

Fostering competitiveness through knowledge management and sustainability-oriented resources: insights from manufacturing industries

Mauro Romano, Antonio Netti, Marika Intenza and Christian Favino

Abstract

Purpose – This paper aims to examine the relationships between sustainability-oriented resources, innovative capabilities and competitiveness, accounting for the mediating roles of responsible innovation and organisational support.

Design/methodology/approach – The authors used a cross-sectional research design during the fiscal year 2023. Data were gathered from a sample of 493 manufacturing small- and medium-sized enterprises (SMEs) across the European Union (EU), the UK and the USA. Mediation effects were tested using the causal steps approach and path analysis.

Findings – The empirical evidence proves that both direct and indirect pathways enhance competitiveness, with responsible innovation and organisational support acting as key mediators.

Practical implications – This research suggests that SME managers should deepen their commitment to responsible innovation by embedding sustainability into business models and daily routines. Furthermore, policymakers should encourage targeted initiatives, such as grants or incentives, to support sustainable transitions and bolster long-term competitiveness.

Originality/value – Unlike prior research, this study's dual-path model elucidates how these sustainability-oriented mechanisms enable SMEs to convert internal resources into competitive performance. By adopting a context-sensitive approach across different geopolitical environments, this research offers new insights into how firms can strategically leverage both tangible and intangible resources within diverse institutional frameworks.

Keywords Resource-based view (RBV), Sustainability-oriented resources availability, Innovative capabilities, Responsible innovation, Organisational support, Competitive advantage

Paper type Research paper

(Information about the authors can be found at the end of this article.)

Received 18 July 2025
Revised 26 October 2025
17 December 2025
Accepted 17 January 2026

© Mauro Romano, Antonio Netti, Marika Intenza and Christian Favino. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/>

1. Introduction

Nowadays, the global business landscape has undergone a rapid and sweeping transformation, driven by heightened demands for sustainability, technological innovation, and evolving regulatory frameworks. Despite political setbacks, sustainability efforts are set to persist (Bick, 2025; Mackay *et al.*, 2025; Rudolf and Schmidt, 2025; United Nations, 2024). For instance, recent insights from the *Harvard Business Review* suggest that, notwithstanding political volatility in countries such as the USA, the momentum of global sustainability initiatives remains resilient (Mandyck, 2024). This durability stems from the recognition that sustainability is essential for the long-term success of firms, investors, and nations alike (Corvino *et al.*, 2024; Nam *et al.*, 2024; Romano *et al.*, 2024). International regulations, stakeholder expectations, and financial market pressures continue to reinforce these practices, making their neglect

extremely difficult even amid political volatility (Gomez-Trujillo *et al.*, 2024; Intenza *et al.*, 2025; Ning and Shen, 2024).

From a theoretical standpoint, our study is grounded in the resource-based view (RBV) (Barney, 1991; Wernerfelt, 1984), which posits that firms achieve a competitive advantage through valuable, rare, inimitable, and non-substitutable (VRIN) resources. However, given our focus on sustainability and innovation, two well-recognised theoretical developments of the RBV need to be considered. First, the natural-resource-based view (NRBV) (Hart, 1995; Hart and Dowell, 2011) extends the RBV by emphasising sustainability-oriented resources as critical drivers of competitiveness. Second, the knowledge-based view (KBV) (Grant, 1996; Spender, 1996) highlights knowledge, learning, and innovative capabilities as the most strategic resources for firms, particularly in dynamic environments. Integrating these theoretical lenses allows us to investigate how both sustainability-oriented resources (via NRBV) and innovative capabilities (via KBV) contribute to long-run firms' competitiveness (Branca *et al.*, 2025; Foss and Mazzelli, 2025).

Despite the relevance of these issues, the ongoing academic debate still presents at least two shortcomings. First, while the RBV (Barney, 1991; Wernerfelt, 1984), its natural extension through the NRBV (Hart, 1995; Hart and Dowell, 2011), and the KBV (Grant, 1996; Spender, 1996) have been widely investigated, they have generally been treated as distinct theoretical perspectives. Consequently, the way sustainability-oriented resources and innovative capabilities jointly shape long-term competitiveness remains under-examined. Second, although responsible innovation (Owen *et al.*, 2012; Stilgoe *et al.*, 2013; von Schomberg, 2013) and organisational support (Eisenberger *et al.*, 1986; Rhoades and Eisenberger, 2002) are increasingly acknowledged as valuable drivers (Andersén, 2021; Chesbrough, 2020; Intenza *et al.*, 2025), little is known about how these mechanisms operate simultaneously to translate resources and capabilities into long-term competitiveness. Moreover, most existing studies adopt a single-country perspective, overlooking how these relationships may vary across different institutional and regulatory contexts.

To address these gaps, we investigate how sustainability-oriented resources and innovative capabilities influence long-term competitiveness via the mediating roles of responsible innovation and organisational support. Analysing 493 manufacturing small- and medium-sized enterprises (SMEs) across the European Union (EU), the UK, and the USA, allows us to compare settings that significantly differ in regulatory stringency, stakeholder expectations, and political uncertainty.

Accordingly, our research questions are formulated as follows:

- RQ1.* How do sustainability-oriented resource availability and innovative capabilities affect SMEs' sustainable competitiveness?
- RQ2.* To what extent do responsible innovation and organisational support mediate these relationships?
- RQ3.* Do these mechanisms differ across institutional contexts, specifically in the EU, UK, and USA?

Our study offers many theoretical contributions. In line with the broader literature highlighting the relevance of sustainability-driven resources for competitive advantage (Čater *et al.*, 2025; Liu, 2025), this analysis provides timely insights into how different contexts influence internal resource deployment and strategic outcomes. In particular, by integrating the RBV, KBV, and NRBV, we show how sustainability-oriented resources and innovative capabilities contribute to long-term competitiveness through responsible innovation and organisational support.

From a practical standpoint, we underscore the relevance of embedding sustainability into the core strategies of SMEs to foster competitiveness. By combining sustainable practices,

firms can improve their market positioning and respond more effectively to stakeholder demands. In this context, Top Management Teams (TMT) play a central role in cultivating a culture of sustainability within their organisations, supporting learning and capability development, and aligning corporate goals with sustainable outcomes.

The remainder of the paper is organised as follows. Section 2 delves into the theoretical grounds. Section 3 formulates the research hypotheses. Section 4 details the methodological approach undertaken. Section 5 shows the findings and associated robustness checks. Section 6 interprets the key results, as well as highlights the theoretical contributions and practical implications, and Section 7 concludes by acknowledging the study's limitations and suggesting directions for future research.

2. Theoretical background

RBV has long been a cornerstone in strategic management research, arguing that firms achieve sustainable competitive advantage when they possess the so-called VRIN resources (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). From this perspective, firms are heterogeneous bundles of internal configuration where resources drive strategic differentiation and value creation (Barney *et al.*, 2001; Crook *et al.*, 2008).

Over time, RBV has evolved to address new competitive challenges. Notably, NRBV (Hart, 1995; Hart and Dowell, 2011) emphasises sustainability-oriented resources as critical drivers of long-term competitive advantage. Many studies have shown that environmental resources and capabilities – such as pollution prevention, clean technologies, and product stewardship – diminish operating costs, strengthen legitimacy, and enhance resilience (Corvino *et al.*, 2024; Intenza *et al.*, 2025; Netti *et al.*, 2025; Romano *et al.*, 2024). These outcomes represent critical pathways through which sustainability-oriented resources contribute to long-term competitiveness (Christmann, 2000; Dangelico, 2016; Oliver, 1997; Sharma and Vredenburg, 1998). Consistently with the NRBV, we conceptualise sustainability-oriented resource availability as the stock of tangible and intangible assets that support firms to embed environmental priorities into their core strategies (Do *et al.*, 2022; Liu and Wang, 2025).

At the same time, the KBV moves the RBV forward by positing that knowledge is the most strategically significant factor to gain a competitive advantage (Grant, 1996; Spender, 1996). Within this perspective, innovative capabilities – defined as the ability to generate new ideas, develop differentiated products, introduce more efficient processes or adopt novel business models – are essential for attaining competitiveness (Miller and Friesen, 1983; Verona and Ravasi, 2003; Zahra and Covin, 1993). More recent works stress that in dynamic contexts, and particularly in sustainability-driven industries, innovative capabilities enable firms to align technological development with emerging societal and environmental expectations (Chesbrough, 2020; Perotti *et al.*, 2025).

By integrating the NRBV and KBV, we can better grasp how internal assets translate into competitive outcomes through two main mechanisms: responsible innovation and organisational support. On the one hand, responsible innovation is strictly aligned with ethical acceptability, social desirability, and sustainability goals. Specifically, complementary dimensions that shape innovation processes are characterised by anticipation, reflexivity, inclusion, and responsiveness, thus accounting for future impacts, involving different stakeholders and remaining adaptable to evolving societal needs (Owen *et al.*, 2012; Stilgoe *et al.*, 2013). Prior research has shown that firms with plentiful and flexible resources are better positioned to mobilise financial, technological, and human capital to sustain such innovation pathways (Bouguerra *et al.*, 2024; Do *et al.*, 2022). Moreover, responsible innovation enhances stakeholder legitimacy and long-term resilience, making it a strategic driver of long-run competitiveness (Porter and Kramer, 2011). On the other hand, organisational support is understood as the leadership, culture,

structures, and routines that allow firms to activate and coordinate their internal conditions (Lee *et al.*, 2018). For instance, change-sensitive leadership and a learning-oriented culture strengthen adaptability in dynamic contexts (Eisenhardt and Martin, 2000; Schein, 2010), while human resource practices such as teamwork, shared decision-making, and continuous training help transform static resource endowments into dynamic performance outcomes (Andersén, 2021). Organisational support, therefore, represents the infrastructure through which resources and capabilities are effectively deployed and combined to sustain competitiveness (Grant, 1996; Makadok, 2001).

To infer, we adopt a multidimensional perspective of long-run competitiveness, which extends beyond financial performance to include resilience, adaptability, and legitimacy (Barney, 1991; Dangelico, 2016; Porter and Kramer, 2011). This broader view reflects the growing consensus that firms must pursue not only financial outcomes, but also environmental and social legitimacy (Hart and Dowell, 2011). From this standpoint, we argue that competitiveness is not simply a matter of possessing valuable resources, but of strategically configuring them through responsible innovation and organisational support, thereby transforming internal conditions into long-term sustainable advantage and reinforcing legitimacy with key stakeholders (Donaldson and Lee, 1995; Freeman, 1984). Such a perspective is particularly relevant for SMEs, which often operate under resource constraints yet are increasingly required to balance financial performance with societal expectations. Accordingly, throughout this study, we consistently refer to competitiveness to highlight the multidimensional nature of competitive advantage in sustainability-oriented contexts.

3. Hypotheses development

3.1 Sustainability-oriented resource availability and innovative capabilities

Building on the RBV, long-run competitiveness emerges from the effective configuration and deployment of VRIN resources through organisational processes that facilitate differentiation, cost efficiency, and market adaptation (Barney, 1991; Crook *et al.*, 2008; Peteraf, 1993; Ray *et al.*, 2004; Wernerfelt, 1984). Assets such as managerial competences, technological bases, and reputational capital yield superior performance when effectively orchestrated inside the firm (Newbert, 2007; Sirmon *et al.*, 2011). Even under environmental volatility, well-managed resource endowments act as buffers that enhance resilience and enable innovation, ultimately strengthening competitive positions over time (Do *et al.*, 2022; Wu, 2010).

In line with this reasoning, the NRBV underscores sustainability-oriented resources, including clean technologies, eco-efficient equipment, and green human capital as main sources of competitive advantage, as they combine operational efficiency with legitimacy *vis-à-vis* regulators and stakeholders (Christmann, 2000; Dangelico, 2016; Hart, 1995; Lichtenthaler, 2022; Sharma and Vredenburg, 1998). Accordingly, we define long-run competitiveness as the integration of firm performance with environmental and social legitimacy outcomes recognised by stakeholders (Hart and Dowell, 2011).

In our study, sustainability-oriented resource availability refers to the firm's access to qualified human resources for sustainable operations, reliable eco-materials, relevant knowledge and technologies, energy-efficient equipment, and a supportive external environment through alliances and collaborations, which together expand the feasible set of strategic actions (Jiao *et al.*, 2020). These endowments allow resources to be embedded into organisational practices, transforming internal conditions into competitive outcomes (Sirmon *et al.*, 2011; Helfat and Peteraf, 2003). Similarly, the extent to which resources contribute to sustainable competitive advantage is shaped by the surrounding institutional and stakeholder environment, which reinforces the role of resource availability in sustaining competitiveness (Oliver, 1997).

Though there has been a great deal on RBV and NRBV, relatively little is known about how these mechanisms apply to SMEs and whether their relevance persists across different institutional contexts. To address this gap, we propose the following hypothesis:

H1a. Sustainability-oriented resource availability positively affects competitiveness.

On the same wavelength, innovative capabilities denote the firm's ability to transform knowledge into new products, processes, and business practices (Miller and Friesen, 1983; Verona and Ravasi, 2003; Zahra and Covin, 1993). In particular, the KBV highlights knowledge as the most significant asset for building long-term advantage (Grant, 1996; Spender, 1996). In our study, this construct captures the capacity to mobilise and recombine knowledge to generate ideas and implement novel business models (Ávila, 2022).

Innovative capabilities allow firms to renew their resource base and adapt to shifting conditions. They are particularly valuable when oriented towards sustainability and/or encompass a broad range of initiatives such as product and process improvements, organisational changes, and business model innovations (Chesbrough, 2020; Perotti *et al.*, 2025). Indeed, prior research has shown that firms with strong innovative capabilities are more likely to anticipate environmental shifts, align with stakeholder expectations, and respond proactively to sustainability transitions (Bouguerra *et al.*, 2024; Galbreath, 2005; Zahra and Covin, 1993).

While innovation is widely recognised as a driver of competitiveness, empirical studies have predominantly focused on its effects on financial performance (Calantone *et al.*, 2002; Rosenbusch *et al.*, 2011). The direct contribution of innovative capabilities to competitiveness remains under-developed, especially within resource-constrained contexts like SMEs. Building on this reasoning, we propose the following hypothesis:

H1b. Innovative capabilities positively affect competitiveness.

3.2 The mediating role of responsible innovation

Responsible innovation is recognised as a paradigm that requires firms to anticipate the social and environmental impacts of innovation, involve stakeholders in the implementation of solutions, and align technological development with ethical and sustainability principles (Owen *et al.*, 2012; Stilgoe *et al.*, 2013). This perspective supplements traditional views of innovation by embedding principles of inclusiveness, responsiveness, and sustainability into the innovation process.

The NRBV suggests that sustainability-oriented resources provide both tangible and intangible foundations for responsible innovation practices. Clean technologies, eco-efficient processes, and skilled human capital allow firms to pursue anticipatory and inclusive innovation pathways, balancing economic efficiency with legitimacy outcomes (Do *et al.*, 2022; Hart and Dowell, 2011). Similarly, from a KBV standpoint, these resources also facilitate learning, recombination, and stakeholder engagement, thereby covering a pivotal role for responsible innovation.

Despite the growing attention devoted to responsible innovation in recent years, prior research has largely conceptualised it as a normative or policy-driven ideal (Burget *et al.*, 2017; Owen *et al.*, 2012; Stilgoe *et al.*, 2013). Only a thin number of studies have examined the organisational and resource conditions that enable its implementation within firms (Holm *et al.*, 2025). In particular, it remains unclear whether and how the availability of sustainability-oriented resources fosters the adoption of responsible innovation practices in SMEs, which often operate under resource constraints yet face heightened stakeholder pressures. More specifically, sustainability-oriented resources may act as a critical enabler of responsible innovation within SMEs, as limited access to human, technological, and

relational assets often hinders their ability to anticipate impacts and engage stakeholders. This highlights the relevance of examining whether sustainability-oriented resources systematically support the adoption of responsible innovation practices in smaller firms. On this basis, we formulate the following hypothesis:

H2a. Sustainability-oriented resource availability positively affects responsible innovation.

On the same page, innovative capabilities represent the organisational capacity to integrate knowledge across domains, experiment with new ideas, and adapt processes and models in response to changing environments (Miller and Friesen, 1983; Zahra and Covin, 1993). The KBV emphasises that the competitive advantage arises not simply by possessing knowledge, but from the capability to generate, recombine, and apply it in novel ways (Grant, 1996; Verona and Ravasi, 2003).

In sustainability-oriented contexts, these capabilities allow firms to tackle ethical and societal pressures through continuous learning and stakeholder engagement (Chesbrough, 2020). By fostering exploration and adaptation, innovative capabilities provide the basis for anticipating future impacts and aligning technological development with societal values (Owen *et al.*, 2012; Stilgoe *et al.*, 2013). Recent work suggests that firms with stronger innovative capabilities are better positioned to integrate environmental foresight, assess potential impacts in advance, and adjust technologies in line with stakeholder expectations (Harrison *et al.*, 2021).

While conceptually related, little empirical research has explicitly examined the link between innovative capabilities and responsible innovation. Different authors have examined responsible innovation as a normative principle or policy framework (Burget *et al.*, 2017), leaving underexplored the organisational capacities that enable firms to operationalise it. This gap is particularly relevant within SMEs, where resource constraints make the mobilisation of knowledge and the development of innovation more challenging. Examining this relationship is therefore crucial to understanding how smaller firms can convert knowledge into socially responsive and sustainable innovation pathways. These considerations lead to the following hypothesis:

H2b. Innovative capabilities positively affect responsible innovation.

As outlined above, responsible innovation is a process through which firms transform internal resources and capabilities into outcomes that generate technological advancement, legitimacy, and stakeholder trust (Do *et al.*, 2022; Porter and Kramer, 2011; Stilgoe *et al.*, 2013). It serves as the bridge linking firm-level conditions to societal expectations (Owen *et al.*, 2012).

From the NRBV perspective, sustainability-oriented resources provide the foundation for responsible innovation by equipping firms with the assets needed for inclusive innovation pathways (Hart and Dowell, 2011). In this vein, responsible innovation may serve as a mediating factor that converts resource availability into long-term competitiveness by integrating economic goals with social legitimacy.

From the KBV perspective, innovative capabilities strengthen the firm's ability to create and integrate knowledge, pursue novel opportunities, and involve stakeholders in reflective learning processes (Chesbrough, 2020; Grant, 1996; Verona and Ravasi, 2003). These capabilities are particularly suited to operationalise responsible innovation, since they provide the organisational conditions required to anticipate impacts, adapt technologies, and embed social values into innovation practices (Harrison *et al.*, 2021; Owen *et al.*, 2012). Accordingly, responsible innovation can be expected to function as the linking mechanism through which innovative capabilities translate into long-term competitiveness. In light of the above considerations, the following two hypotheses are formulated:

H3a. Responsible innovation mediates the relationship between sustainability-oriented resource availability and competitiveness.

H3b. Responsible innovation mediates the relationship between innovative capabilities and competitiveness.

3.3 The mediating role of organisational support

From both NRBV and KBV perspectives, resources drive competitive advantage only when they are effectively embedded in organisational support systems that promote their deployment (Barney, 1991; Grant, 1996; Makadok, 2001). Organisational support can be understood as the infrastructures, processes, and practices that ensure resources and knowledge are activated and coordinated across the firm (Eisenhardt and Martin, 2000; Schein, 2010).

In sustainability-oriented contexts, such support is pivotal for incorporating environmental and social objectives into operational routines. Firms endowed with greater sustainability-oriented resources are more likely to invest in training, information systems, and cross-functional initiatives that foster collaboration and learning, thereby facilitating the effective mobilisation of those resources (Hart and Dowell, 2011).

Empirical evidence shows that resource availability often leads to more collaborative and learning-oriented organisational contexts (Andersén, 2021). However, it remains unclear whether SMEs with richer sustainability-oriented resources systematically develop stronger organisational support systems. Previous research has typically conceived organisational support as a contextual condition for performance rather than an outcome of resource endowments. Consistently with this argument, we advance the following hypothesis:

H4a. Sustainability-oriented resource availability positively affects organisational support.

In keeping with this line of thought, innovative capabilities involve more than generating ideas; they require an organisational context that fosters collaboration, autonomy, and change (Eisenhardt and Martin, 2000; Verona and Ravasi, 2003). The KBV suggests that these capabilities stem from the firm's ability to create and disseminate knowledge through structures that support experimentation and learning (Grant, 1996). They represent a dynamic process in which knowledge is generated, shared, and transformed into routines, practices, and innovations that continuously renew the organisational system.

Organisational support, in turn, provides the enabling environment in which innovative capabilities flourish. Leadership commitment and participatory cultures reinforce the knowledge diffusion and its integration into operations (Schein, 2010). Firms with stronger innovative capabilities are more likely to create these support mechanisms, as the pursuit of innovation requires cross-functional coordination and the institutionalisation of learning routines (Verona and Ravasi, 2003). Empirical research suggests that innovative firms tend to develop both collaborative and adaptive organisational contexts (Andersén, 2021), but the mechanisms through which capabilities translate into such support remain underexplored.

In spite of these insights, scant studies have examined whether innovative capabilities systematically foster the development of organisational support in SMEs, where resource constraints often limit the ability to institutionalise supportive practices. This gap calls for greater attention to the reciprocal relationship between innovation and the organisational conditions that sustain it. These considerations lead to the following hypothesis:

H4b. Innovative capabilities positively affect organisational support.

Organisational support represents the structural and cultural context through which resources and capabilities are mobilised towards strategic aims (Grant, 1996;

Makadok, 2001). It encompasses the infrastructures, processes, and practices that nurture collaboration, knowledge sharing, and learning across the organisation (Eisenhardt and Martin, 2000; Schein, 2010).

By providing training, information systems, and cross-functional platforms, organisational support facilitates the alignment of business activities with broader sustainability goals, thus allowing firms to transform resource endowments into competitive outcomes (Hart and Dowell, 2011).

Building on NRBV and KBV perspectives, we argue that organisational support functions as a mechanism through which both sustainability-oriented resources and innovative capabilities are translated into long-term competitiveness. When supported by organisational support, sustainability-oriented resources can be effectively coordinated and deployed, while innovative capabilities are more likely to be institutionalised in routines and practices that reinforce adaptability and stakeholder responsiveness (Andersén, 2021; Verona and Ravasi, 2003).

Although prior studies acknowledge the relevance of organisational support, little is known about its mediating role in linking resources and capabilities to competitiveness. This issue is particularly salient in the realm of SMEs, where supportive structures often determine how effectively internal resources and capabilities can be mobilised. Taken together, these insights motivate the following hypotheses:

- H5a.* Organisational support positively mediates the relationship between sustainability-oriented resource availability and competitiveness.
- H5b.* Organisational support positively mediates the relationship between innovative capabilities and competitiveness.

4. Methodology

4.1 Sample and data collection

The data collection involved administering an anonymous online survey using the Prolific platform (www.prolific.com), which is one of the most used tools by academic researchers in social science studies (Marzi *et al.*, 2023; Peer *et al.*, 2017; Rinderknecht *et al.*, 2025). Our sampling procedure applied strict filters for company size, industry type, location, and professional role. Participants who did not meet these prerequisites were automatically excluded at the screening stage. Specifically, the target respondents were SME managers (i.e., top management, middle management, junior management, researchers, and self-employed/partners) operating in the manufacturing sector (i.e., the computer, electronics and other manufacturing sectors), and residing in the EU, the UK and the USA. These settings were chosen to facilitate a comparison across distinct geographical contexts with heterogeneous regulatory environments, cultural attitudes and stakeholder expectations towards sustainability. As is well known, they are characterised by diverse political, economic and support frameworks, resulting in peculiar factors that can significantly impact the key drivers of SMEs' competitiveness (Akkerman *et al.*, 2009; Aureli *et al.*, 2020; Jensen *et al.*, 2007). The EU has been at the forefront of proactive sustainability regulations through the European Green Deal and the Corporate Sustainability Reporting Directive (CSRD) – 2022 / 2464/EU, promoting strategic integration of responsible innovation within firms (Deloitte, 2024; Hummel and Jobst, 2024). The UK's post-Brexit landscape represents an intriguing context in which to investigate strategic sustainability after the de-Europeanising process (Gravey and Jordan, 2023). Finally, the USA provides a market-driven, yet less regulated environment for exploring whether sustainable factors underpin the competitive advantage, particularly for SMEs (Latella *et al.*, 2025).

The questionnaire was developed based on the established literature to ensure the use of validated measurement scales (Adomako and Tran, 2022; Ávila, 2022; Jiao *et al.*, 2020;

Lee *et al.*, 2018). Specifically, the constructs were measured using a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Content validity was established through different techniques. First, the survey was designed to be anonymous to minimise social desirability bias (Fisher, 1993). Second, the authors' expertise in the field, combined with rigorous methodological approaches and a thorough literature review, significantly contributed to the robustness of the research framework. Third, we performed a pilot study in February to examine the survey's functionality and refine the instrument. After addressing any identified issues in this preliminary run, the survey was launched in March and ended in April 2023. Data collection achieved a high response rate of 67.26% [1]. A total of 494 questionnaires were initially gathered. Afterwards, responses were excluded if participants failed to pass instrumental manipulation checks, designed to maintain engagement and assess attention (Shahzad *et al.*, 2020; Trabucchi *et al.*, 2023). Precisely, the questionnaire was discarded if he/she failed a maximum of two out of three designed attention checks. After applying these quality control measures, the final sample consisted of 150 respondents from the EU, 249 from the UK, and 94 from the USA, thus achieving a total sample of 493 observations (Table 1).

4.2 Variables

Dependent variable.

Competitiveness refers to the firm's perceived ability to outperform competitors across several dimensions, such as research and development (R&D), capacity management, profitability, corporate reputation, and its overall ability to maintain a competitive advantage. Based on prior research, it was computed through a composite measure derived from five survey items (Ávila, 2022). The label is: *COMP*.

Independent variables.

Resource availability regards the firm's access to qualified human resources, reliable sources of sustainable materials, relevant knowledge and technologies, energy-efficient equipment, and a supportive external environment (such as technological alliances and collaborations), that collectively enable the adoption and implementation of sustainable operations. Following Jiao *et al.* (2020), it was operationalised by way of five survey questions. The label is: *RES_AV*.

Innovation capabilities pertain to the organisation's capacity to deploy new ideas and skills aimed at developing innovative products, services and processes that enhance competitiveness, and support effective recruitment and talent development. Building on previous studies (Ávila, 2022; Liao *et al.*, 2007), it was measured using a set of five survey items. The label is: *INN_CAP*.

Table 1 Sample selection

Description	Entries
Total questionnaires from SME managers	494
(-) wrong answers in the attention checkers	(1)
(=) total valid answers	493
Settings	Respondents ^a
UK	249 (50.51%)
EU	150 (30.42%)
USA	94 (19.07%)
Note(s): ^a Percentage computed on the valid answers	
Source(s): Authors' elaboration	

Mediating factors.

Responsible innovation concerns the development and launch of new products and services that prioritise social well-being, environmental sustainability, and ethical issues, thus demonstrating a commitment towards green solutions that contribute to a better future and address significant societal challenges. Drawing on [Adomako and Tran \(2022\)](#), we used six items to compute this construct. The label is: *RESP_INN*.

Organisational support for environmental initiatives encompasses management's proactive efforts to implement environmental strategies, the allocation of resources to address environmental issues, and the provision of written guidelines to ensure the adoption of green practices across the organisation. Building on [Lee et al. \(2018\)](#), it was calculated using three items. The label is: *ORG_SUPP*.

Control variables.

Both individual- and firm-level control variables were incorporated into the analysis ([Adomako and Tran, 2022](#); [Ávila, 2022](#); [Branca et al., 2025](#); [Lei et al., 2024](#)).

At the individual level, the age of each interviewee was self-reported and subsequently coded as follows: 1 for ages 18–30 years, 2 for 31–45 years, 3 for 46–60 years, and 4 for those older than 60 years. This variable is labelled as: *CEO_AGE*. A nominal variable was included to indicate the manager's gender. It was coded as 1 for male managers, 2 for female managers, and 3 for other or unspecified genders. The label is: *CEO_GENDER*. Finally, the manager's experience was assessed using an ordinal variable, with the following coding: 1 for less than one year, 2 for one to five years, 3 for six to ten years, and 4 for more than ten years. The label is: *CEO_EXP*.

At the firm level, a dummy variable was included to differentiate between low- and high-technology industries, coded as 0 for low-technology and 1 for high-technology sectors. This classification relies on the notion that firms operating within high-tech industries are better positioned to reconfigure their operations and capabilities, conceivably resulting in increased competitiveness. The label is: *SECTOR*. Firm size was operationalised using an ordinal variable, with the following coding framework: 1 for firms with fewer than 5 employees; 2 for firms employing between 5 and 20 employees; 3 for those with 21–50 employees; 4 for firms employing between 51 and 250 employees; and 5 for firms with more than 250 employees. The label is: *FIRM_SIZE*. At last, the operational market was included as a dummy variable, where 1 points out mass-market customers, and 0 denotes business-to-business customers.

For additional details concerning constructs and items, please refer to [Table 2](#).

4.3 Measurement model evaluation

To evaluate our hypotheses, we conducted a mediation analysis based on single-mediator models using OLS regressions. Building upon the framework established by [Baron and Kenny \(1986\)](#), the process of mediation involves three steps. First, it requires demonstrating that the independent variable significantly influences the mediators. Second, it is needed to prove that the independent variable also impacts the dependent variable; however, for mediation to be present, the strength of this direct effect should diminish when the mediators are included in the model. Specifically, the coefficient from the initial regression of the independent variable on the dependent variable should be larger in absolute value than the coefficient obtained when both the independent variable and the mediators are included in the model, thus suggesting that part of the effect may be conveyed through the mediators. Finally, to confirm mediation, the mediators themselves must significantly affect the dependent variable when controlling for the independent variable ([Baron and Kenny, 1986](#); [MacKinnon et al., 2007](#); [Zhao et al., 2010](#)). As depicted in [Figure 1](#), the independent

Table 2 Scales and measures

<i>Constructs</i>	<i>Coding</i>	<i>Items</i>	<i>References</i>
Competitiveness	COMP1	1. In terms of research and development, this company is more capable than its competitors	Ávila (2022)
	COMP2	2. This company has better capacity management than its competitors	
	COMP3	3. This company is more profitable than its competitors	
	COMP4	4. The corporate image of this company is superior to that of its competitors	
	COMP5	5. Competitors find it hard to gain a competitive advantage over my company	
Sustainability-oriented resource availability	RES_AV1	1. Our company has qualified human resources to adopt sustainable operations	Jiao et al., 2020
	RES_AV2	2. Our company has a stable and reliable source of environmentally friendly materials	
	RES_AV3	3. Our company has the necessary knowledge and technologies relevant to sustainable operations adoption	
	RES_AV4	4. Our company has energy-efficiency production equipment to support sustainable operations adoption	
	RES_AV5	5. Our company has a supportive external environment, such as technology alliance with technology institutions and cooperation with universities	
Innovative capabilities	INN_CAP1	1. Innovation capability is a key factor for recruitment	Ávila (2022)
	INN_CAP2	2. On the whole, our company encourages staff to be innovative	
	INN_CAP3	3. Our company always procures the acquisition of new skills and/or equipment to improve manufacturing operations or service-oriented processes	
	INN_CAP4	4. New skills are always being developed so as to transform old products into new and innovative ones. These products are destined for the market	
	INN_CAP5	5. Our company has superior research and development capabilities for new products or services in comparison to that of our competitors	
Responsible innovation	RESP_INN1	1. Our company produces new products/services that demonstrate a willingness to add value to customers' well-being	Adomako and Tran (2022)
	RESP_INN2	2. On average, each year, we introduce new products/ services that provide social welfare needs of our customers	
	RESP_INN3	3. Industry experts would say that we are more prolific when it comes to launching products that aim at implementing resource conservation and environmental protection	
	RESP_INN4	4. Our new product offerings offer solutions for a better future	
	RESP_INN5	5. Our company has introduced new products/services that capture the responsible side of innovation	
	RESP_INN6	6. Our company is good at introducing responsible solutions to a meaningful problem	
Organisational support	ORG_SUPP1	1. I think our top management initiates environmental strategies to improve environmental performance	Lee et al., 2018
	ORG_SUPP2	2. I think our company provides resources to deal with environmental issues	
	ORG_SUPP3	3. I think our company provides written guidelines on how to follow green practices	
	ORG_SUPP4	4. I think our company provides a code of environmental ethics and standards of practice for the environment	

(continued)

Table 2

Constructs	Coding	Items	References
CEO Age	CEO_AGE	Your age is: 1. 18–3; 2. 31–45; 3. 46–60; 4. more than 60	Branca <i>et al.</i> , 2025; Intenza <i>et al.</i> , 2025
CEO Gender	CEO_GENDER	Your gender is: 1. Male; 2. Female; 3. Other	Ciampi <i>et al.</i> , 2021; Marzi <i>et al.</i> , 2023
CEO Experience	CEO_EXP	Your experience in the industry where your company is operating: 1. less than 1 year; 2. 1–5 years; 3. 6–10 years; 4. more than 10 years	Ciampi <i>et al.</i> , 2021; Marzi <i>et al.</i> , 2023
Firm Size	FIRM_SIZE	The number of employees in your company is: 1. Less than 5; 2. 5–20; 3. 21–50; 4. 51–250; 5. 250–500; 6. Greater than 500	Marzi <i>et al.</i> , 2023
Sector	SECTOR	How do you define the sector your company is operating in? 0. Low-tech; 1. High-tech	Ramirez <i>et al.</i> , 2018
Market	MARKET	The main customers of your company are: 0. Business-to-business customer; 1. Mass market customer	Marzi <i>et al.</i> , 2023

Source(s): Authors' elaboration

variables (*RES_AV* and *INN_CAP*) are assumed to exert a positive effect on the mediators (*RESP_INN* and *ORG_SUPP*), which subsequently influence the dependent variable (*COMP*).

The hypothesis testing proceeded through three stages.

The initial step involved examining the baseline relationships by estimating the following regression models (*H1a–H1b*):

$$COMP_i = \beta_0 + \beta_1 * RES_AV_{ij} + \sum \beta_{ij} Control_variables_{ij} + \epsilon_{ij} \quad (1A)$$

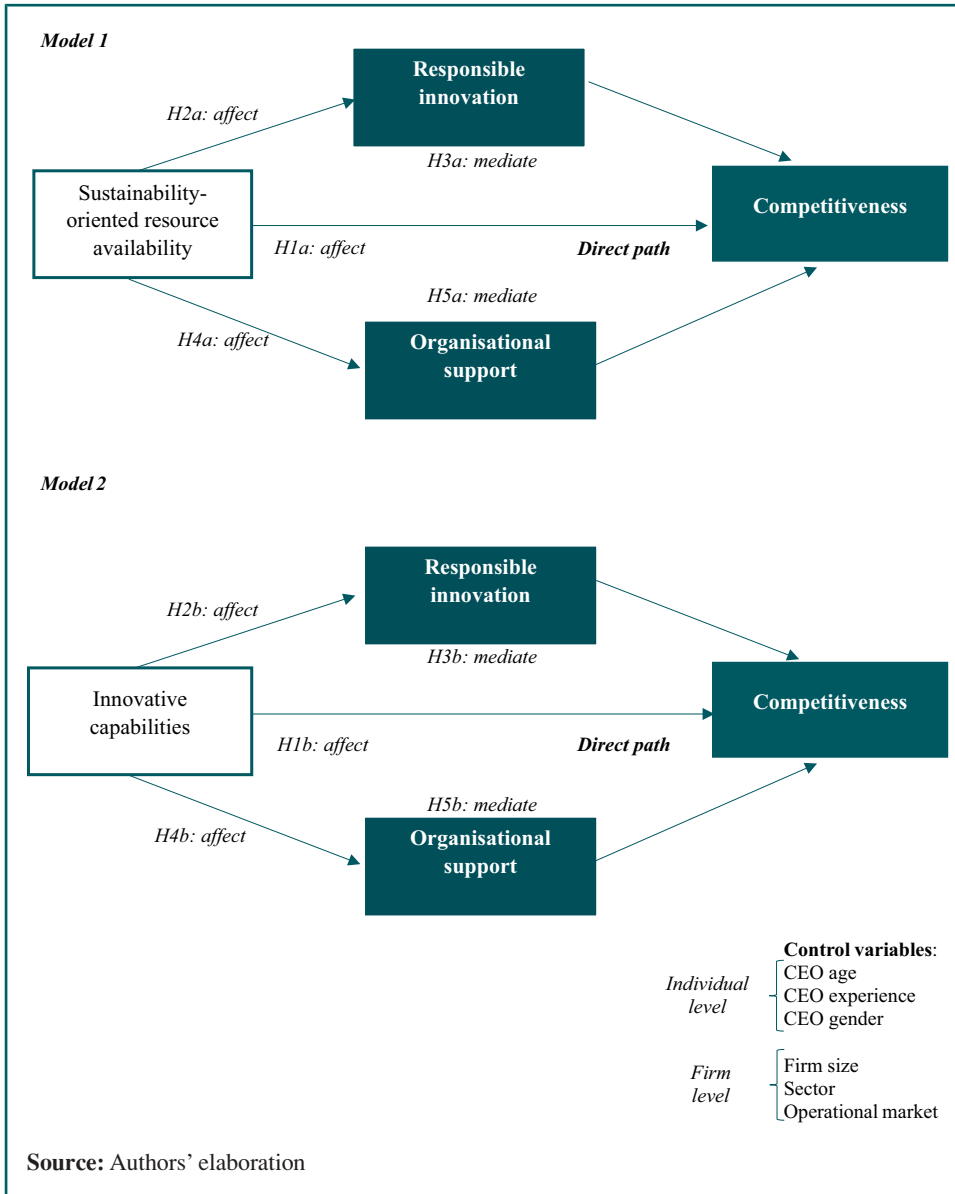
$$COMP_i = \beta_0 + \beta_1 * INN_CAP_{ij} + \sum \beta_{ij} Control_variables_{ij} + \epsilon_{ij} \quad (1B)$$

The second step was devoted to assessing the association between the independent variables (*RES_AV* and *INN_CAP*) and the mediators (*RESP_INN* and *ORG_SUPP*). Specifically, the econometric specifications for these relationships are outlined as follows (*H2a–H2b*; *H3a–H3b*):

$$RESP_INN_i = \beta_0 + \beta_1 * RES_AV_{ij} + \sum \beta_{ij} Control_variables_{ij} + \epsilon_{ij} \quad (2A)$$

$$RESP_INN_i = \beta_0 + \beta_1 * INN_CAP_{ij} + \sum \beta_{ij} Control_variables_{ij} + \epsilon_{ij} \quad (2B)$$

Figure 1 Dual-path conceptual model



$$ORG_SUPP_i = \beta_0 + \beta_1 * RES_AV_{ij} + \sum \beta_{ij} Control_variables_{ij} + \epsilon_{ij} \quad (3A)$$

$$ORG_SUPP_i = \beta_0 + \beta_1 * INN_CAP_{ij} + \sum \beta_{ij} Control_variables_{ij} + \epsilon_{ij} \quad (3B)$$

The third step consisted of evaluating the mediating variables' role as significant predictors of the primary relationships by incorporating them together with the independent variables in the regression models for the dependent variable. Accordingly, the following models were specified (H4a–H4b; H5a–H5b):

$$COMP_i = \beta_0 + \beta_1 * RES_AV_{ij} + \beta_2 * RESP_INN_{ij} + \sum \beta_{ij} Control_variables_{ij} + \epsilon_{ij} \quad (4A)$$

$$COMP_i = \beta_0 + \beta_1 *INN_CAP_{ij} + \beta_2 *RESP_INN_{ij} + \sum \beta_{ij} Control_variables_{ij} + \varepsilon_{ij} \quad (4B)$$

$$COMP_i = \beta_0 + \beta_1 *RES_AV_{ij} + \beta_2 *ORG_SUPP_{ij} + \sum \beta_{ij} Control_variables_{ij} + \varepsilon_{ij} \quad (5A)$$

$$COMP_i = \beta_0 + \beta_1 *INN_CAP_{ij} + \beta_2 *ORG_SUPP_{ij} + \sum \beta_{ij} Control_variables_{ij} + \varepsilon_{ij} \quad (5B)$$

In addition to the causal steps approach described above, we used the Sobel test and path analysis to strengthen our empirical findings (Baron and Tang, 2011; Sobel, 1982; Zhao *et al.*, 2010).

5. Findings

5.1 Common method bias, reliability and validity

Common method bias (CMB) may have potentially existed in such a survey-based cross-sectional analysis (Podsakoff *et al.*, 2003). To safeguard our results from the potential influence of CMB, we adopted a comprehensive analytical approach encompassing confirmatory factor analysis (CFA), tests of reliability, measures of sampling adequacy, and normality checks.

CFA was used to examine the underlying structure of the data (Brown and Moore, 2012; Harrington, 2009). It specifically assesses the extent to which the proposed factorial structure can accurately reproduce the observed covariance matrix among a set of variables. Table 3 presents the factor loadings derived from the CFA for a single-factor solution, where notably high positive loadings corroborate a strong association with the latent construct. All factor loadings are statistically significant at $p < 0.001$, suggesting that the probability of these patterns arising by random chance is exceedingly low, thus reinforcing the robustness and reliability of the findings.

Cronbach's alpha coefficients were calculated for each latent construct to evaluate internal consistency (Anderson and Gerbing, 1988). All constructs demonstrated Cronbach's alpha values surpassing the recommended threshold of 0.70, indicating acceptable levels of reliability. Besides, the average variance extracted (AVE) scores surpass the 0.50 threshold (Table 3), thus corroborating the convergent validity of the construct measurements (Hair *et al.*, 2021). Kaiser–Meyer–Olkin (KMO) measure was used to assess sampling adequacy (Nunnally, 1978). The KMO values exceeded the critical benchmark of 0.50 (Hair *et al.*, 1979), thereby satisfying the requisites for factor analysis and confirming the suitability of the data for such procedures. Furthermore, Bartlett's test of sphericity produced highly significant results across all constructs, further supporting the appropriateness of the data for factor analysis.

Finally, after assessing the multivariate normality through the Shapiro–Wilk test, latent variables were transformed using the Box–Cox procedure [2] (Box and Cox, 1964). The latter is a commonly used methodological approach to transform the data distribution into a normal distribution.

5.2 Descriptive statistics and multicollinearity tests

Multicollinearity was assessed using Pearson correlation coefficients alongside Variance inflation factors (VIFs). As shown in Table 4, the majority of Pearson correlation values fall below ± 0.7 . Still, all VIF values are below the commonly accepted threshold of 5, pointing out that the selected explanatory variables likely represent different underlying latent constructs. Consequently, multicollinearity does not pose a significant issue within our OLS regression models, thereby enabling more dependable interpretation of the relationships among the variables (Hair, 2014).

Table 3 Reliability and validity checks

<i>Constructs and items</i>	<i>One factor solution (CFA)</i>	<i>Cronbach's alpha</i>	<i>AVE</i>	<i>KMO Bartlett's test of sphericity</i>
Competitiveness		0.885	0.633	KMO: 0.883 Chi-square: 1236.719 Sig. level: 0.000
COMP1	0.810			
COMP2	0.809			
COMP3	0.848			
COMP4	0.836			
COMP5	0.835			
Sustainability-oriented resource availability		0.846	0.572	KMO: 0.840 Chi-square: 1050.382 Sig. level: 0.000
RES_AV1	0.837			
RES_AV2	0.737			
RES_AV3	0.868			
RES_AV4	0.839			
RES_AV5	0.664			
Innovative capabilities			0.607	KMO: 0.867 Chi-square: 1145.997 Sig. level: 0.000
INN_CAP1	0.802	0.872		
INN_CAP2	0.847			
INN_CAP3	0.819			
INN_CAP4	0.826			
INN_CAP5	0.780			
Responsible innovation		0.890	0.599	KMO: 0.900 Chi-square: 1491.132 Sig. level: 0.000
RESP_INN1	0.811			
RESP_INN2	0.758			
RESP_INN3	0.776			
RESP_INN4	0.840			
RESP_INN5	0.822			
RESP_INN6	0.816			
Organisational support		0.786	0.808	KMO: 0.855 Chi-square: 1581.368 Sig. level: 0.000
ORG_SUPP1	0.902			
ORG_SUPP2	0.909			
ORG_SUPP3	0.910			
ORG_SUPP4	0.915			

Note(s): No. of observations: 493

Source(s): Authors' elaboration using Stata[®] and JASP[®] software

Table 5 shows the descriptive statistics of the variables included in our research design (Figure 1). The dependent variable, *COMP*, exhibits a minimum score of 5 and a maximum of 35, with an average of 21.64 (SD=6.38). Among the independent latent variables, *RES_AV* ranges from 5 to 35, with a mean of 22.33 (SD=6.54), while *INN_CAP* presents a mean of 22.93 (SD=6.30), also spanning the same range. The mediating variables, *RESP_INN* and *ORG_SUPP*, report a means of 27.09 (SD=7.62) and 17.42 (SD=6.61), respectively, with scores covering their respective ranges.

Control variables enable us to detect the demographic features of our sample. For instance, *CEO_AGE* has an average value of 2.11 (SD=0.76), suggesting that the bulk of managers are between 31 and 60 years old. Moreover, *CEO_EXP* averaged 3.06 (SD=0.92), suggesting that most managers reported their industry experience to be in the range of

Table 4 Pearson correlation matrix

Variables	VIF	1	2	3	4	5	6	7	8	9	10
1. RES_AV	1.37	1									
2. INN_CAP	1.92	0.64***	1								
3. RESP_INN	2.15	0.61***	0.70***	1							
4. ORG_SUPP	2.53	0.78***	0.61***	0.59***	1						
5. CEO_AGE	2.28	0.04	-0.04	-0.04	0.06	1					
6. CEO_GENDER	2.11	0.02	0.04	0.03	0.08*	0.03	1				
7. CEO_EXP	2.06	0.05	-0.03	-0.07	0.08*	0.47***	-0.10**	1			
8. FIRM_SIZE	1.96	0.25***	0.14***	0.19***	0.25***	0.09**	-0.07	0.06	1		
9. SECTOR	1.88	-0.20***	-0.22***	-0.17***	-0.21***	0.07	0.08*	-0.00	-0.15***	1	
10. MARKET	1.82	0.04	-0.02	-0.11**	0.01	0.03	-0.09**	0.11**	0.00	0.05	1

Note(s): No. of observations: 493

Source(s): Authors' elaboration using Stata® software

Table 5 Descriptive statistics

Variables	Type	Variable	Label	Min.	Max.	Mean	SD
Competitiveness	Dependent	Continuous	COMP	5	35	21.64	6.38
sustainability-oriented resource availability	Independent	Continuous	RES_AV	5	35	22.33	6.54
Innovative capabilities	Independent	Continuous	INN_CAP	5	35	22.93	6.30
Responsible innovation	Mediating factor	Continuous	RESP_INN	6	42	27.09	7.62
Organisational support	Mediating factor	Continuous	ORG_SUPP	4	28	17.42	6.61
CEO age	Control	Categorical (ordinal)	CEO_AGE	1	4	2.11	0.76
CEO gender	Control	Categorical (nominal)	CEO_GENDER	0	3	1.25	0.45
CEO experience	Control	Categorical (ordinal)	CEO_EXP	1	4	3.06	0.92
Firm size	Control	Categorical (ordinal)	FIRM_SIZE	1	6	3.56	1.07
Sector	Control	Categorical (dummy)	SECTOR	0	1	0.48	0.50
Operational market	Control	Categorical (dummy)	MARKET	0	1	0.23	0.42

Note(s): No. of observations: 493

Source(s): Authors' elaboration using Stata® software

6–10 years. *CEO_GENDER* ranges from 0 to 3 with a mean value of 1.25 (SD=0.45), thus suggesting that the sample includes a balanced mix of genders. *FIRM_SIZE* has a mean of 3.56 (SD=1.07), further corroborating that our sample focused on SMEs. Additional categorical controls include *SECTOR* and *MARKET*, with mean values of 0.48 and 0.23, respectively. This figures out that the majority of the SMEs in our sample operate within the business-to-business (B2B) segment, and that the sample encompasses firms from both high- and low-technology industries.

5.3 Data analysis

5.3.1 Analysis of the EU sub-sample. Table 6 sets out the regression results for the EU sub-sample. Model A refers to the results when resource availability acts as the key explanatory variable; alternatively, Model B illustrates the empirical evidence when innovative capabilities are considered as the independent variable. Starting with Model 1A, the results show that *RES_AV* significantly predicts *COMP* ($\beta=0.27$, $p < 0.01$), fulfilling the first condition of Baron and Kenny (1986). Models 2A-3A highlights that *RES_AV* also significantly influences *RESP_INN* ($\beta = 1.09$, $p < 0.01$) and *ORG_SUPP* ($\beta=0.16$, $p < 0.01$). These results support the second condition, confirming that the independent variable is significantly associated with the mediators. Moving to the mediating models, Models 4A-5B

display that *RESP_INN* positively mediates both the relationship between *RES_AV* and *COMP* ($\beta=0.11$, $p < 0.01$), as well as *INN_CAP* and *COMP* ($\beta=0.07$, $p < 0.01$), thus satisfying the third condition. Moreover, *ORG_SUPP* positively mediates the basic relationships between *RES_AV* and *COMP* ($\beta=0.30$, $p < 0.10$), as well as *INN_CAP* and *COMP* ($\beta=0.25$, $p < 0.05$). Indeed, when the mediators are included in the regressions, the coefficient for the independent variables (*RES_AV* and *INN_CAP*) decreases but remains significant.

To infer, partial mediation rather than full mediation was found in Models 4A-4B-5A-5B (Zhao *et al.*, 2010).

5.3.2 Analysis of the UK Sub-sample. Table 7 presents the findings for the UK sub-sample, reflecting a similar pattern to the EU context. In particular, *RES_AV* exerts a significant positive effect on *COMP* (Model 1A: $\beta = 0.20$, $p < 0.01$), thereby meeting the first condition of mediation. Subsequent models (2A-3A) demonstrate that *RES_AV* significantly predicts both *RESP_INN* ($\beta = 0.83$, $p < 0.01$) and *ORG_SUPP* ($\beta = 0.23$, $p < 0.01$), confirming the second condition. In models incorporating the mediators, both *RESP_INN* and *ORG_SUPP* positively mediate the relationship between *RES_AV* and *COMP* (Model 4A: $\beta = 0.14$, $p < 0.01$; Model 5A: $\beta = 0.31$, $p < 0.05$). Furthermore, when considering *INN_CAP* as an independent variable, both *RESP_INN* and *ORG_SUPP* positively mediate the baseline relationship (Model 4B: $\beta = 0.09$, $p < 0.01$; Model 5B: $\beta = 0.21$, $p < 0.10$). Indeed, the coefficients for *RES_AV* and *INN_CAP* considerably diminish upon inclusion of the mediating variables, satisfying the second condition for mediation.

Thus, these results suggest partial mediation rather than full mediation prevails in Models 4A-4B-5A-5B (Zhao *et al.*, 2010).

5.3.3 Analysis of the US sub-sample. Table 8 sets out the results regarding the US sub-sample. Notably, *RES_AV* demonstrates a significant positive effect on *COMP* (Model 1A: $\beta = 0.19$, $p < 0.01$), thus meeting the first criterion of mediation. Focussing on Models 2A-3A, *RES_AV* significantly predicts both *RESP_INN* ($\beta = 1.00$, $p < 0.01$) and *ORG_SUPP* ($\beta = 0.24$, $p < 0.01$), thereby confirming the second condition. When mediators are included in the models, the results from Models 4A-4B and 5A-5B indicate that, within the US context, neither *RESP_INN* nor *ORG_SUPP* effectively mediate the baseline relationships. Unlike the patterns observed in the EU and UK samples, such empirical evidence suggests that sustainable drivers do not play a substantial mediating role in the USA, implying that other mechanisms might be driving the relationship between resource endowments, innovation capabilities, and competitiveness in this context.

5.4 Robustness and post hoc analyses

To substantiate our empirical evidence, we conducted three main robustness checks. The former two, namely the path analysis and Sobel, tests were performed to appraise the statistical significance of the indirect effects of the independent variables (*RES_AV* and *INN_CAP*) on competitiveness via responsible innovation and organisational support (Baron and Kenny, 1986; MacKinnon and Dwyer, 1993; Sobel, 1982; Wright, 1934); whereas, the fit indices values were calculated to assess the overall adequacy of each regression model (Yin *et al.*, 2022).

Table 9 presents the path analysis results with resource availability as the main independent variable, while Table 10 presents those with innovative capabilities as the main explanatory variable. However, both are performed by using the bootstrap technique across the three sub-samples. Specifically, Table 9 exhibits the path analyses with *RESP_INN* and *ORG_SUPP* as mediators, unveiling a positive and significant total effect of *RES_AV* on *COMP* in most of the three subsamples [Panel A (EU): $c + (a * b) = 0.50$, $p < 0.01$; Panel A (UK): $c + (a * b) = 0.48$, $p < 0.01$; Panel A (USA): $c + (a * b) = 0.32$, $p < 0.01$; Panel B (EU): $d + (e * f) = 0.88$, $p < 0.05$; Panel B (UK): $d + (e * f) = 0.82$, $p < 0.05$], thereby corroborating

H1a. The results fully corroborate *H2a* and *H4a* for the EU and UK subsamples when *RESP_INN* mediates the basic relationship. In particular, the direct effect of *RES_AV* on *RESP_INN* [Panel A (EU): $a = 1.02, p < 0.01$] and the mediating effect of this variable [Panel A (EU): $a * b = 0.23, p < 0.01$] are both positive and statistically significant. Similar empirical evidence is observed for the UK setting [Panel A (UK): $a = 0.83, p < 0.01$; Panel A (UK): $a * b = 0.27, p < 0.01$]. However, the findings when *ORG_SUPP* is included as a mediating factor do not attain the same level of statistical significance. Even though *H3a* is supported across all sub-samples [Panel B (EU): $e = 0.22, p < 0.01$; Panel B (UK): $e = 0.23, p < 0.01$; Panel B (EU): $e = 0.24, p < 0.01$], the mediating hypothesis *H5a* is not confirmed.

Table 10 reveals a positive and significant total effect of *INN_CAP* on *COMP* in almost all subsamples [Panel A (EU): $c + (a * b) = 0.14, p < 0.05$; Panel A (UK): $c + (a * b) = 0.18, p < 0.05$; Panel B (EU): $d + (e * f) = 0.76, p < 0.01$; Panel B (UK): $d + (e * f) = 0.62, p < 0.05$], thereby corroborating *H1b*. The empirical findings fully support *H2b* and *H4b* solely for the EU and UK subsamples when *RESP_INN* acts as a mediating variable. Specifically, the direct effect of *INN_CAP* on *RESP_INN* [Panel A (EU): $a = 0.92, p < 0.01$; Panel A (UK): $a = 0.72, p < 0.01$] and the mediating outcomes [Panel A (EU): $a * b = 0.14, p < 0.05$; Panel A (UK): $a * b = 0.18, p < 0.05$] are both positive and statistically significant. Nonetheless, the findings involving *ORG_SUPP* as a mediator do not reach the same levels of statistical significance. Although *H3b* is supported across all sub-samples [Panel B (EU): $e = 0.15, p < 0.01$; Panel B (UK): $e = 0.13, p < 0.01$; Panel B (EU): $e = 0.15, p < 0.01$], the mediating hypothesis *H5b* is only confirmed in the EU subsample [Panel B (EU): $e * f = 0.50, p < 0.10$].

The Sobel statistic is calculated as the ratio of the indirect effect to its standard error, which can then be tested against the standard normal distribution to determine significance (Zhao *et al.*, 2010). As shown in **Table 11**, the results predominantly indicate partial mediation across most pathways. These findings provide robust evidence supporting the mediating roles of both responsible innovation and organisational support within the EU and UK geopolitical contexts. Conversely, in the US sub-sample, these drivers do not exhibit a significant mediating influence, suggesting that their role in facilitating the relationship between resources, innovation capacity, and competitiveness is scant or missing in this setting.

To evaluate the goodness of the models, **Table 11** presents the fit indices across the three sub-samples (i.e. EU, UK, and USA). The root mean square error of approximation (RMSEA) measures the discrepancy between the model and the data, with values below 0.08 pointing out a good fit (Steiger, 1990). All RMSEA values are roughly around 0.07 or 0.09, suggesting an acceptable fit across all groups. The standardised root mean square residual (SRMR) reflects the difference between observed and model-implied correlations, with values under 0.08 generally deemed acceptable (Hu and Bentler, 1999). In our analysis, SRMR values mostly range between 0.07 and 0.09, supporting the effectiveness of the models. The comparative fit index (CFI) and Tucker–Lewis Index (TLI) values above 0.90 are typically regarded as indicative of a good fit (Hu and Bentler, 1999). In this context, CFI and TLI indices exceed 0.84, with many approaching or surpassing 0.90, denoting satisfactory model adequacy. Values of PCMIN/DF below 3 are preferred (Kline, 2016); in our case, ratios range from roughly 1.68 to 2.91, further endorsing the suitability of the models. These fit indices, on the whole, hint at the validity and robustness of the estimated models.

Concerning the hypothesis testing (**Table 11**), the empirical evidence meets most of the assumed relationships. In the EU sample, *H4a*, *H5a*, and *H5b* are completely supported, suggesting strong validation. Conversely, *H5a* and *H5b* related to the mediating role of organisational support are only moderately supported in the EU and UK samples, while in the US sample, the hypotheses are rejected.

Table 6 Regression analysis (EU)

Variables	Model 1A Y = COMP	Model 2A Y = RESP_INN	Model 3A Y = ORG_SUPP	Model 4A Y = COMP	Model 5A Y = COMP	Model 1B Y = COMP	Model 2B Y = RESP_INN	Model 3B Y = ORG_SUPP	Model 4B Y = COMP	Model 5B Y = COMP
RES_AV	0.27*** (0.03)	1.09*** (0.10)	0.22*** (0.01)	0.16*** (0.04)	0.21*** (0.05)	0.27*** (0.02)	0.92*** (0.07)	0.15*** (0.01)	0.20*** (0.03)	0.23*** (0.03)
INN_CAP	—	—	—	0.11*** (0.02)	—	—	—	—	—	—
RESP_INN	—	—	—	—	—	—	—	—	—	—
ORG_SUPP	—	—	—	—	0.30* (0.18)	—	—	—	—	0.25** (0.13)
CEO_AGE	-3.23 (2.04)	11.83** (5.33)	-0.01 (0.92)	-4.56** (1.79)	-3.22 (1.99)	-2.21 (1.77)	14.90** (6.26)	0.17 (1.22)	-3.23** (1.62)	-2.25 (1.68)
CEO_EXP	0.06 (1.26)	-15.94*** (4.60)	1.37** (0.68)	1.86 (1.21)	-0.35 (1.28)	0.18 (1.17)	-15.34*** (4.68)	1.61* (0.89)	1.22 (1.17)	0.22 (1.12)
CEO_GENDER	-3.45 (2.30)	6.86 (9.05)	-3.11** (1.47)	-4.23** (2.06)	-2.51 (2.16)	-2.37 (2.07)	10.87 (7.70)	-2.27 (1.62)	-3.11 (1.99)	-1.80 (1.94)
FIRM_SIZE	-0.66 (1.02)	3.62 (3.36)	1.20 (0.58)	-1.07 (0.99)	-1.03 (1.06)	-0.01 (0.94)	6.42** (3.32)	2.04*** (0.67)	-0.45 (0.94)	0.52 (0.98)
SECTOR	-2.63 (2.52)	2.57 (8.55)	1.19 (1.43)	-2.92 (2.23)	-2.99 (2.54)	-1.35 (2.34)	6.39 (8.28)	1.40 (1.66)	-1.79 (2.22)	-1.71 (2.35)
MARKET	-4.91* (2.56)	-16.30* (8.64)	-2.89* (1.54)	-3.07 (2.38)	-4.03 (2.62)	-3.65 (2.30)	-12.33 (7.83)	-2.53 (1.78)	-2.80 (2.22)	-3.02 (2.22)
Constant	42.49** (7.94)	23.80*** (23.80)	4.06 (4.66)	34.83*** (7.02)	41.27*** (7.78)	28.66*** (7.46)	25.93 (22.17)	1.30 (5.66)	26.88*** (7.01)	28.34*** (7.34)
No. of obs.	150	150	150	150	150	150	150	150	150	150
F-statistics	19.73***	24.65***	54.71***	23.36***	18.16***	27.96***	33.88***	21.81***	27.66***	25.46***
R ²	0.44	0.49	0.63	0.52	0.46	0.56	0.56	0.48	0.59	0.58
Mean VIF	1.15	1.15	1.15	1.38	1.55	1.15	1.15	1.15	1.45	1.35

Note(s): The standard errors in parentheses are robust to heteroskedasticity and autocorrelation; latent variables have undergone a transformation process via the Box-Cox technique *Significance levels:* * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source(s): Authors' elaboration using Stata® software

Table 7 Regression analysis (UK)

Variables	Model 1A Y = COMP	Model 2A Y = RESP_INN	Model 3A Y = ORG_SUPP	Model 4A Y = COMP	Model 5A Y = COMP	Model 1B Y = COMP	Model 2B Y = RESP_INN	Model 3A Y = ORG_SUPP	Model 4B Y = COMP	Model 5B Y = COMP
RES_AV	0.20** (0.03)	0.83*** (0.09)	0.23*** (0.01)	0.09** (0.08)	0.13*** (0.04)	0.21*** (0.02)	0.72*** (0.06)	0.13*** (0.01)	0.14*** (0.03)	0.18*** (0.03)
INN_CAP	—	—	—	0.14*** (0.06)	—	—	—	—	0.09*** (0.02)	—
RESP_INN	—	—	—	—	—	—	—	—	—	—
ORG_SUPP	—	—	—	—	0.31** (0.14)	—	—	—	—	0.21* (0.12)
CEO_AGE	-2.43* (1.39)	-11.03*** (3.78)	-0.57 (0.64)	-0.92 (1.39)	-2.25 (1.37)	-0.93 (1.34)	-5.45 (3.74)	0.68 (0.82)	-0.43 (1.34)	-1.07 (1.31)
CEO_EXP	-0.81 (1.23)	0.02 (3.30)	0.94 (0.62)	-0.81 (1.12)	-1.10 (1.23)	0.08 (1.14)	2.86 (3.17)	1.26* (0.71)	-0.18 (1.06)	-0.18 (1.14)
CEO_GENDER	-4.46** (2.19)	1.53 (5.98)	4.99*** (0.99)	-4.67** (2.16)	-6.00** (2.40)	-6.17*** (2.10)	-3.58 (5.88)	4.69*** (1.20)	-5.85*** (2.09)	-7.15*** (2.21)
FIRM_SIZE	0.08 (0.92)	2.36 (2.92)	0.71 (0.47)	-0.24 (0.81)	-0.14 (0.93)	1.11 (0.87)	7.05*** (2.44)	2.34*** (0.56)	0.47 (0.82)	0.63 (0.92)
SECTOR	0.60 (2.08)	-4.60 (5.76)	-1.82** (0.95)	1.24 (1.99)	1.17 (2.10)	2.25 (1.92)	-0.33 (5.46)	-2.11* (1.22)	2.28 (1.89)	2.69 (1.92)
MARKET	0.84 (2.36)	-21.79*** (6.99)	2.10** (0.95)	3.81* (2.18)	0.19 (2.39)	1.71 (2.11)	-18.06*** (6.14)	3.26** (1.37)	3.35 (2.09)	1.03 (2.10)
Constant	41.45*** (8.32)	126.91*** (24.70)	-4.32 (3.53)	24.15*** (8.07)	42.79*** (8.46)	23.32*** (7.89)	71.15*** (20.35)	-8.91** (4.70)	16.87** (7.91)	25.17*** (7.92)
No. of obs.	249	249	249	249	249	249	249	249	249	249
F-statistics	6.83***	20.73***	80.48***	11.88***	6.22***	14.60***	25.03***	42.30***	14.68***	12.81***
R ²	0.20	0.37	0.64	0.32	0.22	0.33	0.46	0.44	0.38	0.34
Mean VIF	1.15	1.15	1.15	1.28	1.56	1.13	1.13	1.13	1.33	1.30

Note(s): The standard errors in parentheses are robust to heteroskedasticity and autocorrelation; Latent variables have undergone a transformation process via the Box-Cox technique, *Significance levels:* * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$
Source(s): Authors' elaboration using Stata[®] software

6. Discussion

This study deepens our understanding of how internal resources and innovation capabilities translate into long-term competitiveness in manufacturing SMEs. The empirical results corroborate the core tenets of the RBV, which suggest that competitiveness depends on the effective mobilisation of VRIN resources (Barney, 1991; Wernerfelt, 1984). At the same time, the findings enrich this perspective by showing that resources and capabilities gain strategic relevance only when they are activated through mechanisms that reflect sustainability and knowledge dynamics. This evidence, therefore, posits the RBV within a broader theoretical domain that also encompasses the NRBV and the KBV, thereby highlighting how environmental orientation and knowledge integration jointly drive long-term advantage.

While previous research often examined innovation or environmental commitment in isolation (e.g. Do *et al.*, 2022; Halme and Korpela, 2014; Porter and Kramer, 2011), our results provide new empirical insights into their interactive effects. We demonstrate that sustainability-oriented resources and innovative capabilities are most effective when channelled through organisational and ethical processes that align firms' internal conditions with societal expectations. This integrated view supports a dynamic understanding of competitiveness, where environmental legitimacy and knowledge creation operate as complementary forces rather than separate strategic domains.

The cross-country comparison further nurtures this interpretation. The partial mediation identified in the EU and UK samples, contrasted with the absence of significant effects in the US context, indicates that institutional and cultural frameworks dictate how internal resources are leveraged. Such evidence underscores the relevance of a context-sensitive reading of the RBV and aligns with research calling for a more embedded approach to competitiveness that accounts for institutional diversity and stakeholder pressures (Brouthers *et al.*, 2008; Liu and Wang, 2025).

Overall, the empirical evidence highlights that while internal resources remain the cornerstone of competitive advantage, their transformation into long-term performance needs ethical, organisational, and contextual mechanisms. These insights bridge established theories on resource value with emerging perspectives on sustainability and knowledge management. The following sections elaborate on these findings by presenting their theoretical implications (§ 6.1) and managerial and policy implications (§ 6.2).

6.1 Theoretical implications

The results offer intriguing insights into how sustainability-oriented resource availability and innovation capabilities contribute to the competitiveness of manufacturing SMEs (El Nemar *et al.*, 2022; Halme and Korpela, 2014; Lukovszki *et al.*, 2021). Grounded in the RBV (Barney, 1991; Wernerfelt, 1984) and extended through the complementary lenses of the NRBV (Hart, 1995; Hart and Dowell, 2011) and KBV (Grant, 1996; Spender, 1996), the proposed dual-path model assumes that responsible innovation (Owen *et al.*, 2012; Stilgoe *et al.*, 2013) and organisational support (Aarons *et al.*, 2014; Schein, 2010) act as mediators, transforming internal resource endowments into strategic outcomes. Therefore, the findings strongly corroborate the RBV: while direct effects on competitiveness are evident across all sub-samples, the mediating roles of responsible innovation and organisational support – characterised by partial mediation – are statistically confirmed only in the EU and UK.

These results substantiate and extend the RBV's central tenets while introducing novel elements that integrate sustainability-oriented and knowledge-based dimensions into the theory. In line with prior studies (Do *et al.*, 2022; Porter and Kramer, 2011), our findings reinforce the strategic relevance of responsible innovation and organisational support in shaping SMEs' competitiveness. However, the absence of mediation effects in the US

Table 8 Regression analysis (US)

Variables	Model 1A Y = COMP	Model 2A Y = RESP_INN	Model 3A Y = ORG_SUPP	Model 4A Y = COMP	Model 5A Y = COMP	Model 1B Y = COMP	Model 2B Y = RESP_INN	Model 3A Y = ORG_SUPP	Model 4B Y = COMP	Model 5B Y = COMP
RES_AV	0.19*** (0.04)	1.00*** (0.12)	0.24*** (0.02)	0.14** (0.06)	0.22*** (0.06)	0.17*** (0.04)	0.93*** (0.09)	0.15*** (0.02)	0.13** (0.06)	0.15*** (0.04)
INNL_CAP	-	-	-	0.04 (0.04)	-	-	-	-	0.04 (0.05)	-
RESP_INN	-	-	-	-	-	-	-	-	-	-
ORG_SUPP	-	-	-	-	-0.16 (0.17)	-	-	-	-	0.14 (0.14)
CEO_AGE	1.69 (2.21)	-1.65 (6.81)	0.58 (1.30)	1.76 (2.22)	1.78 (2.25)	1.96 (2.12)	-0.25 (9.08)	1.12 (1.89)	1.96 (2.09)	1.80 (0.14)
CEO_EXP	-3.72 (2.24)	-4.28 (6.69)	-0.78 (1.30)	-3.53 (2.19)	-3.85* (2.27)	-3.12 (2.19)	-0.76 (6.57)	-0.88 (1.68)	-3.09 (2.19)	-2.99 (2.18)
CEO_GENDER	6.10 (3.73)	17.82 (11.12)	2.39 (1.66)	5.31 (3.71)	6.49* (3.80)	4.17 (3.19)	7.71 (8.97)	-1.05 (2.63)	3.88 (3.23)	4.32 (3.13)
FIRM_SIZE	0.48 (2.43)	3.36 (8.02)	0.58 (1.16)	0.33 (2.43)	0.57 (2.44)	0.34 (2.51)	2.64 (6.27)	0.44 (1.49)	0.24 (2.53)	0.28 (2.52)
SECTOR	-3.42 (3.06)	-7.15 (8.57)	0.59 (1.48)	-3.10 (3.04)	-3.32 (3.04)	-4.06 (2.94)	-10.18 (8.09)	-1.55 (2.21)	-3.68 (2.91)	-3.84 (2.99)
MARKET	8.24*** (3.07)	3.79 (8.70)	-3.37** (1.54)	8.07*** (2.99)	7.68** (3.21)	7.70*** (2.92)	0.49 (8.33)	-2.64 (2.43)	7.69*** (2.92)	8.07*** (2.86)
Constant	22.17 (16.35)	36.69 (49.84)	3.81 (7.51)	20.55 (16.28)	22.80 (16.59)	20.88 (15.45)	26.07 (47.81)	14.14 (11.57)	19.91 (15.31)	18.91 (15.63)
No. of obs.	94	94	94	94	94	94	94	94	94	94
F-statistics	6.86***	11.42***	36.01***	6.71***	5.91***	7.70***	23.02***	7.97***	7.03***	7.05***
R ²	0.34	0.55	0.67	0.35	0.34	0.34	0.59	0.33	0.35	0.35
Mean VIF	1.31	1.31	1.31	1.58	1.79	1.30	1.30	1.30	1.61	1.39

Note(s): The standard errors in parentheses are robust to heteroskedasticity and autocorrelation; latent variables have undergone a transformation process via the Box-Cox technique, *Significance levels:* * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source(s): Authors' elaboration using Stata® software

Table 9 Path analysis with sustainability-oriented resource availability as explanatory variable

Testing path	Label	EU			UK			USA					
		Coefficient	BootSE	CI lower	CI upper	Coefficient	BootSE	CI lower	CI upper	Coefficient	BootSE	CI lower	CI upper
<i>Panel A: Path analysis with responsible innovation as a mediator</i>													
Direct effect													
Sustainability-oriented resource availability → responsible innovation	a	1.02***	0.10	0.83	1.21	0.83***	0.09	0.65	1.01	1.00***	0.12	0.78	1.23
Responsible innovation → competitiveness	b	0.18***	0.02	0.14	0.22	0.17***	0.09	0.13	0.21	0.12***	0.03	0.05	0.18
Sustainability-oriented resource availability → competitiveness	c	0.27***	0.03	0.21	0.33	0.21***	0.03	0.14	0.27	0.19***	0.04	0.11	0.26
Indirect effect													
Sustainability-oriented resource availability → responsible innovation → competitiveness	A * b	0.23***	0.08	0.06	0.40	0.27**	0.13	0.03	0.52	0.13	0.11	-0.08	0.35
Total effect													
Sustainability-oriented resource availability → competitiveness	c + (a * b)	0.50***	0.09	0.32	0.67	0.48***	0.13	0.23	0.73	0.32***	0.12	0.08	0.55
<i>Panel B: Path analysis with organisational support as a mediator</i>													
Direct effect													
Sustainability-oriented resource availability → organisational support	e	0.22***	0.03	0.19	0.25	0.23***	0.01	0.20	0.25	0.24***	0.02	0.21	0.28
Organisational support → competitiveness	f	0.84***	0.12	0.60	1.08	0.64***	0.11	0.43	0.84	0.44***	0.14	0.17	0.71
Sustainability-oriented resource availability → competitiveness	d	0.28***	0.03	0.21	0.33	0.21***	0.03	0.14	0.27	0.19***	0.04	0.11	0.26
Indirect effect													
Sustainability-oriented resource availability → organisational support → competitiveness	e * f	0.60	0.38	-0.15	1.36	0.62	0.41	-0.20	1.43	-0.49	0.46	-1.40	0.42
Total effect													
Sustainability-oriented resource availability → competitiveness	d + (e * f)	0.88**	0.38	0.12	1.63	0.82**	0.42	0.00	1.64	-0.31	0.47	-1.22	0.61

Note(s): The results of the path analysis with bootstrap procedure include all control variables; Latent variables have undergone a transformation process via the Box-Cox technique, *Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01*

Source(s): Authors' elaboration using Stata® software

Table 10 Path analysis with innovative capabilities as explanatory variable

Testing path	Label	EU			UK			USA					
		Coefficient	Boot SE	CI lower CI upper	Coefficient	Boot SE	CI lower CI upper	Coefficient	Boot SE	CI lower CI upper			
<i>Panel A: Path analysis with responsible innovation as a mediator</i>													
Direct effect													
Innovative capabilities → responsible innovation	a	0.92***	0.07	0.78	1.07	0.72***	0.06	0.60	0.84	0.93***	0.10	0.74	1.12
Responsible innovation → competitiveness	b	0.18***	0.02	0.14	0.22	0.17***	0.02	0.13	0.21	0.12***	0.03	0.05	0.18
Innovative capabilities → competitiveness	c	0.27***	0.02	0.22	0.31	0.21***	0.02	0.16	0.25	0.17***	0.04	0.10	0.24
Indirect effect													
Innovative capabilities → responsible innovation → competitiveness	A * b	0.14**	0.06	0.02	0.26	0.18**	0.09	-0.00	0.36	0.11	0.12	-0.12	0.34
Total effect													
Innovative capabilities → competitiveness	c + (a * b)	0.40***	0.07	0.27	0.53	0.39***	0.10	0.20	0.58	0.28**	0.12	0.04	0.53
<i>Panel B: Path analysis with organisational support as a mediator</i>													
Direct effect													
Innovative capabilities → organisational support	e	0.15***	0.01	0.12	0.18	0.13***	0.01	0.10	0.15	0.15***	0.02	0.10	0.19
Organisational support → competitiveness	f	0.84***	0.12	0.60	1.08	0.64***	0.11	0.43	0.84	0.44***	0.14	0.17	0.71
Innovative capabilities → competitiveness	d	0.27***	0.02	0.22	0.31	0.21***	0.02	0.16	0.25	0.17***	0.04	0.10	0.24
Indirect effect													
Innovative capabilities → organisational support → competitiveness	e * f	0.50*	0.29	-0.07	1.06	0.41	0.32	-0.22	1.02	0.42	0.36	-0.28	1.12
Total effect													
Innovative capabilities → competitiveness	d + (e * f)	0.76***	0.29	0.20	1.33	0.62**	0.32	-0.02	1.26	0.59	0.36	-0.12	1.30

Note(s): The results of the path analysis with bootstrap procedure include all control variables; latent variables have undergone a transformation process via the Box-Cox technique, *Significance levels: *p < 0.10; **p < 0.05; ***p < 0.01*

Source(s): Authors' elaboration using Stata® software

sub-sample suggests that the RBV's internalist stance cannot be universally generalised. Consistently with the NRBV's focus on environmental legitimacy and the KBV's emphasis on knowledge diffusion and learning, contextual contingencies can significantly affect how internal resources lead to competitive advantage. Consequently, our empirical evidence challenges a strictly firm-centred interpretation of the RBV and advocates for a more embedded, context-sensitive view (Brouthers *et al.*, 2008).

This study offers several theoretical contributions. First, we enrich the RBV by testing a dual-path model that accounts for how internal resource endowments are converted into competitive advantage not only through direct effects but also via sustainability-oriented mechanisms (Lichtenthaler, 2022). The integration of knowledge-based mediators – responsible innovation and organisational support – enhances the explanatory strength of the RBV in sustainability-sensitive environments. Second, our empirical evidence contributes to the growing body of literature that embeds sustainability into strategic and knowledge management (Carayannis *et al.*, 2017; Nguyen and Kanbach, 2024). On the one hand, responsible innovation emerges not as a passive response to regulatory or reputational pressures but as an active process through which firms engage stakeholders and refine their innovation practices in a socially conscious way (Owen *et al.*, 2012). On the other hand, organisational support strengthens the internal conditions – such as culture, leadership, and coordination – that allow knowledge and capabilities to be effectively deployed (Makadok, 2001). These findings move the RBV forward by highlighting the role of behavioural and relational mechanisms through which capabilities are transformed into competitive outcomes.

Finally, our results reinforce the recent call for a context-sensitive and socially embedded interpretation of the RBV (Liu and Wang, 2025). The observed cross-country differences confirm that the effectiveness of knowledge-based capabilities is shaped not only by firm-specific routines but also by institutional configurations, stakeholder pressure, and cultural expectations. By perceiving sustainability as an internal driver of strategic alignment – rather than as an external constraint – our model integrates the NRBV's ethical and environmental focus with the KBV's knowledge-centric logic, thereby offering a more comprehensive and geopolitically aware understanding of how competitive advantage emerges (Brouthers *et al.*, 2008).

6.2 Managerial and policy implications

The results of this study provide relevant insights for managers and entrepreneurs seeking to enhance the competitiveness of manufacturing SMEs through sustainability-oriented strategies. From a managerial perspective, our findings confirm that the availability of internal resources and innovation capabilities, while essential, is not sufficient to ensure long-term competitive advantage. Managers should therefore invest in developing enabling mechanisms – such as organisational structures, cultural support, and ethical leadership – that allow these resources to be mobilised effectively. This involves embedding sustainability and responsibility into everyday routines, thereby transforming potential into performance. Consistently with the NRBV and KBV, firms should view sustainability-oriented practices not as additional costs or external constraints, but as knowledge-intensive processes that strengthen adaptive capacity and innovation effectiveness.

The mediating role of responsible innovation further highlights that innovation processes must be designed to be both efficient and ethically aware. Managers should move beyond short-term, market-driven innovation opportunities to embrace broader corporate governance models that integrate sustainability, stakeholder participation, and reflexivity into product and process development. Encouraging cross-functional collaboration and participatory decision-making can ensure that innovation trajectories remain aligned with both internal capabilities and external expectations, ultimately strengthening legitimacy and long-term competitiveness. As emphasised by the KBV, this requires not only technical

Table 11 Overall results and fit indices of the models

Sub-sample	Description of the indirect path	OLS	Path analysis	Sobel statistic	Mediation type	Accepted hypotheses ^b	RMSEA	SRMR	CFI	TLI	PCMIN/DF
EU	Sustainability-oriented resource availability → responsible innovation → competitiveness	H4a: Accepted	H4a: Accepted	2.91***	Partial mediation	Completely supported	0.07**	0.07	0.92	0.90	1.68
	Sustainability-oriented resource availability → organisational support → competitiveness	H5a: Accepted	H5a: Rejected	5.94***	Partial mediation	Moderately supported	0.09***	0.08	0.87	0.84	2.32
	Innovative capabilities → responsible innovation → competitiveness	H4b: Accepted	H4b: Accepted	2.01**	Partial mediation	Completely supported	0.08***	0.08	0.91	0.89	1.85
	Innovative capabilities → organisational support → competitiveness	H5b: Accepted	H5b: Accepted	8.18***	Partial mediation	Completely supported	0.08***	0.08	0.89	0.87	2.04
	Sustainability-oriented resource availability → responsible innovation → competitiveness	H4a: Accepted	H4a: Accepted	3.60***	Partial mediation	Completely supported	0.07***	0.08	0.89	0.87	2.22
UK	Sustainability-oriented resource availability → responsible innovation → competitiveness	H5a: Accepted	H5a: Rejected	7.03***	Partial mediation	Moderately supported	0.09***	0.09	0.89	0.86	2.91
	Innovative capabilities → responsible innovation → competitiveness	H4b: Accepted	H4b: Accepted	3.44***	Partial mediation	Completely supported	0.07***	0.07	0.89	0.87	2.33
	Innovative capabilities → organisational support → competitiveness	H5b: Accepted	H5b: Rejected	7.92***	Partial mediation	Moderately supported	0.09***	0.08	0.89	0.87	2.90
	Sustainability-oriented resource availability → responsible innovation → competitiveness	H4a: Rejected	H4a: Rejected	0.80	–	Not supported	0.10***	0.08	0.84	0.82	1.91
	Sustainability-oriented resource availability → organisational support → competitiveness	H5a: Rejected	H5a: Rejected	-2.98***	–	Not supported	0.10***	0.08	0.89	0.86	1.92
USA	Innovative capabilities → responsible innovation → competitiveness	H4b: Rejected	H4b: Rejected	0.68	–	Not supported	0.10***	0.10	0.80	0.82	1.92
	Innovative capabilities → organisational support → competitiveness	H5b: Rejected	H5b: Rejected	3.52***	–	Not supported	0.10***	0.09	0.86	0.83	1.92

Note(s): No. of observations: 150 (EU), 249 (UK), 94 (USA); latent variables have undergone a transformation process via the Box-Cox technique; Laavan typically ended after 35–42 iterations; ^bHypotheses are considered “Completely supported” when statistical significance is observed over all three tests (namely, OLS, path analysis and Sobel test). They are classified as “Moderately supported” if statistical significance is found in only two of the tests, and “Not supported” if they fail to meet these conditions. *Significance levels:* * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source(s): Authors’ elaboration using Stata[®] and RStudio[®] software

knowledge, but also relational competencies and ethical awareness that can be nurtured through continuous learning and knowledge-sharing practices.

Furthermore, the role of organisational support underscores the significance of internal alignment between strategic intent, leadership commitment, and cultural orientation. Managers should foster a climate that encourages collective responsibility and supports experimentation, learning, and adaptation. Environmental and social objectives should be integrated into performance evaluation systems and incentive structures, reinforcing the behavioural and motivational dimensions of sustainability. In doing so, organisational support becomes the infrastructure that enables resources and capabilities to operate effectively as a source of sustainable competitive advantage.

From a policy perspective, the findings suggest that institutional frameworks can play a decisive role in shaping how SMEs convert resources and knowledge into competitiveness. The cross-country differences observed in our study point to the need for context-sensitive policy interventions. Policymakers should design targeted instruments that incentivise responsible innovation and strengthen SMEs' organisational capabilities, especially in less regulated environments. Support mechanisms could include fiscal incentives for sustainability-oriented R&D, public-private partnerships for knowledge exchange and training programmes promoting environmental and social responsibility. These measures would help SMEs – often constrained by limited resources – to develop the needed capabilities to navigate complex, sustainability-driven markets.

Ultimately, both managers and policymakers should perceive sustainability not as a compliance exercise but as a strategic lever for innovation, legitimacy, and growth. By operationalising the dual-path mechanisms of responsible innovation and organisational support, SMEs can transform their resource endowments into sustained competitiveness, contributing to a broader, system-wide transition towards responsible and knowledge-based economic development.

7. Conclusions and limitations

This study explored how sustainability-oriented resource availability and innovation capabilities affect SMEs' competitiveness, emphasising the mediating roles of responsible innovation and environmental organisational support. The findings underscored that while internal resources are fundamental, their strategic value is significantly enhanced when channelled through sustainability and knowledge-oriented mechanisms. Notably, the mediating effects were statistically significant in the EU and UK sub-samples, whereas no statistically significant effects were found in the US context. This divergence suggests that institutional and cultural environments critically shape how firms leverage their resources for competitive advantage. Such results reinforce the relevance of adopting a context-sensitive interpretation of the RBV, acknowledging that the effectiveness of internal capabilities is contingent upon external institutional frameworks and stakeholder expectations (Oliver, 1997). The divergence observed between the US and EU sub-samples may reflect differences in regulatory landscapes, cultural attitudes towards sustainability, and stakeholder pressure.

Although our study provides valuable insights, some limitations warrant acknowledgment. Firstly, even if the cross-sectional design is frequently employed in management and sustainability research (Branca *et al.*, 2025; Erena *et al.*, 2023; Marzi *et al.*, 2023), it may potentially restrict the ability to investigate the evolution of sustainability practices or establish definitive causal inference (Maxwell and Cole, 2007). Nevertheless, the breadth of the sample and the robustness of the statistical checks lend reliability to the observed relationships. Indeed, beyond the Baron and Kenny (1986) methodological approach, we conducted a comprehensive path analysis estimating all direct and indirect pathways (Wright, 1934), as well as Sobel tests examining the statistical significance of the mediating

effects (Zhao *et al.*, 2010). Moreover, we calculated the fit indices for these models, reinforcing the validity of our assumptions (Yin *et al.*, 2022). To overcome this limitation, future research should investigate longitudinal dynamics to elucidate how firms reconvert their internal resources and competencies over time in response to changing sustainability demands, as well as examining how responsible innovation and organisational support come into play when shifts in institutional and stakeholder pressures occur.

Secondly, relying on self-reported survey data may introduce common perceptual distortions. For this reason, several precautions were adopted to diminish the likelihood that CMB significantly affected our results, such as the anonymity of answers, the implementation of attention checks, and the reliance on validated measurement scales. Future studies might address this limitation by employing multi-method strategies, combining large-scale surveys with qualitative approaches, such as case studies or interviews. Moreover, other scholars can combine primary subjective data with secondary objective data – such as financial reports or market performance metrics – to offer a deeper analysis of the findings.

Thirdly, the empirical scope of this research is circumscribed to manufacturing SMEs. While this choice ensures theoretical consistency, it inevitably narrows the generalisability of the results. Future research could therefore extend the analysis beyond the manufacturing sector, examining whether the proposed dual-path model holds in service-based SMEs or other industries characterised by different competitive dynamics. In addition, comparative studies between family and non-family firms may offer further insights, as variations in ownership structures, governance arrangements, and value orientations are likely to influence how resources are channelled through responsible innovation and organisational support.

Finally, the geographical coverage is limited to mature economies (EU, UK, and USA). While these provide a useful comparison, they do not capture the diversity of institutional environments worldwide. Expanding the analysis to emerging economies, where institutional voids, regulatory uncertainty, and informal stakeholder pressures are more pronounced, would enable us to test the robustness of our model under different socio-economic and institutional conditions and to explore alternative pathways through which firms leverage resources for sustainable competitiveness.

Notes

- [1.] From a pool of 733 eligible participants on the Prolific platform, our data resulted in 494 responses, of which 493 met all the criteria for inclusion in the final data set.
- [2.] Please refer to [Figure A1](#) in “Appendix” for greater information.

References

- Aarons, G.A., Ehrhart, M.G., Farahnak, L.R. and Sklar, M. (2014), “Aligning leadership across systems and organizations to develop a strategic climate for evidence-based practice implementation”, *Annual Review of Public Health*, Vol. 35 No. 1, pp. 255-274, doi: [10.1146/annurev-publhealth-032013-182447](https://doi.org/10.1146/annurev-publhealth-032013-182447).
- Adomako, S. and Tran, M.D. (2022), “Environmental collaboration, responsible innovation, and firm performance: the moderating role of stakeholder pressure”, *Business Strategy and the Environment*, Vol. 31 No. 4, pp. 1695-1704, doi: [10.1002/bse.2977](https://doi.org/10.1002/bse.2977).
- Akkerman, D., Castaldi, C. and Los, B. (2009), “Do liberal market economies really innovate more radically than coordinated market economies?”, *Research Policy*, Vol. 38 No. 1, pp. 181-191, doi: [10.1016/j.respol.2008.10.002](https://doi.org/10.1016/j.respol.2008.10.002).
- Andersén, J. (2021), “Resource orchestration of firm-specific human capital and firm performance—the role of collaborative human resource management and entrepreneurial orientation”, *The International Journal of Human Resource Management*, Vol. 32 No. 10, pp. 1603-1632, doi: [10.1080/09585192.2019.1579250](https://doi.org/10.1080/09585192.2019.1579250).

- Anderson, J.C. and Gerbing, D.W. (1988), "Structural equation modeling in practice: a review of recommended two-stage approach", *Psychological Bulletin*, Vol. 103 No. 3, pp. 411-423, doi: [10.1037/0033-2909.103.3.411](https://doi.org/10.1037/0033-2909.103.3.411).
- Aureli, S., Salvatori, F. and Magnaghi, E. (2020), "A country-comparative analysis of the transposition of the EU non-financial directive: an institutional approach", *Accounting, Economics, and Law: A Convivium*, Vol. 10 No. 2, p. 20180047.
- Ávila, M.M. (2022), "Competitive advantage and knowledge absorptive capacity: the mediating role of innovative capability", *Journal of the Knowledge Economy*, Vol. 13 No. 1, pp. 185-210, doi: [10.1007/s13132-020-00708-3](https://doi.org/10.1007/s13132-020-00708-3).
- 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., Wright, M. and Ketchen, D.J. (2001), "The resource-based view of the firm: ten years after 1991", *Journal of Management*, Vol. 27 No. 6, pp. 625-641, doi: [10.1177/014920630102700601](https://doi.org/10.1177/014920630102700601).
- Baron, R.A. and Tang, J. (2011), "The role of entrepreneurs in firm-level innovation: joint effects of positive affect, creativity, and environmental dynamism", *Journal of Business Venturing*, Vol. 26 No. 1, pp. 49-60, doi: [10.1016/j.jbusvent.2009.06.002](https://doi.org/10.1016/j.jbusvent.2009.06.002).
- Baron, R.M. and Kenny, D.A. (1986), "The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations", *Journal of Personality and Social Psychology*, Vol. 51 No. 6, p. 1173, doi: [10.1037/0022-3514.51.6.1173](https://doi.org/10.1037/0022-3514.51.6.1173).
- Bick, N. (2025), "From framing to implementation: the experience of local sustainability administration in the US", *Environmental Science & Policy*, Vol. 164, p. 104003, doi: [10.1016/j.envsci.2025.104003](https://doi.org/10.1016/j.envsci.2025.104003).
- Bouguerra, A., Hughes, M., Rodgers, P., Stokes, P. and Tatoglu, E. (2024), "Confronting the grand challenge of environmental sustainability within supply chains: how can organizational strategic agility drive environmental innovation?", *Journal of Product Innovation Management*, Vol. 41 No. 2, pp. 323-346, doi: [10.1111/jpim.12692](https://doi.org/10.1111/jpim.12692).
- Box, G.E. and Cox, D.R. (1964), "An analysis of transformations", *Journal of the Royal Statistical Society Series B: Statistical Methodology*, Vol. 26 No. 2, pp. 211-243, doi: [10.1111/j.2517-6161.1964.tb00553.x](https://doi.org/10.1111/j.2517-6161.1964.tb00553.x).
- Branca, E., Intenza, M. and Doni, F. (2025), "Startup entrepreneurs' personality traits and resilience: unveiling the interplay of prior experience", *International Entrepreneurship and Management Journal*, Vol. 21 No. 1, p. 2, doi: [10.1007/s11365-024-01023-y](https://doi.org/10.1007/s11365-024-01023-y).
- Brouthers, K.D., Brouthers, L.E. and Werner, S. (2008), "Resource-based advantages in an international context", *Journal of Management*, Vol. 34 No. 2, pp. 189-217, doi: [10.1177/0149206307312508](https://doi.org/10.1177/0149206307312508).
- Brown, T.A. and Moore, M.T. (2012), "Confirmatory factor analysis", *Handbook of Structural Equation Modeling*, Vol. 361, p. 379.
- Burget, M., Bardone, E. and Pedaste, M. (2017), "Definitions and conceptual dimensions of responsible research and innovation: a literature review", *Science and Engineering Ethics*, Vol. 23 No. 1, pp. 1-19, doi: [10.1007/s11948-016-9782-1](https://doi.org/10.1007/s11948-016-9782-1).
- Calantone, R.J., Cavusgil, S.T. and Zhao, Y. (2002), "Learning orientation, firm innovation capability, and firm performance", *Industrial Marketing Management*, Vol. 31 No. 6, pp. 515-524, doi: [10.1016/S0019-8501\(01\)00203-6](https://doi.org/10.1016/S0019-8501(01)00203-6).
- Carayannis, E.G., Grigoroudis, E., Del Giudice, M., Della Peruta, M.R. and Sindakis, S. (2017), "An exploration of contemporary organizational artifacts and routines in a sustainable excellence context", *Journal of Knowledge Management*, Vol. 21 No. 1, pp. 35-56, doi: [10.1108/JKM-10-2015-0366](https://doi.org/10.1108/JKM-10-2015-0366).
- Čater, T., Uršič, D., Čater, B. and Žabkar, V. (2025), "The nexus of technological innovation, green product/process innovation and environmental strategy: the path towards sustainability-based competitive advantage", *Technology Analysis & Strategic Management*, Vol. 38 No. 5, pp. 1-15, doi: [10.1080/09537325.2025.2486010](https://doi.org/10.1080/09537325.2025.2486010).
- Chesbrough, H.W. (2020), "To recover faster from covid-19, open up: managerial implications from an open innovation perspective", *Industrial Marketing Management*, Vol. 88, pp. 410-413, doi: [10.1016/j.indmarman.2020.04.010](https://doi.org/10.1016/j.indmarman.2020.04.010).
- Christmann, P. (2000), "Effects of "best practices" of environmental management on cost advantage: the role of complementary assets", *Academy of Management Journal*, Vol. 43 No. 4, pp. 663-680, doi: [10.5465/1556360](https://doi.org/10.5465/1556360).

- Ciampi, F., Demi, S., Magrini, A., Marzi, G. and Papa, A. (2021), "Exploring the impact of big data analytics capabilities on business model innovation: the mediating role of entrepreneurial orientation", *Journal of Business Research*, Vol. 123, pp. 1-13, doi: [10.1016/j.jbusres.2020.09.023](https://doi.org/10.1016/j.jbusres.2020.09.023).
- Corvino, A., Doni, F. and Intenza, M. (2024), "Business model rethinking. A reaction against extraordinary events in the business scenario", in Costa, E., Contrafatto, M., Parker, L.D. *Accounting, Accountability and Crisis Management*, Routledge, Abingdon, pp. 54-69.
- Crook, T.R., Ketchen, D.J., Combs, J.G. and Todd, S.Y. (2008), "Strategic resources and performance: a meta-analysis", *Strategic Management Journal*, Vol. 29 No. 11, pp. 1141-1154, doi: [10.1002/smj.703](https://doi.org/10.1002/smj.703).
- Dangelico, R.M. (2016), "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).
- Deloitte (2024), "The EU sustainability regulation landscape: looking ahead to the next phase of the EU green deal", available at: www.deloitte.com/uk/en/Industries/financial-services/blogs/the-eu-sustainability-regulation-landscape.html
- Do, B.R., Budhwar, P. and Patel, C. (2022), "The link between responsible leadership and organisational resilience: the mediating mechanism of responsible HRM", *Human Resource Management Review*, Vol. 32 No. 4, p. 100836, doi: [10.1016/j.hrmr.2021.100836](https://doi.org/10.1016/j.hrmr.2021.100836).
- Donaldson, T. and Lee, E.P. (1995), "The stakeholder theory of the corporation: concepts, evidence, and implications", *The Academy of Management Review*, Vol. 20 No. 1, pp. 65-91, doi: [10.2307/258887](https://doi.org/10.2307/258887).
- Eisenberger, R., Huntington, R., Hutchison, S. and Sowa, D. (1986), "Perceived organizational support", *Journal of Applied Psychology*, Vol. 71 No. 3, pp. 500-507, doi: [10.1037/0021-9010.71.3.500](https://doi.org/10.1037/0021-9010.71.3.500).
- Eisenhardt, K.M. and Martin, J.A. (2000), "Dynamic capabilities: what are they?", *Strategic Management Journal*, Vol. 21 Nos 10-11, pp. 1105-1121, doi: [10.1002/1097-0266\(200010/11\)21:10/11<1105::AID-SMJ133>3.0.CO;2-E](https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E).
- El Nemar, S., El-Chaarani, H., Dandachi, I. and Castellano, S. (2022), "Resource-based view and sustainable advantage: a framework for SMEs", *Journal of Strategic Marketing*, Vol. 33 No. 6, pp. 1-24, doi: [10.1080/0965254X.2022.2160486](https://doi.org/10.1080/0965254X.2022.2160486).
- Erena, O.T., Kalko, M.M. and Debele, S.A. (2023), "Organizational factors, knowledge management and innovation: empirical evidence from medium-and large-scale manufacturing firms in Ethiopia", *Journal of Knowledge Management*, Vol. 27 No. 4, pp. 1165-1207, doi: [10.1108/JKM-11-2021-0861](https://doi.org/10.1108/JKM-11-2021-0861).
- Fisher, R.J. (1993), "Social desirability bias and the validity of indirect questioning", *Journal of Consumer Research*, Vol. 20 No. 2, pp. 303-315, doi: [10.1086/209351](https://doi.org/10.1086/209351).
- Foss, N.J. and Mazzelli, A. (2025), "Bringing managers and management back into strategy: interfaces and dynamic managerial capabilities", *Journal of Business Research*, Vol. 186, p. 114947, doi: [10.1016/j.jbusres.2024.114947](https://doi.org/10.1016/j.jbusres.2024.114947).
- Freeman, R.E. (1984), *Strategic Management: A Stakeholder Approach*, Pitman, Boston.
- Galbreath, J. (2005), "Which resources matter the most to firm success? An exploratory study of resource-based theory", *Technovation*, Vol. 25 No. 9, pp. 979-987, doi: [10.1016/j.technovation.2004.02.008](https://doi.org/10.1016/j.technovation.2004.02.008).
- Gomez-Trujillo, A.M., Gonzalez-Perez, M.A. and Baena-Rojas, J.J. (2024), "Sustainable strategy as a lever for corporate legitimacy and long-term competitive advantage: an examination of an emerging market multinational", *European Business Review*, Vol. 36 No. 1, pp. 112-139, doi: [10.1108/EBR-01-2023-0003](https://doi.org/10.1108/EBR-01-2023-0003).
- Grant, R.M. (1996), "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17 No. S2, pp. 109-122, doi: [10.1002/smj.4250171110](https://doi.org/10.1002/smj.4250171110).
- Gravey, V. and Jordan, A.J. (2023), "UK environmental policy and brexit: simultaneously de-europeanising, disengaging and (re)-engaging?", *Journal of European Public Policy*, Vol. 30 No. 11, pp. 2349-2371, doi: [10.1080/13501763.2023.2201613](https://doi.org/10.1080/13501763.2023.2201613).
- Hair, J. F. (Ed.) (2014), *Multivariate Data Analysis*, 7. ed., Pearson new internat. ed., Pearson, Harlow, England.
- Hair, J.F., Anderson, R.E., Tatham, R.L. and Grablovsky, B.J. (1979), *Multivariate Data Analysis with Readings*, Petroleum Publishing Company, Tulsa.
- Hair, J., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2021), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage Publishers.

- Halme, M. and Korpela, M. (2014), "Responsible innovation toward sustainable development in small and medium-sized enterprises: a resource perspective", *Business Strategy and the Environment*, Vol. 23 No. 8, pp. 547-566.
- Harrington, D. (2009), *Confirmatory Factor Analysis*, Oxford University Press.
- Harrison, J.S., Bosse, D.A. and Phillips, R.A. (2021), "Stakeholder theory at a crossroads: the past, present, and future of a key construct in business and society research", *Business & Society*, Vol. 60 No. 1, pp. 7-31, doi: [10.1177/00076503211066595](https://doi.org/10.1177/00076503211066595).
- Hart, S.L. (1995), "A natural-resource-based view of the firm", *The Academy of Management Review*, Vol. 20 No. 4, pp. 986-1014, doi: [10.5465/amr.1995.9512280033](https://doi.org/10.5465/amr.1995.9512280033).
- Hart, S.L. and Dowell, G. (2011), "A natural-resource-based view of the firm: fifteen years after", *Journal of Management*, Vol. 37 No. 5, pp. 1464-1479, doi: [10.1177/0149206310390219](https://doi.org/10.1177/0149206310390219).
- Helfat, C.E. and Peteraf, M.A. (2003), "The dynamic resource-based view: capability lifecycles", *Strategic Management Journal*, Vol. 24 No. 10, pp. 997-1010, doi: [10.1002/smj.332](https://doi.org/10.1002/smj.332).
- Holm, C.G., Becker, A. and König, A. (2025), "A systematic review of managerial and organizational levers influencing implementation success in firms", *Journal of Management and Governance*, Vol. 29 No. 3, pp. 450-478, doi: [10.1007/s11846-025-00880-3](https://doi.org/10.1007/s11846-025-00880-3).
- Hu, L. and Bentler, P.M. (1999), "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modeling: A Multidisciplinary Journal*, Vol. 6 No. 1, pp. 1-55, doi: [10.1080/10705519909540118](https://doi.org/10.1080/10705519909540118).
- Hummel, K. and Jobst, D. (2024), "An overview of corporate sustainability reporting legislation in the European Union", *Accounting in Europe*, Vol. 21 No. 3, pp. 320-355, doi: [10.1080/17449480.2024.2312145](https://doi.org/10.1080/17449480.2024.2312145).
- Intenza, M., Turzo, T., Netti, A. and Marzi, G. (2025), "Linking responsible innovation and nonfinancial reporting: evidence from manufacturing SMEs", *Business Strategy and the Environment*, Vol. 35 No. 1, pp. 615-633, doi: [10.1002/bse.70194](https://doi.org/10.1002/bse.70194).
- Jensen, M., Johnson, B., Lorenz, E. and Lundvall, B. (2007), "Forms of knowledge and modes of innovation", *Research Policy*, Vol. 36 No. 5, pp. 680-693, doi: [10.1016/j.respol.2007.01.006](https://doi.org/10.1016/j.respol.2007.01.006).
- Jiao, J., Liu, C. and Xu, Y. (2020), "Effects of stakeholder pressure, managerial perceptions, and resource availability on sustainable operations adoption", *Business Strategy and the Environment*, Vol. 29 No. 8, pp. 3246-3260, doi: [10.1002/bse.2569](https://doi.org/10.1002/bse.2569).
- Kline, R.B. (2016), *Principles and Practice of Structural Equation Modelling*, 4th ed., The Guilford Press.
- Latella, P., Morea, D., Baldissarro, G., Iazzolino, G., Veltri, S. and Farinelli, E. (2025), "Corporate governance and impact on eco-efficiency: a comparative empirical analysis on European Union and United States listed companies", *Business Strategy and the Environment*, Vol. 34 No. 6, pp. 6442-6456, doi: [10.1002/bse.4308](https://doi.org/10.1002/bse.4308).
- Lee, J.W., Kim, Y.M. and Kim, Y.E. (2018), "Antecedents of adopting corporate environmental responsibility and green practices", *Journal of Business Ethics*, Vol. 148 No. 2, pp. 397-409, doi: [10.1007/s10551-016-3024-y](https://doi.org/10.1007/s10551-016-3024-y).
- Lei, H., Saeheng, P. and Le, P.B. (2024), "Stimulating knowledge sharing behaviors for frugal innovation: the roles of inclusive leadership and competitive intensity", *Journal of Knowledge Management*, Vol. 28 No. 5, pp. 1468-1489, doi: [10.1108/JKM-02-2023-0138](https://doi.org/10.1108/JKM-02-2023-0138).
- Liao, S., Fei, W.C. and Chen, C.C. (2007), "Knowledge sharing, absorptive capacity, and innovation capability: an empirical study of taiwan's knowledge-intensive industries", *Journal of Information Science*, Vol. 33 No. 3, pp. 340-359, doi: [10.1177/0165551506070739](https://doi.org/10.1177/0165551506070739).
- Lichtenthaler, U. (2022), "Explicating a sustainability-based view of sustainable competitive advantage", *Journal of Strategy and Management*, Vol. 15 No. 1, pp. 76-95.
- Liu, L. and Wang, C. (2025), "Monetary policy and corporate financialization drive sustainable technology", *International Review of Economics & Finance*, Vol. 101, p. 104187, doi: [10.1016/j.iref.2025.104187](https://doi.org/10.1016/j.iref.2025.104187).
- Liu, S. (2025), "Green management promotes long-term business competitive advantage through the resource-based view", *Total Quality Management & Business Excellence*, Vol. 36 Nos 9-10, pp. 1-28, doi: [10.1080/14783363.2025.2499142](https://doi.org/10.1080/14783363.2025.2499142).

- Lukovszki, L., Rideg, A. and Sipos, N. (2021), "Resource-based view of innovation activity in SMEs: an empirical analysis based on the global competitiveness project", *Competitiveness Review: An International Business Journal*, Vol. 31 No. 3, pp. 513-541.
- Mackay, S., Hales, R., Hewson, J., Addis, R. and Mackey, B. (2025), "Addressing climate inaction as our greatest threat to sustainable development", *Global Environmental Change*, Vol. 91, p. 102969, doi: [10.1016/j.gloenvcha.2025.102969](https://doi.org/10.1016/j.gloenvcha.2025.102969).
- MacKinnon, D.P. and Dwyer, J.H. (1993), "Estimating mediated effects in prevention studies", *Evaluation review*, Vol. 17 No. 2, pp. 144-158, doi: [10.1177/0193841X9301700202](https://doi.org/10.1177/0193841X9301700202).
- MacKinnon, D.P., Fairchild, A.J. and Fritz, M.S. (2007), "Mediation analysis", *Annual Review of Psychology*, Vol. 58 No. 1, pp. 593-614, doi: [10.1146/annurev.psych.58.110405.085542](https://doi.org/10.1146/annurev.psych.58.110405.085542).
- Makadok, R. (2001), "Toward a synthesis of the resource-based and dynamic-capability views of rent creation", *Strategic Management Journal*, Vol. 22 No. 5, pp. 387-401, doi: [10.1002/smj.158](https://doi.org/10.1002/smj.158).
- Mandyck, J. (2024), "Why global sustainability efforts will continue despite trump", Harvard Business Review, available at: <https://hbr.org/2024/12/why-global-sustainability-efforts-will-continue-despite-trump>
- Marzi, G., Fakhar Manesh, M., Caputo, A., Pellegrini, M.M. and Vlačić, B. (2023), "Do or do not. Cognitive configurations affecting open innovation adoption in SMEs", *Technovation*, Vol. 119, p. 102585, doi: [10.1016/j.technovation.2022.102585](https://doi.org/10.1016/j.technovation.2022.102585).
- Maxwell, S.E. and Cole, D.A. (2007), "Bias in cross-sectional analyses of longitudinal mediation", *Psychological Methods*, Vol. 12 No. 1, pp. 23-44.
- Miller, D. and Friesen, P.H. (1983), "Strategy-making and environment: the third link", *Strategic Management Journal*, Vol. 4 No. 3, pp. 221-235.
- Nam, H.J., Bilgin, M.H. and Ryu, D. (2024), "Firm value, ownership structure, and strategic approaches to ESG activities", *Eurasian Business Review*, Vol. 14 No. 1, pp. 187-226, doi: [10.1007/s40821-024-00252-z](https://doi.org/10.1007/s40821-024-00252-z).
- Netti, A., Intenza, M., Favino, C. and Saraò, C.P. (2025), "How stakeholder engagement drives environmental innovation to mitigate climate change: evidence from european small caps", *Business Strategy and the Environment*, Vol. 34 No. 8, pp. 10185-10206, doi: [10.1002/bse.70101](https://doi.org/10.1002/bse.70101).
- Newbert, S.L. (2007), "Empirical research on the resource-based view of the firm: an assessment and suggestions for future research", *Strategic Management Journal*, Vol. 28 No. 2, pp. 121-146, doi: [10.1002/smj.573](https://doi.org/10.1002/smj.573).
- Nguyen, H.L. and Kanbach, D.K. (2024), "Toward a view of integrating corporate sustainability into strategy: a systematic literature review", *Corporate Social Responsibility and Environmental Management*, Vol. 31 No. 2, pp. 962-976.
- Ning, Y. and Shen, B. (2024), "Environmental regulations, finance, and firm environmental investments: an empirical exploration", *Total Quality Management & Business Excellence*, Vol. 35 Nos 7-8, pp. 713-738, doi: [10.1080/14783363.2024.2329691](https://doi.org/10.1080/14783363.2024.2329691).
- Nunnally, J. (1978), *Psychometric Theory*, McGraw-Hill, New York, NY.
- Oliver, C. (1997), "Sustainable competitive advantage: combining institutional and resource-based views", *Strategic Management Journal*, Vol. 18 No. 9, pp. 697-713.
- Owen, R., Macnaghten, P. and Stilgoe, J. (2012), "Responsible research and innovation: from science in society to science for society, with society", *Science and Public Policy*, Vol. 39 No. 6, pp. 751-760, doi: [10.1093/scipol/scs093](https://doi.org/10.1093/scipol/scs093).
- Peer, E., Brandimarte, L., Samat, S. and Acquisti, A. (2017), "Beyond the turk: alternative platforms for crowdsourcing behavioral research", *Journal of Experimental Social Psychology*, Vol. 70, pp. 153-163, doi: [10.1016/j.jesp.2017.01.00](https://doi.org/10.1016/j.jesp.2017.01.00).
- Perotti, F., Troise, C., Ferraris, A. and Hirwani Wan Hussain, W. (2025), "Bridging innovation management and circular economy: an empirical assessment of green innovation and open innovation", *Creativity and Innovation Management*, Vol. 34 No. 2, pp. 466-485, doi: [10.1111/caim.12647](https://doi.org/10.1111/caim.12647).
- Peteraf, M.A. (1993), "The cornerstones of competitive advantage: a resource-based view", *Strategic Management Journal*, Vol. 14 No. 3, pp. 179-191, doi: [10.1002/smj.425014030](https://doi.org/10.1002/smj.425014030).
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y. and Podsakoff, N.P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879-903.

- Porter, M.E. and Kramer, M.R. (2011), "Creating shared value", *Harvard Business Review*, Vol. 89 Nos 1-2, pp. 62-77, available at: <https://hbr.org/2011/01/the-big-idea-creating-shared-value>
- Ramirez, F.J., Parra-Requena, G., Ruiz-Ortega, M.J. and Garcia-Villaverde, P.M. (2018), "From external information to marketing innovation: the mediating role of product and organizational innovation", *Journal of Business & Industrial Marketing*, Vol. 33 No. 5, pp. 693-705, doi: [10.1108/JBIM-12-2016-0291](https://doi.org/10.1108/JBIM-12-2016-0291).
- Ray, G., Barney, J.B. and Muhanna, W.A. (2004), "Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view", *Strategic Management Journal*, Vol. 25 No. 1, pp. 23-37, doi: [10.1002/smj.366](https://doi.org/10.1002/smj.366).
- Rinderknecht, R.G., Doan, L. and Sayer, L.C. (2025), "The daily lives of crowdsourced US respondents: a time use comparison of MTurk, prolific, and ATUS", *Sociological Methodology*, Vol. 55 No. 2, pp. 183-217, doi: [10.1177/00811750241312226](https://doi.org/10.1177/00811750241312226).
- Rhoades, L. and Eisenberger, R. (2002), "Perceived organizational support: a review of the literature", *Journal of Applied Psychology*, Vol. 87 No. 4, pp. 698-714, doi: [10.1037/0021-9010.87.4.698](https://doi.org/10.1037/0021-9010.87.4.698).
- Romano, M., Netti, A., Corvino, A. and Intenza, M. (2024), "Environmental innovation in healthcare industry: the moderating role of women on board in cost of debt", *Corporate Social Responsibility and Environmental Management*, Vol. 31 No. 3, pp. 1921-1933, doi: [10.1002/csr.2678](https://doi.org/10.1002/csr.2678).
- Rosenbusch, N., Brinckmann, J. and Bausch, A. (2011), "Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs", *Journal of Business Venturing*, Vol. 26 No. 4, pp. 441-457, doi: [10.1016/j.jbusvent.2009.12.002](https://doi.org/10.1016/j.jbusvent.2009.12.002).
- Rudolf, M. and Schmidt, M. (2025), "Efficiency, sufficiency and consistency in sustainable development: reassessing strategies for reaching overarching goals", *Ecological Economics*, Vol. 227, p. 108426, doi: [10.1016/j.ecolecon.2024.108426](https://doi.org/10.1016/j.ecolecon.2024.108426).
- Schein, E.H. (2010), *Organizational Culture and Leadership*, 4th ed., Jossey-Bass, San Francisco.
- Shahzad, M., Qu, Y., Zafar, A.U., Rehman, S.U. and Islam, T. (2020), "Exploring the influence of knowledge management process on corporate sustainable performance through green innovation", *Journal of Knowledge Management*, Vol. 24 No. 9, pp. 2079-2106, doi: [10.1108/JKM-11-2019-0624](https://doi.org/10.1108/JKM-11-2019-0624).
- Sharma, S. and Vredenburg, H. (1998), "Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities", *Strategic Management Journal*, Vol. 19 No. 8, pp. 729-753, doi: [10.1002/\(SICI\)1097-0266\(199808\)19:8<729::AID-SMJ967>3.0.CO;2-4](https://doi.org/10.1002/(SICI)1097-0266(199808)19:8<729::AID-SMJ967>3.0.CO;2-4).
- Sirmon, D.G., Hitt, M.A., Ireland, R.D. and Gilbert, B.A. (2011), "Resource orchestration to create competitive advantage: breadth, depth, and life cycle effects", *Journal of Management*, Vol. 37 No. 5, pp. 1390-1412, doi: [10.1177/0149206310385695](https://doi.org/10.1177/0149206310385695).
- Sobel, M.E. (1982), "Asymptotic confidence intervals for indirect effects in structural equation models", *Sociological Methodology*, Vol. 13, pp. 290-312, doi: [10.2307/270723](https://doi.org/10.2307/270723).
- Spender, J.-C. (1996), "Making knowledge the basis of a dynamic theory of the firm", *Strategic Management Journal*, Vol. 17 No. S2, pp. 45-62, doi: [10.1002/smj.4250171106](https://doi.org/10.1002/smj.4250171106).
- Steiger, J.H. (1990), "Structural model evaluation and modification: an interval estimation approach", *Multivariate Behavioral Research*, Vol. 25 No. 2, pp. 173-180, doi: [10.1207/s15327906mbr2502_4](https://doi.org/10.1207/s15327906mbr2502_4).
- Stilgoe, J., Owen, R. and Macnaghten, P. (2013), "Developing a framework for responsible innovation", *Research Policy*, Vol. 42 No. 9, pp. 1568-1580, doi: [10.1016/j.respol.2013.05.008](https://doi.org/10.1016/j.respol.2013.05.008).
- Trabucchi, D., Patrucco, A.S., Buganza, T. and Marzi, G. (2023), "Is transparency the new green? How business model transparency influences digital service adoption", *Technovation*, Vol. 126, p. 102803, doi: [10.1016/j.technovation.2023.102803](https://doi.org/10.1016/j.technovation.2023.102803).
- United Nations (2024), "Sustainable development report 2024", available at: <https://unstats.un.org/sdgs/report/2024/The-Sustainable-Development-Goals-Report-2024.pdf>
- Verona, G. and Ravasi, D. (2003), "Unbundling dynamic capabilities: an exploratory study of continuous product innovation", *Industrial and Corporate Change*, Vol. 12 No. 3, pp. 577-606, doi: [10.1093/icc/12.3.577](https://doi.org/10.1093/icc/12.3.577).
- von Schomberg, R. (2013), "A vision of responsible innovation", in Owen, R.J. Bessant, & M. Heintz (Eds), *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, John Wiley & Sons., pp. 51-74, doi: [10.1002/9781118551424.ch3](https://doi.org/10.1002/9781118551424.ch3).
- 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).

Wright, S. (1934), "The method of path coefficients", *The Annals of Mathematical Statistics*, Vol. 5 No. 3, pp. 161-215.

Wu, L.Y. (2010), "Applicability of the resource-based and dynamic capability views under environmental volatility", *Journal of Business Research*, Vol. 63 No. 1, pp. 27-31, doi: [10.1016/j.jbusres.2009.01.007](https://doi.org/10.1016/j.jbusres.2009.01.007).

Yin, Y., Shi, D. and Fairchild, A.J. (2022), "The effect of model size on the root mean square error of approximation (RMSEA): the non-normal case", *Structural Equation Modeling: A Multidisciplinary Journal*, Vol. 30 No. 3, pp. 378-392, doi: [10.1080/10705511.2022.2127729](https://doi.org/10.1080/10705511.2022.2127729).

Zahra, S.A. and Covin, J.G. (1993), "Business strategy, technology policy and firm performance", *Strategic Management Journal*, Vol. 14 No. 6, pp. 451-478, doi: [10.1002/smj.4250140605](https://doi.org/10.1002/smj.4250140605).

Zhao, X., Lynch, J.G., Jr, and Chen, Q. (2010), "Reconsidering baron and kenny: myths and truths about mediation analysis", *Journal of Consumer Research*, Vol. 37 No. 2, pp. 197-206, doi: [10.1086/651257](https://doi.org/10.1086/651257).

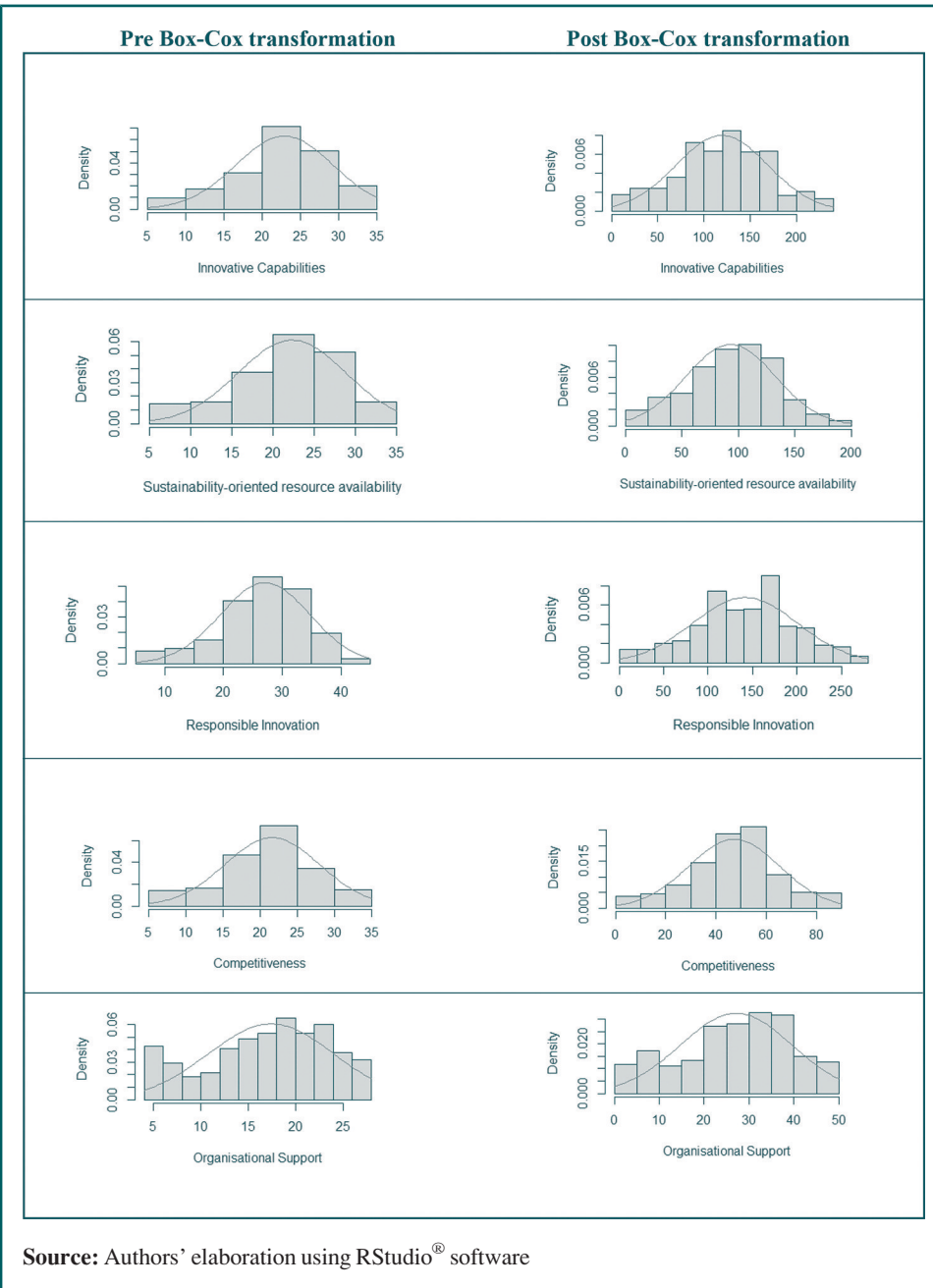
Author affiliations

Mauro Romano and Antonio Netti are both based at the Department of Economic and Finance (DiEF), University of Bari Aldo Moro, Bari, Italy, and Family Business Lab on Accounting and Governance (FLAG), Department of Economics, Management, Institutions (DEMI), University of Naples Federico II, Naples, Italy.

Marika Intenza is based at the Department of Economic and Management (DEM), University of Pisa, Pisa, Italy, and Corporate Social Responsibility Research Laboratory (CSR Lab), Department of Social Sciences (DISS), University of Foggia, Foggia, Italy.

Christian Favino is based at the Department of Social Sciences (DISS), University of Foggia, Foggia, Italy, and Corporate Social Responsibility Research Laboratory (CSR Lab), Department of Social Sciences (DISS), University of Foggia, Foggia, Italy.

Figure A1 Latent constructs before and after Box–Cox transformation



Corresponding author

Mauro Romano can be contacted at: mauro.romano@uniba.it

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgroupublishing.com/licensing/reprints.htm
 Or contact us for further details: permissions@emeraldinsight.com