Nos 1-2, pp. 199-212, doi: [10.1007/s10551-007-9382-8](https://doi.org/10.1007/s10551-007-9382-8).
- Pérez-Orozco, A., Leiva, J.C. and Mora-Esquivel, R. (2024), "The mediating role of marketing management in the relationship between online presence and product innovation among SMEs", *Journal of Economics, Finance and Administrative Science*, Vol. 29 No. 58, pp. 246-262, doi: [10.1108/JEFAS-04-2022-0087](https://doi.org/10.1108/JEFAS-04-2022-0087).
- Podsakoff, P.M., Podsakoff, N.P., Williams, L.J., Huang, C. and Yang, J. (2023), "Common method bias: it's bad, it's complex, it's widespread, and it's not easy to fix", *Annual Review of Organizational Psychology and Organizational Behavior*, Vol. 11 No. 1, pp. 17-61, doi: [10.1146/annurev-orgpsych-110721-040030](https://doi.org/10.1146/annurev-orgpsych-110721-040030).
- Rajapathirana, R.P.J. and Hui, Y. (2018), "Relationship between innovation capability, innovation type, and firm performance", *Journal of Innovation and Knowledge*, Vol. 3 No. 1, pp. 44-55, doi: [10.1016/j.jik.2017.06.002](https://doi.org/10.1016/j.jik.2017.06.002).
- Ramanathan, R., He, Q., Black, A., Ghobadian, A. and Gallea, D. (2017), "Environmental regulations, innovation and firm performance: a revisit of the Porter hypothesis", *Journal of Cleaner Production*, Vol. 155, pp. 79-92, doi: [10.1016/j.jclepro.2016.08.116](https://doi.org/10.1016/j.jclepro.2016.08.116).
- Rehman, S.U., Kraus, S., Shah, S.A., Khanin, D. and Mahto, R.V. (2021), "Analyzing the relationship between green innovation and environmental performance in large manufacturing firms", *Technological Forecasting and Social Change*, Vol. 163, 120481, doi: [10.1016/j.techfore.2020.120481](https://doi.org/10.1016/j.techfore.2020.120481).
- Ren, S., Yang, X., Hu, Y. and Chevallier, J. (2022), "Emission trading, induced innovation and firm performance", *Energy Economics*, Vol. 112, 106157, doi: [10.1016/j.eneco.2022.106157](https://doi.org/10.1016/j.eneco.2022.106157).

- Rodrigo-Alarcón, J., García-Villaverde, P.M., Ruiz-Ortega, M.J. and Parra-Requena, G. (2018), "From social capital to entrepreneurial orientation: the mediating role of dynamic capabilities", *European Management Journal*, Vol. 36 No. 2, pp. 195-209, doi: [10.1016/j.emj.2017.02.006](https://doi.org/10.1016/j.emj.2017.02.006).
- Rojas-Cabezas, G., Mora-Esquivel, R., Álvarez, N.M., Chacón-Espejo, S., Nocetti-Núñez, V. and Leiva, J.C. (2024a), "Green management, perceived barriers to sustainability, and innovation performance in Latin American SMEs", *International Journal of Business Environment*, Vol. 15 Nos 3-4, pp. 429-450, doi: [10.1504/IJBE.2024.139669](https://doi.org/10.1504/IJBE.2024.139669).
- Rojas-Cabezas, G., Mora-Esquivel, R., Márquez, N., Chacón-Espejo, S., Nocetti-Núñez, V. and Leiva, J.C. (2024b), "The influence of institutional context in the relationship between green management, perceived barriers to sustainability and innovation performance in SMEs", *Academia. Revista Latinoamericana de Administración*, Vol. 37 No. 4, pp. 654-679, doi: [10.1108/ARLA-07-2024-0158](https://doi.org/10.1108/ARLA-07-2024-0158).
- Sabando-Vera, D., Montalván-Burbano, N., Parrales-Guerrero, K., Yonfá-Medrandá, M. and Plaza-Úbeda, J.A. (2025), "Growing a greener future: a bibliometric analysis of green innovation in SMEs", *Technological Forecasting and Social Change*, Vol. 212, 123976, doi: [10.1016/j.techfore.2025.123976](https://doi.org/10.1016/j.techfore.2025.123976).
- Sahoo, S., Kumar, A. and Upadhyay, A. (2023), "How do green knowledge management and green technology innovation impact corporate environmental performance? Understanding the role of green knowledge acquisition", *Business Strategy and the Environment*, Vol. 32 No. 1, pp. 551-569, doi: [10.1002/bse.3160](https://doi.org/10.1002/bse.3160).
- Salvadó, J.A., de Castro, G.M., Navas López, J.E. and Verde, M.D. (2012), *Environmental Innovation and Firm Performance: A Natural Resource-Based View*, Palgrave Macmillan, London, doi: [10.1057/9781137264046](https://doi.org/10.1057/9781137264046).
- Sarkar, S. and Pansera, M. (2017), "Sustainability-driven innovation at the bottom: insights from grassroots ecopreneurs", *Technological Forecasting and Social Change*, Vol. 114, pp. 327-338, doi: [10.1016/j.techfore.2016.08.029](https://doi.org/10.1016/j.techfore.2016.08.029).
- Shah, S.G.M. and Ivascu, L. (2024), "Accentuating the moderating influence of green innovation, environmental disclosure, environmental performance, and innovation output between vigorous board and Romanian manufacturing firms' performance", *Environment, Development and Sustainability*, Vol. 26 No. 4, pp. 10569-10589, doi: [10.1007/s10668-023-03164-6](https://doi.org/10.1007/s10668-023-03164-6).
- Shu, C., Zhou, K.Z., Xiao, Y. and Gao, S. (2016), "How green management influences product innovation in China: the role of institutional benefits", *Journal of Business Ethics*, Vol. 133 No. 3, pp. 471-485, doi: [10.1007/s10551-014-2401-7](https://doi.org/10.1007/s10551-014-2401-7).
- Shu, C., Zhao, M., Liu, J. and Lindsay, W. (2020), "Why firms go green and how green impacts financial and innovation performance differently: an awareness-motivation-capability perspective", *Asia Pacific Journal of Management*, Vol. 37 No. 3, pp. 795-821, doi: [10.1007/s10490-018-9630-8](https://doi.org/10.1007/s10490-018-9630-8).
- Shuwaikh, F., Benkraiem, R. and Dubocage, E. (2023), "Investment in green innovation: how does it contribute to environmental and financial performance?", *Journal of Innovation Economics and Management*, Vol. 41 No. 2, pp. 107-149, doi: [10.3917/jie.pr1.0137](https://doi.org/10.3917/jie.pr1.0137).
- Silwal, P.P. (2022), "Corporate cultures and financial performance: the mediating role of firm innovation", *Cogent Business and Management*, Vol. 9 No. 1, 2010480, doi: [10.1080/23311975.2021.2010480](https://doi.org/10.1080/23311975.2021.2010480).
- Singh, S.K., Gupta, S., Busso, D. and Kamboj, S. (2021), "Top management knowledge value, knowledge sharing practices, open innovation and organizational performance", *Journal of Business Research*, Vol. 128, pp. 788-798, doi: [10.1016/j.jbusres.2019.04.040](https://doi.org/10.1016/j.jbusres.2019.04.040).
- Singh, S.K., Del Giudice, M., Chiappetta Jabbour, C.J., Latan, H. and Sohal, A.S. (2022), "Stakeholder pressure, green innovation, and performance in small and medium-sized enterprises: the role of green dynamic capabilities", *Business Strategy and the Environment*, Vol. 31 No. 1, pp. 500-514, doi: [10.1002/bse.2906](https://doi.org/10.1002/bse.2906).
- Tang, M., Walsh, G., Lerner, D., Fitz, M.A. and Li, Q. (2018), "Green innovation, managerial concern and firm performance: an empirical study", *Business Strategy and the Environment*, Vol. 27 No. 1, pp. 39-51, doi: [10.1002/bse.1981](https://doi.org/10.1002/bse.1981).

- Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-533, doi: [10.1002/\(sici\)1097-0266\(199708\)18:7<509::aid-smj882>3.0.co;2-z](https://doi.org/10.1002/(sici)1097-0266(199708)18:7<509::aid-smj882>3.0.co;2-z).
- Valdivieso-Uvidia, J.M., Expósito-Langa, M. and Belso-Martínez, J.A. (2025), "The role of technological intensity, cluster membership, and internationalisation for greater green innovation: the case of the Valencian Community", *Tec Empresarial*, Vol. 19 No. 2, pp. 71-89, doi: [10.18845/te.v19i2.7940](https://doi.org/10.18845/te.v19i2.7940).
- Vasileiou, E., Georgantzis, N., Attanasi, G. and Llerena, P. (2022), "Green innovation and financial performance: a study on Italian firms", *Research Policy*, Vol. 51 No. 6, 104530, doi: [10.1016/j.respol.2022.104530](https://doi.org/10.1016/j.respol.2022.104530).
- Vithessonthi, C. and Tongurai, J. (2015), "The effect of leverage on performance: domestically-oriented versus internationally-oriented firms", *Research in International Business and Finance*, Vol. 34, pp. 265-280, doi: [10.1016/j.ribaf.2015.02.016](https://doi.org/10.1016/j.ribaf.2015.02.016).
- Wang, X., Zhang, R., Gong, Z. and Chen, X. (2023), "Impact of blockchain on the green innovation performance of enterprises under the policy uncertainty", *Industrial Management and Data Systems*, Vol. 123 No. 10, pp. 2681-2703, doi: [10.1108/IMDS-02-2023-0071](https://doi.org/10.1108/IMDS-02-2023-0071).
- Wang, C., Qiu, J., Chen, B. and Deng, X. (2024), "Green finance, green culture and corporate green management innovation: evidence from Chinese listed companies", *Finance Research Letters*, Vol. 67, 105774, doi: [10.1016/j.frl.2024.105774](https://doi.org/10.1016/j.frl.2024.105774).
- Xie, X., Hoang, T.T. and Zhu, Q. (2022), "Green process innovation and financial performance: the role of green social capital and customers' tacit green needs", *Journal of Innovation and Knowledge*, Vol. 7 No. 1, 100165, doi: [10.1016/j.jik.2022.100165](https://doi.org/10.1016/j.jik.2022.100165).
- Zairbani, A. and Kumar, J.P.S. (2025), "How does green knowledge sharing improve sustainable business performance?", *Knowledge and Process Management*, Vol. 32 No. 1, pp. 42-53, doi: [10.1002/kpm.1796](https://doi.org/10.1002/kpm.1796).
- Zhou, Y., Shu, C., Jiang, W. and Gao, S. (2019), "Green management, firm innovations, and environmental turbulence", *Business Strategy and the Environment*, Vol. 28 No. 4, pp. 567-581, doi: [10.1002/bse.2265](https://doi.org/10.1002/bse.2265).
- Zhou, S., Rashid, M.H.U., Zobair, S.A.M., Sobhani, F.A. and Siddik, A.B. (2023), "Does ESG impact firms' sustainability performance? The mediating effect of innovation performance", *Sustainability*, Vol. 15 No. 6, p. 5586, doi: [10.3390/su15065586](https://doi.org/10.3390/su15065586).

### Further reading

- Anderson, N., Potočník, K. and Zhou, J. (2014), "Innovation and creativity in organizations: a state-of-the-science review, prospective commentary, and guiding framework", *Journal of Management*, Vol. 40 No. 5, pp. 1297-1333, doi: [10.1177/0149206314527128](https://doi.org/10.1177/0149206314527128).
- Chang, C.H. (2011), "The influence of corporate environmental ethics on competitive advantage: the mediation role of green innovation", *Journal of Business Ethics*, Vol. 104 No. 3, pp. 361-370, doi: [10.1007/s10551-011-0914-x](https://doi.org/10.1007/s10551-011-0914-x).
- Dangelico, R.M. (2015), "Green product innovation: where we are and where we are going", *Business Strategy and the Environment*, Vol. 25 No. 8, pp. 560-576, doi: [10.1002/bse.1886](https://doi.org/10.1002/bse.1886).
- Dangelico, R.M. and Pujari, D. (2010), "Mainstreaming green product innovation: why and how companies integrate environmental sustainability", *Journal of Business Ethics*, Vol. 95 No. 3, pp. 471-486, doi: [10.1007/s10551-010-0434-0](https://doi.org/10.1007/s10551-010-0434-0).
- Dziallas, M. and Blind, K. (2019), "Innovation indicators throughout the innovation process: an extensive literature analysis", *Technovation*, Vol. 80, pp. 3-29, doi: [10.1016/j.technovation.2018.05.005](https://doi.org/10.1016/j.technovation.2018.05.005).
- Ghisetti, C. and Rennings, K. (2014), "Environmental innovations and profitability: how does it pay to be green? An empirical analysis on the German innovation survey", *Journal of Cleaner Production*, Vol. 75, pp. 106-117, doi: [10.1016/j.jclepro.2014.03.097](https://doi.org/10.1016/j.jclepro.2014.03.097).

- Kijkasiwat, P. and Phuensane, P. (2020), "Innovation and firm performance: the moderating and mediating roles of firm size and small and medium enterprise finance", *Journal of Risk and Financial Management*, Vol. 13 No. 5, pp. 97-112, doi: [10.3390/jrfm13050097](https://doi.org/10.3390/jrfm13050097).
- Wernerfelt, B. (1984), "A resource-based view of the firm", *Strategic Management Journal*, Vol. 5 No. 2, pp. 171-180, doi: [10.1002/smj.4250050207](https://doi.org/10.1002/smj.4250050207).
- Zailani, S., Eltayeb, T.K., Hsu, C.C. and Tan, K.C. (2015), "The impact of external institutional drivers and internal strategy on environmental performance", *International Journal of Operations and Production Management*, Vol. 32 No. 6, pp. 721-745, doi: [10.1108/01443571211226514](https://doi.org/10.1108/01443571211226514).

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