Journal of Small Business Management

ISSN: 0047-2778 (Print) 1540-627X (Online) Journal homepage: www.tandfonline.com/journals/ujbm20

Eco-innovations in family SMEs: Understanding the role of financial performance satisfaction

Phuong-Anh Nguyen Duong, Wim Voordeckers, Jolien Huybrechts, Frank Lambrechts & Anita Van Gils

To cite this article: Phuong-Anh Nguyen Duong, Wim Voordeckers, Jolien Huybrechts, Frank Lambrechts & Anita Van Gils (2025) Eco-innovations in family SMEs: Understanding the role of financial performance satisfaction, Journal of Small Business Management, 63:4, 1721-1749, DOI: 10.1080/00472778.2024.2405537

To link to this article: https://doi.org/10.1080/00472778.2024.2405537

© 2024 The Author(s). Published with license by Taylor & Francis Group, LLC.

Published online: 04 Oct 2024.

Submit your article to this journal

Article views: 1334

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at https://www.tandfonline.com/action/journalInformation?journalCode=ujbm20

JOURNAL OF SMALL BUSINESS MANAGEMENT
2025, VOL. 63, NO. 4, 1721–1749
https://doi.org/10.1080/00472778.2024.2405537

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

Eco-innovations in family SMEs: Understanding the role of financial performance satisfaction

Phuong-Anh Nguyen Duong [a], Wim Voordeckers [a], Jolien Huybrechts [b], Frank Lambrechts [a], and Anita Van Gils [b]

[a]Research Center for Entrepreneurship and Family Firms, Hasselt University, Belgium; [b]Department of Organization, Strategy & Entrepreneurship, Maastricht University, The Netherlands

ABSTRACT

What drives eco-innovations among family SMEs? Given the mixed findings about family firms' engagement in environmental practices, this question has profound implications for academia and practitioners. By applying the mixed gamble lens, we propose an inverted U-shape relationship between financial performance satisfaction and the extent to which family SMEs introduce eco-innovations. An analysis using data from Dutch family SMEs supports our hypothesis. Our results provide not only managerial implications for family business practitioners to enhance eco-innovations, but also challenge prior findings in sustainability and family business research regarding the linear relationship between financial performance satisfaction and strategic decisions, opening avenues for future research to dive deeper into the complex impact of financial performance satisfaction on organizational outcomes.

KEYWORDS

Eco-innovation; family firm; financial performance satisfaction; SME; sustainability

Introduction

Environmental issues are gaining public attention; for example, 93% of EU citizens consider climate change a severe problem (European Commission, 2021). As the most prevalent organizational form worldwide (La Porta et al., 1999), family firms are considered crucial in addressing environmental challenges (Lambrechts & Gnan, 2022; Sharma & Sharma, 2021; Van Gils et al., 2014). Indeed, family firms are found to exhibit a higher long-term orientation (Brigham et al., 2013), which should lead to more proactive environmental strategies. However, empirical evidence is equivocal as studies have reported both positive (Agostino & Ruberto, 2021; Combs et al., 2022; Horbach et al., 2022) and negative (Aiello et al., 2021; Memili et al., 2018; Miroshnychenko et al., 2022) effects of family influence on environmental practices, such as pollution prevention, green supply chain management, and green product development practices. Therefore, studies have been dedicated to shedding

CONTACT Jolien Huybrechts j.huybrechts@maastrichtuniversity.nl Department of Organization, Strategy & Entrepreneurship, Maastricht University, Tongersestraat 53, Maastricht 6211 LM, The Netherlands

© 2024 The Author(s). Published with license by Taylor & Francis Group, LLC.
This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

light on these mixed findings by investigating the drivers of family firms' engagement in eco-innovations,[1] defined as the introduction of new or significantly improved products and processes that have ecological benefits over alternatives (Bammens & Hünermund, 2020; Barbieri et al., 2016). Examples of eco-innovations include a process innovation that reduces material and/or water consumption per unit of product/service output, or a product innovation that enhances recyclability after use. We focus on eco-innovation because compared to adopting standardized environmental practices or available green technologies in the open market, organizational engagement in eco-innovation represents a more impactful corporate sustainability manifestation (Berrone et al., 2013).

Sustainability literature has identified several catalysts that facilitate organizational eco-innovations, namely regulatory, market, technological, and firm-specific conditions (Bossle et al., 2016; Díaz-García et al., 2015). However, when it comes to firm-specific factors, drivers of eco-innovations in family firms may differ notably from those of non-family firms owing to the involvement of members of the family system, which can exert a profound influence on their eco-innovation activities (Sharma & Sharma, 2011). For instance, while non-family firms are often driven by short-term benefits such as market share preservation, family firms are found to be mainly propelled by long-term benefits such as reputation and quality improvement (Dangelico et al., 2019; Delmas & Gergaud, 2014; Lambrechts et al., 2022). Furthermore, researchers increasingly emphasize the heterogeneity among family firms, suggesting the differences among family firms "are potentially as great as, or greater than, the differences between family and non-family firms" (Chua et al., 2012, p. 1111). For example, family firms with higher levels of transgenerational intention are reported to engage more in eco-innovations (Bammens & Hünermund, 2020). Despite these fruitful discoveries, empirical studies about drivers of eco-innovations in family firms remain limited (Bammens & Hünermund, 2020; Broccardo et al., 2019; Ferreira et al., 2021).

Among the sources that cause heterogeneity in family firms' behaviors and performance (Daspit et al., 2018, 2021), the effect of financial performance satisfaction (FPS) on eco-innovations among family firms remains unknown. This is intriguing because FPS, which we define as the extent to which the firm is satisfied with its past financial performance (Chrisman et al., 2012), is reported to play a decisive role in family firms' strategic decisions such as R&D investments and acquisition (Gomez–Mejia et al., 2014; Hussinger & Issah, 2019). However, extant family business research has only examined the

[1]One of the earliest definitions of eco-innovations reads as follows: "all measures of relevant actors (firms, politicians, unions, associations, churches, private households) which develop new ideas, behavior, products and processes, apply or introduce them and which contribute to a reduction of environmental burdens or to ecologically specified sustainability targets" (Rennings, 2000, p. 322). In light of the growing prevalence of this term in scientific publications (Díaz-García et al., 2015) and family business research (Bammens & Hünermund, 2020), we adopt this term to enhance the comparability of our study with prior research.

linear impact of FPS on strategic decisions (Mahto & Khanin, 2015; Patel & Chrisman, 2014), while organizational studies have provided compelling evidence regarding a nonlinear relationship between FPS and strategic decisions such as acquisitions or new market entry (Cheng et al., 2022; Iyer & Miller, 2008; Ref & Shapira, 2017). Moreover, given the intricate nature of eco-innovation decisions within family firms, which entail weighing short-term gains against long-term impacts on financial and socioemotional wealth[2] (Diaz-Moriana et al., 2024), a linear relationship with FPS is improbable. Therefore, to provide a deeper insight into the influence of FPS, our research will examine the nonlinear impact of this antecedent on the extent to which family firms introduce eco-innovation.

Furthermore, whereas extant organizational research has primarily relied on the behavioral theory of the firm (BTOF; Cyert & March, 1963) to explicate the impact of FPS on firms' strategies, our study builds on the mixed gamble lens (Gomez–Mejia et al., 2014) arguing for an inverted U-shaped relationship between the level of FPS and the extent family firms introduce eco-innovations. The mixed gamble lens is "a substantially different approach compared to the BTOF" (Gomez–Mejia et al., 2014, p. 1354) and particularly well-suited to the study context because it enables the weighing of both the likely gains and losses of family firms' risky strategic actions in both financial wealth (FW) and socioemotional wealth (SEW), the two nonfungible currencies in family firms (Gomez-Mejia et al., 2015). It also allows us to theorize about the differences in short- and long-term anticipated gains and losses within these two wealth categories due to eco-innovation decisions. This is important as different degrees in FPS (low, moderate, or high) serve as distinct reference points for assessing the desired gains and the perceived urgency of these gains in financial and socioemotional wealth. Moreover, SEW encompasses various dimensions that "do not always work in concert" (Davila et al., 2023, p. 1). For example, SEW dimensions, such as the desire to preserve the family's identity, may encourage higher levels of eco-innovation, while other dimensions, such as the fear of losing family control, may discourage it (Arena & Michelon, 2018; Bammens & Hünermund, 2020; Hsu & Chen, 2023). For a deeper conceptual analysis, our theorizing will, therefore, take into account all SEW dimensions (Berrone et al., 2012). Using data from Dutch small- and medium-sized family enterprises (SMEs), we find empirical support for our hypothesis.

In doing so, our study makes several contributions. First, we extend knowledge on a potential determinant of eco-innovations in family firms, a crucial yet understudied topic (Bammens & Hünermund, 2020) that becomes more germane given rising environmental concerns, the ubiquity of family firms,

[2]Socio-emotional wealth entails the nonfinancial aspects of the firm that meet the family's social and affective needs, such as the ability to exercise family influence and the perpetuation of the family dynasty (Gómez-Mejía et al., 2007, 2010).

and thus their potential to contribute to a more sustainable society. Second, by examining the heterogeneity in eco-innovations among family firms, we uncover why these firms are not uniformly arriving at similar levels of eco-innovations. We thus address the calls for more research on the heterogeneity of family firms in general (Chua et al., 2012) and concerning eco-innovations in particular (Calabrò et al., 2019). Third, by challenging the oft-argued linear impact of FPS on family firms' strategic decisions, we uncover its curvilinear impact, which we attribute to the result of weighing the likely gains and losses in FW and different dimensions of SEW at the backdrop of different reference points being low, low-to-moderate, moderate, moderate-to-high, and high levels of FPS. Hence, we advance family business research by pinpointing the complex nature of FPS. Fourth, most studies (Gomez-Mejia et al., 2015) indirectly measure FPS using the divergence between a firm's current and historical performance (that is, performance below/above historical aspiration) or the gap between a firm's performance and its competitors' (that is, performance below/above social aspirations). Our study employs a direct measurement of the extent to which the firm is satisfied with its past financial performance, reflecting more precisely the expectation or aspiration of the firm about its economic performance compared with the common indirect estimation. Finally, to enhance the societal relevancy of our study, we focus on family SMEs since these companies play a preponderant part in the world economy and are responsible for around 60% of all carbon dioxide emissions and 70% of all pollution (Parker et al., 2009).

Literature review and hypothesis development

In this section, we will articulate how FPS influences the extent to which family firms introduce eco-innovations by applying the mixed gamble lens.

The mixed gamble lens

As one of the dominant theoretical perspectives used in management research of family firms (Bammens et al., 2021), the mixed gamble lens is often applied to predict how FPS affects family firms' risky strategic decisions (Alessandri et al., 2018; Gomez-Mejia et al., 2014, 2015; Hussinger & Issah, 2019). Therefore, we will expound on this lens and discuss how it is prevalent to predict the influence of FPS on family firms' eco-innovation decisions.

The mixed gamble perspective is a refinement of the behavioral agency model (BAM)—the premise for major theoretical developments about family firms' behaviors (Gomez–Mejia et al., 2014). The BAM advocates that the behavioral preferences of individuals are shaped by problem framing and loss aversion (Chrisman & Patel, 2012). Loss aversion means that individuals are more concerned with avoiding losses than obtaining gains. Problem framing

means that choices are considered from a perspective of gains or losses, usually in reference to current asset endowments, but in family firms also in reference to socioemotional wealth. Drawing on the tenets of the BAM, scholars put forth that the owners of family firms are loss-averse with respect to their socioemotional wealth. Therefore, to avoid SEW losses, family firms are found to be less likely to engage in polluting activities (Berrone et al., 2010). Yet, a recent meta-analysis shows that family influence has a negative impact not only on pollution prevention, but also on green supply chain management and green product development practices (Miroshnychenko et al., 2022). These contradicting findings suggest heterogeneity among family firms and that the BAM may not be sufficient to explain family firm behaviors in environmental activities.

Scholars have refined the behavioral agency framework by integrating the concept of the mixed gamble to enhance the predictions regarding differences in high-risk strategic decisions between FFs and non-FFs, for instance, in R&D investments (Gomez–Mejia et al., 2014), acquisitions (Gomez-Mejia et al., 2015; Hussinger & Issah, 2019), and internationalization (Alessandri et al., 2018). The mixed gamble perspective suggests that family firms have to assess both the likely gains and losses of their actions in financial and socioemotional terms in tandem. Specifically, family firms will attempt to estimate possible SEW gains as well as future FW gains when making strategic decisions to consider whether it is worth risking prospective SEW and FW losses (Gomez-Mejia et al., 2014, 2015). Since FW and SEW are the two nonfungible currencies in family firms (Gomez-Mejia et al., 2015), the mixed gamble is a more holistic approach to examining the impact of FPS on risky strategic decisions in family firms compared to other prominent lenses in organizational studies such as the BTOF (Cyert & March, 1963).

However, weighing the upside and downside of a strategic action in financial and socioemotional terms in parallel is challenging for decision-makers since a change in one dimension often leads to an opposite change in the other one. As a result, "the trade-off between financial and SEW considerations will often lead to win-lose or lose-win outcomes, respectively, when these outcomes are assessed in financial and socioemotional terms" (Gomez-Mejia et al., 2015, p. 1373).

In this mixed gamble dilemma, firms are often advocated to strongly consider the level of FPS (Gomez–Mejia et al., 2014) because performance above or below satisfaction can heighten the alignment or misalignment of the FW and SEW. For example, studies show that under low vulnerability, such as when FPS is high, socioemotional and financial goals are at odds as drivers of strategic change (Schweiger et al., 2023). Without financial distress, family business owners tend to be risk-averse and strongly avoid the uncertain gains tied to a strategic option while placing more weight on protecting current endowments. In contrast, under vulnerability, SEW and

FW concerns can converge as drivers of strategic change, for meeting the organization's financial obligations is a critical precondition for family owners to enjoy socioemotional and financial utilities in tandem. For example, under high vulnerability, such as when financial performance falls far below aspirations, firms will seek to improve it in the short-term to not face a complete loss of SEW, including the family's control over the firm and the potential for transgenerational succession, in this case, aligning FW and SEW goals (Gomez-Mejia et al., 2010). However, at the same time, enhancing short-term financial performance is frequently attained through cost-cutting measures, such as divesting an inefficient division and restructuring actions that could potentially harm the family's reputation, the family name and the family identity (Dyer & Whetten, 2006), suggesting again a trade-off between FW and SEW considerations. Hence, financial vulnerability should induce the need for fast financial improvements, even if this connotes accepting temporary losses in some SEW dimensions but protecting others. So, an open question in the context of eco-innovations is how family SMEs assess the potential gains and losses of SEW and FW under the influence of FPS.

Financial performance satisfaction in family SMEs and the introduction of eco-innovations

First, it is important to consider the nature of eco-innovations. A recent literature review identifies two streams of research (López Pérez et al., 2024). One portrays eco-innovations as a win-win situation, as these practices can improve sales, reputation, and provide new marketing opportunities (Díaz-García et al., 2015; Leoncini et al., 2019; Scarpellini et al., 2016). A second stream of literature suggests a win-lose situation: while environmental performance increases, these activities entail additional costs that negatively affect financial performance. The authors (López Pérez et al., 2024) go on to suggest that the two views are reconcilable if you consider that engaging in eco-innovation negatively impacts financial performance in the short run but, if successful, can enhance it in the long run.

In examining eco-innovation decisions within family firms, it is essential to not only assess their financial implications but also to evaluate their potential impact on SEW, both in the short and long run. Strong involvement in eco-innovations can enhance reputation and the prospect of passing on an esteemed brand to the next family generation (Bammens & Hünermund, 2020). So, particularly when taking a longer time horizon, gains in the SEW dimensions, such as dynastic succession and family identity (Bammens & Hünermund, 2020; Berrone et al., 2012; Gómez-Mejía et al., 2007), can be foreseen. Overall, this suggests that engagement in eco-innovation can increase both FW and SEW in the long run, which is a win-win situation.

Notwithstanding this pronounced benefit, the process leading to eco-innovations can result in certain losses of current financial and socioemotional endowments because eco-innovation is not merely an application of current environmental practices. Its process includes new idea creations and further development, which entail risks (Díaz-García et al., 2015), making the FW and SEW gains discussed above speculative and uncertain. Furthermore, eco-innovations require financial and human resource investments (Cainelli et al., 2012; Díaz-García et al., 2015) and interorganizational cooperation (Horbach, 2008). Hence, family SMEs may need to use their retained earnings to invest in these activities, borrow from external sources, tap into internal reserves, or hire experts, resulting in dependency on non-family partners, which might threaten their ability to retain family control and pass the firm to the next generation (Jansen et al., 2023). Furthermore, sustainability strategies like eco-innovations will incur immediate expenses for the company, thereby decreasing short-term profits (Wang et al., 2008). Consequently, some active shareholders might contemplate altering the existing management structure, posing a risk to the controlling family's authority (Hsu & Chen, 2023). In short, extensive engagement in eco-innovation tends to threaten family control and influence in the short run, causing SEW loss in this crucial dimension.

Second, although SEW is often attributed as a key driver of sustainability practices in family firms (Mariani et al., 2023), an increasing number of studies highlight that various SEW dimensions differentially impact family firms' behavior and performance outcomes (Davila et al., 2023; Miller & Le Breton–Miller, 2014) as well as their sustainability strategies (Cruz et al., 2014; Diéguez-Soto et al., 2021; Hsueh et al., 2023; Zientara, 2017). The grammar of this sentence is incorrect. Please change into: Concretely, family firms for which the family control and influence SEW dimension is most salient are more cautious about engaging in environmental activities due to concerns about becoming overly dependent on external funding or negatively impacting short-term shareholder wealth (Arena & Michelon, 2018; Hsu & Chen, 2023). Conversely, family SMEs, for which the role of renewal of family bonds to the firm through dynastic succession is heightened, tend to introduce eco-innovations extensively as an attempt to maintain a good image benefiting the future descendants (Bammens & Hünermund, 2020; Delmas & Gergaud, 2014; Hsu & Chen, 2023). Similarly, family members' identification with the firm (Bammens & Hünermund, 2020; Dyer & Whetten, 2006), their orientation to strengthen/avoid losing social ties with stakeholders (Delmas & Gergaud, 2014; Kallmuenzer et al., 2023), and their emotional attachment to the firm (Diéguez-Soto et al., 2021) encourages family firms to act in a socially responsible fashion. The more closely the family's identity is tied to the organization, the stronger a family business is seen as an extension of the

family; therefore, the owning family will be sensitive about the quality of the products/services they provide as well as the external image they present to their customers, suppliers, and other external stakeholders (Berrone et al., 2012). As a result, these family SMEs will engage in eco-innovation to a greater extent (Arena & Michelon, 2018; Bammens & Hünermund, 2020). With regard to family SMEs' social relationships, that is, binding social ties, family firms are argued to be deeply embedded in their communities; thus, they frequently engage in activities valued by the community, such as charity or environmental initiatives (Berrone et al., 2010). In the same vein, other studies emphasize that family firms' strong sustainability engagement stems from their endeavors to forge deeper relationships with their stakeholders, such as customers and employees, who place importance on sustainability strategies (Delmas & Gergaud, 2014; Kallmuenzer et al., 2023). Third, the emotional attachment of family members to the firm positively influences the family owners' willingness to perpetuate the business and fosters the family's sense of legacy (Basly & Saunier, 2020; Berrone et al., 2012). As such, family SMEs with a high level of emotional attachment to the firm will exhibit a greater tendency to engage extensively in environmental practices (Diéguez-Soto et al., 2021).

All in all, it is crucial to account for SEW multidimensionality. Accordingly, in our theorization, we consider all SEW dimensions mentioned above. In what follows, we argue how different degrees in FPS (low, low-to-moderate, moderate, moderate-to-high, or high), serving as distinct reference points for assessing the desired gains and the perceived urgency of these gains in FW and SEW, influence family firms' engagement in eco-innovation.

At the left side of the concave, where FPS is at the lowest level, the firm's financial health is perceived to be at risk, which can threaten the firm's survival and, thus, the family's SEW (Gomez-Mejia et al., 2015). In this situation of below-aspiration financial performance, we know that time orientation shortens (Souder & Bromiley, 2012) and that even family SMEs tend to base their investment decisions on eco-innovations on a short(er) time horizon. While the allure of long-term financial success and SEW preservation, in terms of gains in family identity, binding social ties, emotional attachment to the firm, and dynastic succession, may tempt family SMEs to invest in eco-innovations, the inherently higher risks associated with these environmental initiatives pose a significant challenge. Hence, wary of further jeopardizing FW, family SMEs will be cautious about embracing such high-risk activities as eco-innovation to a great extent. On the contrary, the shorter time horizon might incline family firms to pursue cost-cutting strategies and eliminate nonessential operations and expenses to maintain current operations (Cater & Schwab, 2008). These cost-cutting strategies could allow family firms to hand over control of a revitalized and potentially more efficient firm to the next generation in the long-term (Gomez-Mejia et al., 2015), which is more uncertain when the firm

would decide to invest in high-risk activities such as eco-innovation in vulnerable times.

Furthermore, recent research found that firms that face weak financial conditions (reflected in financial constraints and distress) and poor economic environments invest far less in CSR and sustainability practices such as green product development (Chan et al., 2017; Miroshnychenko & De Massis, 2022). This effect may be even worse in family firms as the financing of sustainability activities like eco-innovations would imply attracting external investors (internal sources are probably insufficient, and debt is usually not an option because of the distress situation), which may compromise the control dimension of SEW (Jansen et al., 2023). Considering the above arguments about FW and SEW, the extent to which family SMEs engage in eco-innovations at the lowest level of FPS will be low.

Compared to firms with the lowest level of FPS, family SMEs with low-to-moderate levels of FPS tend to exhibit longer time orientations (Souder & Bromiley, 2012), enabling them to evaluate risky strategies such as eco-innovations differently. As short-term enhancement of financial performance is not imperative, the appeal of long-term financial success from introducing more eco-innovations increases. As these family SMEs are more satisfied with their financial performance, they are still motivated to increase it. As indicated by Kahneman and Tversky (1979), people who are not entirely at peace with their financial situation are likely to accept gambles that would be unacceptable to them otherwise. Reviewing the gamble these firms face, the likelihood of losing family control and, consequently, jeopardizing other SEW dimensions, such as the perpetuation of the family dynasty through investing in eco-innovations, is diminished as their financial situation is less dire. At the same time, the prospect of future financial gains (Mahto & Khanin, 2015) and the positive implications for the family's identity, the bonds with stakeholders, the family's emotional attachment to the firm, and the preservation of the family dynasty become more appealing. Consequently, the trade-off among SEW dimensions emanating from eco-innovation investments decreases. So, from both the FW and SEW perspectives, these types of family SMEs will be inclined to engage in eco-innovation activities to a greater extent. Altogether, the extent to which family SMEs engage in eco-innovations at the low-to-moderate level of FPS will be higher compared to firms with the lowest level of FPS.

Family SMEs with moderate levels of FPS will have the highest levels of eco-innovations as they are still motivated to increase their financial performance through investments in eco-innovations. They also have the discretion to do so as they have a bigger error margin. That is, even if the eco-innovation turns out unsuccessful, the firm's existence is not in immediate danger, which means they do not risk losing all FW and SEW. The prospect of potential long-term gains in FW and SEW will lead to high levels of engagement in eco-innovation activities.

Compared to family SMEs with moderate levels of FPS, those with moderate-to-high levels of FPS tend to have an intensified desire to protect both current FW

and SEW endowments (Gomez-Mejia et al., 2015). Similar to the moderate level, there are potential SEW gains from introducing more eco-innovations at high FPS levels in terms of gains in the family's identity, binding social ties, emotional attachment, dynastic succession, and lower risks of losing these SEW dimensions. Moreover, in the long run, financial rewards can be expected as a result of these investments (Mahto & Khanin, 2015). However, despite potential FW gains from high engagement in eco-innovations, the uncertainties associated with these activities make them less attractive compared to other sustainability practices with more certain outcomes. In other words, since these firms are already highly satisfied with their financial performance, there is little to gain in FW (Gomez-Mejia et al., 2015). Out of concern for protecting their current FW, family SMEs are less incentivized to engage extensively in high-risk, high-gain activities like eco-innovations. Accordingly, family SMEs will lean toward less risky environmental strategies if these strategies present fewer threats to preserving their existing SEW endowment. In sum, and considering both FW and SEW arguments, since there is only little to gain in FW, but also much to lose in SEW, family SMEs with moderate-to-high levels of FPS are inclined to limit their involvement in eco-innovations compared to those with the moderate FPS level.

Where FPS is at the highest level, the drive to protect both current FW and SEW endowments reaches its peak (Gomez-Mejia et al., 2015). The extent to which family SMEs engage extensively in risky investments (for example, eco-innovations) is again the lowest (Mahto & Khanin, 2015) due to the limited marginal gains that might arise from successful eco-innovations.

All in all, we hypothesize that:

Hypothesis: The relationship between the level of FPS and the extent to which family SMEs introduce eco-innovations has an inverted U-shape, such that family SMEs with high or low levels of FPS introduce fewer eco-innovations than those with moderate levels of FPS.

Table 1 summarizes the potential outcomes of eco-innovation engagement for family SMEs in terms of FW and SEW gains and losses at low, low-to-moderate, moderate, moderate-to-high, and high levels of FPS.

Data and methods

Data

We obtained data for this study through a survey sent to the CEOs of 4,040 small and medium-sized Dutch companies at the beginning of 2019. The Netherlands represents a favorable setting in which to conduct our research, as previous research reported that more than 60% of SMEs are family firms (Van Gils et al., 2019). In addition, the score of Dutch firms' eco-innovation activities is representative of the European Union (European Commission, 2019).

Table 1. Overview of potential outcomes of the eco-innovation mixed gamble across different levels of FPS.

		Eco-innovation is unsuccessful	Eco-innovation is successful
FPS LOW	FW	High initial costs without enough return could lead to bankruptcy of firm	High initial costs might still be detrimental for firm survival in the short run If firm survives, financial performance will benefit
	SEW	Potential loss of all SEW	Potential loss of family control due to external help/financing Gains in identity, binding social ties, emotional attachment, and perpetuation of the family dynasty
FPS LOW-TO-MODERATE AND FPS MODERATE	FW	No recovery of invested financial resources	Long-term financial gains, better competitive position
	SEW	Potential loss of identity, binding social ties, and emotional attachment	Gains in identity, binding social ties, emotional attachment, and the perpetuation of the family dynasty
FPS MODERATE-TO-HIGH AND FPS HIGH	FW	No recovery of invested financial resources	Perceived financial gains are low as the financial performance is already at the aspired level
	SEW	Potential loss of identity, binding social ties, and emotional attachment	Gains in identity, binding social ties, emotional attachment, and the perpetuation of the family dynasty

The sample represented the population of Dutch firms located in the province of Limburg that employ up to 250 people, excluding firms that are part of a branch. Information about these firms was obtained from Orbis, a financial database created by Bureau van Dijk. After sending a reminder, 759 surveys were returned, resulting in a response rate of 18.8%. We identify a firm as a family firm if it meets one of the following conditions: (i) the CEO identified the firm as being a family firm, or (ii) one family or one person owns at least 50% of the shares, and at least one family member is part of the management team of the company. This is in line with commonly used definitions of family firms (Chrisman et al., 2005; Westhead & Howorth, 2006). Based on this definition, 75.2% of the companies in our sample are family firms. After excluding observations with missing values, 345 family SMEs were left in the sample. More details and tests relating to missing values are provided in the Appendix A.

Dependent variable

Following the questions relating to eco-innovations in the Community Innovation Survey,[3] we asked the respondents whether they introduced any process innovations between 2016 and 2018 that (1) reduced energy use per

[3]Community Innovation Survey (CIS) is a pan-European survey focusing on innovation activities within the business sector, conducted on behalf of the European Commission. It follows the methodology outlined in the OECD Oslo Manual for innovation and R&D surveys (OECD, 2005). The scale to measure eco-innovation in CIS is widely adopted in management and innovation literature (Bammens & Hünermund, 2023; Galbreath et al., 2021; Ghisetti et al., 2015).

unit of product/service output, (2) reduced material and/or water consumption per unit of product/service output, (3) reduced CO_2 emissions (total company emissions), (4) reduced air pollution, (5) reduced water or soil pollution, (6) reduced noise pollution, (7) replaced fossil with renewable energy sources, (8) replaced used materials with less dangerous alternatives, or (9) recycled waste, water or materials for own use or sale. We also collected information on whether firms introduced any product innovations between 2016 and 2018 that (1) reduced energy use, (2) reduced air, water, or soil contamination, (3) improved recyclability of the product after use, or (4) extended the lifespan of a product/service. We then constructed dummies from each individual item and summed them up for each firm in our sample (Bammens & Hünermund, 2020; Galbreath et al., 2021). The resulting variable eco-innovations ranges from zero to 13, with a mean of about 5.09 and a standard deviation of 3.52 (see Table 2).

Independent variable

Financial Performance Satisfaction (FPS). The respondents specify the extent to which they have been satisfied with their firm's financial performance in 2016 using a 7-point Likert scale, which ranges from very dissatisfied (1) to very satisfied (7) (Chrisman et al., 2012).[4]

Control variables

In our analyses, we control for firm age, firm size, R&D intensity, collaboration, industry, number of family owners, CEO tenure, and CEO gender. As literature shows a negative correlation between firm age and eco-innovations and a positive correlation between firm size and eco-innovations (Hoogendoorn et al., 2015; Horbach et al., 2012), we control for firm age measured as the natural logarithm of the number of years since the firm's foundation and control for firm size measured as the natural logarithm of the number of employees. Since prior research reports a strong relationship between R&D and eco-innovations (Ghisetti et al., 2015), we control for R&D expenditure measured as the average yearly spending of the firm on R&D expressed as a percentage of their turnover. The variable is defined by five categories: none, 1–5%, 6–10%, 11–20%, and > 20%. As such, our variable

[4]We follow Chrisman et al. (2012) to measure financial performance satisfaction. It is a single-item scale. While multi-item scales are generally considered more reliable, single-item scales have been demonstrated to perform well in various instances and mitigate concerns related to common method bias (Bergkvist & Rossiter, 2007; Rossiter, 2002). Specifically, single-item scales are advantageous in cases of questionnaire space constraints and are more conducive to achieving high response rates because their lower redundancy makes them less burdensome for respondents (Wanous et al., 1997). In addition, single-item scales are often straightforward and respondents can easily understand the question and its relevance to the construct being measured, that is, have increased face validity (Matthews et al., 2022).

Table 2. Descriptive statistics and correlations.

Variables	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Eco-innovations	5.087	3.515	1												
(2) FPS	4.687	1.650	0.008	1											
(3) Firm age[a]	3.429	0.899	0.204***	−0.012	1										
(4) Firm size[a]	2.856	1.057	0.230***	0.121*	0.272***	1									
(5) No R&D expenditure	0.203	0.403	−0.275***	−0.110*	−0.022	−0.283***	1								
(6) R&D expenditure 1–5% of sales	0.632	0.483	0.226***	0.059	0.095	0.202***	−0.661***	1							
(7) R&D expenditure 6–10% of sales	0.130	0.337	0.003	0.042	−0.048	0.056	−0.195***	−0.507***	1						
(8) R&D expenditure 11–20% of sales	0.029	0.168	−0.014	−0.041	−0.107*	0.001	−0.087	−0.226***	−0.067	1					
(9) R&D expenditure > 20% of sales	0.006	0.076	0.042	0.107*	−0.040	−0.037	−0.039	−0.100	−0.030	−0.013	1				
(10) Collaboration	0.472	0.500	0.258***	0.053	0.016	0.202***	−0.261***	0.132*	0.082	0.079	0.004	1			
(11) Number of family owners	1.693	1.407	0.124*	0.011	0.039	0.182***	−0.059	0.073	0.011	−0.073	−0.038	0.054	1		
(12) CEO tenure	19.247	11.39	0.152**	−0.117*	0.245***	−0.127*	0.000	−0.002	−0.026	0.040	0.039	−0.079	0.038	1	
(13) CEO gender	0.064	0.245	−0.088	−0.015	−0.065	−0.037	0.045	−0.022	0.005	−0.045	−0.020	0.014	−0.010	−0.111*	1

$n = 345$, *$p < .05$, **$p < .01$, ***$p < .001$.

[a]Log-transformed variable. In order to enhance readability, correlations are computed from logged variables, while descriptive statistics are shown for the raw form of each variable.

R&D expenditure serves as a proxy for a firm's general level of investment in innovation. Collaborations with external actors are crucial for eco-innovations (De Marchi, 2012); hence, we use a binary variable to control for whether the firm collaborated with others for innovation activities (1: yes and 0: no). To control for industry effects, we incorporated industry dummy variables representing five sectors: (1) primary, (2) manufacturing, (3) construction, (4) retail and wholesale, and (5) services. The distribution of sample firms across these categories is as follows: 9%, 16%, 12%, 27%, and 36%, respectively. We also control for family factors, namely the number of family owners, because a high number of family owners has been found to positively relate to family SMEs' propensity to engage in prosocial activities (Campopiano et al., 2014). Finally, since prior research shows the association between CEO tenure (Fabrizi et al., 2014; Javed et al., 2023) and CEO gender and eco-innovation (Javed et al., 2023), we control for these CEO characteristics. CEO tenure is measured by the number of years the CEO has been in the current position. CEO gender is a binary variable: 1 for female and 0 for male.

Common method variance

Since our predictors and criterion variables are obtained from a single source, any observed covariance may be the result of variables in our model sharing the same measurement method (Podsakoff et al., 2003). Therefore, we run Harman's one-factor test on our main variables (that is, eco-innovations and FPS) to investigate the impendence of common method bias. The test shows that one general factor would explain 37.68% of the total variance among the measures, which is clearly below the cutoff value of 50% (Podsakoff et al., 2003). Furthermore, the concern about common method variance is strongest when both the outcome and explanatory variable are perceptual measures derived from the same respondent (Podsakoff & Organ, 1986). Since eco-innovations reflect the organization's practices rather than individual perception, this suggests that common method variance is not a major concern in our data.

Model specification

The Poisson regression is suggested since we have a count dependent variable, that is, a variable with non-negative integer values (Greene, 2003). However, the Poisson distribution wherein the mean and variance are equal is violated. Hence, the negative binomial regression model is used in our estimations to overcome the overdispersion problem (Cameron & Trivedi, 1986). In addition, concerns about an endogeneity problem could arise from the potential causal relationship between FPS and eco-innovation outcomes. We alleviate

this issue by capturing the FPS in 2016 and the eco-innovation outcomes from 2016 to 2018.

Findings

Table 2 provides descriptive statistics and correlations for all variables except those reflecting industries. It shows that no significant correlation is observed between eco-innovations and FPS.

Table 3 presents the estimation results for the negative binomial regression models. The models are constructed gradually by entering only the control variables in the baseline model and then adding the independent variable and its quadratic term step by step. The variance inflation factors are < 5, indicating that multicollinearity is not a problem in our analyses. Breusch–Pagan/Cook–Weisberg tests for heteroscedasticity indicated that we needed to make our standard errors robust to heteroscedasticity, which we apply to all following analyses.

Model 1 includes only control variables, and some of them are significant. For instance, family SMEs conduct eco-innovations to a larger extent when

Table 3. Estimation results for dependent variable eco-innovations.

	Model 1	Model 2	Model 3
	(baseline)		
Firm age	0.106†	0.106†	0.108†
	(0.056)	(0.056)	(0.056)
Firm size	0.078†	0.08*	0.087*
	(0.04)	(0.041)	(0.039)
R&D expenditure 1–5% of sales	0.437***	0.441***	0.41***
	(0.111)	(0.112)	(0.112)
R&D expenditure 6–10% of sales	0.378*	0.384**	0.356*
	(0.147)	(0.148)	(0.148)
R&D expenditure 11–20% of sales	0.359	0.359	0.312
	(0.293)	(0.293)	(0.287)
R&D expenditure > 20% of sales	0.644	0.681	0.777†
	(0.467)	(0.475)	(0.472)
Collaboration	0.244***	0.245***	0.242***
	(0.072)	(0.072)	(0.072)
Number of family owners	0.028†	0.027†	0.033
	(0.016)	(0.016)	(0.017)
CEO tenure	0.008*	0.008*	0.008*
	(0.003)	(0.003)	(0.003)
CEO gender	−0.197	−0.199	−0.216
	(0.157)	(0.157)	(0.153)
Financial performance satisfaction		−0.012	0.203*
		(0.021)	(0.098)
Financial performance satisfaction squared			−0.025*
			(0.011)
Industry dummies	Yes	Yes	Yes
Log likelihood	−859.479	−859.334	−857.116
Wald chi-square	89.26*** (14)	89.88*** (15)	95.78*** (16)
AIC	1750.958	1752.667	1750.232
Observations	345	345	345
Pseudo R^2	0.041	0.042	0.044

$^{\dagger}p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$. Robust standard errors are in parentheses.
Constant included. The base category for R&D expenditure is no R&D expenditure.

they collaborate with others ($p < .001$) and when the CEO tenure is high ($p < .05$). Family SMEs with a ratio of R&D expenditure over sales between 1–5% ($p < .001$) and 6–10% ($p < .05$) also undertake more eco-innovations compared to family firms without R&D expenditure. Our hypothesis predicts an inverse U-shaped relationship between FPS and eco-innovations. Consistent with the Hypothesis, Model 3 shows that the squared term of FPS has a negative and significant effect on eco-innovations ($\beta = -0.025$, $p < .05$). Following Lind and Mehlum (2010), we further verified the marginal effect of FPS by checking the steepness of the slope at both ends of the FPS data range. When FPS equals 1, the slope is positive and statistically significant (0.153, $p < .05$). When FPS equals 7 (the maximum value), the slope is negative and statistically significant (−0.148, $p < .01$). Our results show that the curvilinear relationship turns when FPS equals 4.06 with a 95% confidence interval (interval = [1.209, 5.075]). All the above results are within the FPS data range, thus supporting the Hypothesis.

Robustness tests

To alleviate the concern regarding the potential overlap between some eco-innovation measures, resulting in the double-counting of particular eco-innovations, Model 3 was re-estimated using alternative measurements of the eco-innovation variable. In the first alternative measurement, we excluded two items in product eco-innovations, namely, (1) reduced energy use and (2) reduced air, water, or soil contamination, which could overlap with items in process eco-innovations, that is, (1) reduced energy use per unit of product/service output, (4) reduced air pollution; (5) reduced water or soil pollution. In the second alternative measurement, we excluded three items in process eco-innovations, namely, (1) reduced energy use per unit of product/service output, (4) reduced air pollution, (5) reduced water or soil pollution, which may overlap with items in product eco-innovations, that is, (1) reduced energy use and (2) reduced air, water, or soil contamination. The main results stay consistent.

Discussion and conclusions

Our empirical results validate our theoretical proposition that FPS has an inverted U-shaped relationship with the extent to which family SMEs introduce eco-innovations. As our predictions were drawn from the mixed gamble lens and a deep dive into the potential gains and losses in FW and different SEW dimensions in the short and long run, the findings connote notable theoretical contributions, which we will explicate in the section below. Subsequently, we will discuss the practical implications and conclude the study by outlining limitations and future research avenues.

Theoretical implications

First, our research contributes to the sustainability literature. While extant studies show a linear relationship between FPS and organizational engagement in sustainability practices (Arora & Dharwadkar, 2011; Deng & Long, 2019), our result challenges these findings, pointing to an inverted U-shaped relationship between FPS and the extent to which family SMEs introduce eco-innovations. Hence, our study conforms to organizational research, which has revealed a complex relationship between FPS and risky strategic decisions (Cheng et al., 2022; Iyer & Miller, 2008; Ref & Shapira, 2017). Therefore, we underscore the importance of examining the nonlinear impact of FPS on risky strategic behaviors such as eco-innovations to produce more fine-grained research results.

Second, our study answers the calls for more scholarly efforts on sustainability in the specific context of family businesses (Ferreira et al., 2021). We advance family business literature by weighing the likely gains and losses in FW and SEW (that is, the mixed gamble lens) in the short and long run while accounting for the different impacts of SEW dimensions on risky strategic decisions. Particularly, we study the influence of low, low-to-moderate, moderate, moderate-to-high, and high FPS. While our arguments confirm how at high levels of FPS both FW and SEW considerations will discourage family firms from undertaking risky decisions as they are highly satisfied with their financial performance already (Gomez–Mejia et al., 2014), our theorization deviates from the majority of family business studies when it comes to the impact of FW and SEW considerations on the risky strategic outcomes at the low level of FPS. Specifically, following the conventional arguments, one would expect that at low FPS, where both FW and SEW are at risk, these financial and socioemotional considerations will prompt family SMEs to introduce eco-innovations extensively in an attempt to improve their situation. Yet, considering the risky nature of eco-innovations, we argue that when financial performance falls far below aspirations, the time orientation of family SMEs shortens, which makes them cautious about embracing such high-risk activities as eco-innovation for which the benefits in terms of FW and SEW would only transpire in the long run. Our argument aligns with prior evidence in organizational research that as performance falls farther and farther below aspiration (that is, the low FPS level), a firm's probability of making risky strategic decisions, such as entering new markets, decreases (Ref & Shapira, 2017). As such, we concur with organizational literature in underlining the uncertain and costly nature of risky strategies, which makes the long-term return less appealing to firms in survival mode (that is, low FPS). Moreover, while family firms are oft-argued to take more strategic initiatives at the low levels of FPS to enhance their SEW (Gomez-Mejia et al., 2015), our findings

suggest the opposite effect. That is, while eco-innovations may help family SMEs to increase their SEW via gains in family identity, binding social ties, family's emotional attachment to the firm, and dynastic succession, they pose potential risks to the family control dimension (Bammens & Hünermund, 2020; Berrone et al., 2010; Delmas & Gergaud, 2014; Diéguez-Soto et al., 2021; Hsu & Chen, 2023). As avoiding loss is more important than seeking gains, from the SEW perspective, family SMEs will also be less inclined to introduce eco-innovations extensively. In short, our research showcases how considering the risky nature of the outcome variable and the competing nature of SEW dimensions when weighing the likely gains and losses of FW and SEW under the varied levels of FPS can augment the theoretical predictions. In this way, we draw family business scholars' attention to how the very low to moderate levels of FPS may challenge prior assumptions about family SMEs' risky strategic decisions. Furthermore, in line with previous studies on the "double-edged sword" of SEW in prompting sustainability strategies in family firms (Bammens & Hünermund, 2020; Cruz et al., 2014), our theorization emphasizes the importance of a holistic consideration of SEW dimensions. This comprehensive approach is crucial for a more profound conceptual analysis of family firms' strategic decisions.

Third, our fine-grained picture of the effect of FPS on eco-innovations is further enabled by the direct measurement of this construct. Rather than presuming the satisfaction or aspiration of family SMEs about their performance based on the historical and industry data as in most studies, our construct is extracted from the CEO's insights, directly capturing family firms' satisfaction. Although the indirect measurement can broadly indicate the expectation of organizations in general, this method may not closely reflect the preferences of family SMEs, who tend to prioritize their noneconomic goals over economic ones and thus may be content with their performance even though it is below the industry average. Therefore, the indirect measurement may not capture the nuances in the heterogeneity among the goals of family SMEs and may exaggerate the sample of family firms that are unsatisfied with their performance. Hence, we advocate the importance of applying direct measurement of FPS in future studies.

Fourth, our research enriches the growing body of literature that examines family firm heterogeneity, defined as "the range of categorical and/or variational difference(s) between or among family firms at a given time or across time" (Daspit et al., 2021, p. 298). We focus on how the variation of a condition (that is, FPS) can induce varied strategic performance among family SMEs. These sources of heterogeneity help explain why family SMEs might not uniformly arrive at similar levels of eco-innovations and may offer ideas to reconcile the conflicting findings about the engagement of family firms in sustainability practices. Therefore, we answer the call to examine the

effects of differences among family firms and reinforce the necessity to focus on family firms as a heterogeneous group to gain a deeper understanding of their eco-innovation behaviors.

Practical implications

Our study is a prompt response to the growing ecological awareness and the potential role of family SMEs in this global combat. This is a crucial finding given that family SMEs are usually reported to represent at least 60% of businesses worldwide (Classen et al., 2014; Price et al., 2013; Van Gils et al., 2019). Hence, the results provide a profound insight into how eco-innovations can be stimulated in the most dominant group of businesses worldwide. By unveiling the significant impact of FPS and explaining the underlying FW and SEW considerations, we provide implications for managers, consultants, and policymakers to design practices and incentives that can encourage family SMEs' involvement in eco-innovation activities. Specifically, our mixed gamble analysis highlights how the high-risk and high-cost nature of eco-innovations may threaten family SMEs' FW and SEW, impeding them from engaging extensively in eco-innovation activities when their FPS is high or low. Thus, policymakers could create favorable conditions for family SMEs, for example, to gain government subsidies to realize their eco-innovation strategies without threatening their SEW preservation. Business consultants could make the potential FW gains from eco-innovations more attainable and appealing to family firms by, for instance, helping family SMEs leverage extant environmental inventions or developing the firm's R&D capabilities, as this may reduce the inherent risks.

Limitations and future research

First, our data were collected from a survey conducted in 2019. Therefore, future research would benefit from a longitudinal design to thoroughly explore the impact of this driver over time and examine different time-lag periods to fully account for the causal effect. Second, one of the arguments in our hypothesis development regarding the impact of past FPS on eco-innovations is that eco-innovations can enhance firms' economic performance, especially in the long run, thus encouraging family SMEs to introduce more eco-innovations. However, various types of eco-innovations (that is, eco-product and eco-process innovation) can contribute to economic performance differently in terms of effect size (Zheng & Iatridis, 2022). Another assumption is that eco-innovations can increase family SMEs' SEW (for example, eco-innovations are visible to the public; hence, they can increase family reputation). However, different types of eco-innovations can vary in their visibility to the public. Therefore, it would be valuable to examine in

greater detail whether our drivers of interest can trigger variances in the types of eco-innovations that family firms opt for. Third, there can be differences across countries in how family involvement affects environmental indicators (Rees & Rodionova, 2015); hence, it would be interesting to test the generalizability of our results beyond the Dutch setting. Fourth, we build upon a stream of research using the mixed gamble lens to analyze the likely gains and losses of family SMEs' FW and SEW (Gomez-Mejia et al., 2014, 2015), but we do not measure these constructs. Constructs such as SEW have long served as an unmeasured theoretical concept. Thus, this shortcoming heightens the necessity to better define and measure SEW and its dimensions (Combs et al., 2022). Fifth, our research focuses on family SMEs. Hence, the findings may not be generalizable to large family firms, and future studies could investigate whether our findings hold for large family firms.

As our results diverge from the prior evidence regarding the linear impact of FPS on strategic decisions in family business (Mahto & Khanin, 2015; Patel & Chrisman, 2014) and sustainability research (Arora & Dharwadkar, 2011; Deng & Long, 2019) and thus depart from the conventional wisdom, our study opens avenues for future research. Moving forward, sustainability researchers can challenge prior findings and reexamine whether there is a nonlinear effect between FPS and organizational engagement in other sustainability practices.

In addition, while our study predicts a family firm's engagement in eco-innovation based on its satisfaction with financial performance, future research could investigate the influence of its satisfaction with current SEW. To our knowledge, no research has explored, let alone quantified, a firm's satisfaction level with its SEW. However, based on BAM and the mixed gamble lens, it is reasonable to assume that the satisfaction with current SEW stock impacts the risk family firms are willing to take to improve it.

Finally, in line with a previous call to "analyze how [internal] determinants act differently within family firms" (Broccardo et al., 2019, p. 9), our study shows that exploring the heterogeneity among family SMEs about eco-innovations can provide novel and profound insights about the enablers and impediments of eco-innovations among these firms. Such findings will not only shine light on the contradictory findings about the engagement of family firms in eco-innovations but also have immense societal relevancy as these discoveries provide ideas, tools, and guidelines for policymakers, consultants, and managers to help family firms join the global movement in addressing ecological topics.

In closing, a careful examination of FPS's role can enhance our understanding of the heterogeneity in family SMEs' eco-innovation decisions. By weighing the likely gains and losses in FW and SEW (that is, the mixed gamble lens) in the short and long run and considering the different impacts of SEW dimensions, we demonstrated that the influence of FPS on risky strategic decisions such as eco-innovation is more

complex than the linear relationship identified in prior family firm research. We believe this finding is an essential contribution to the literature on family business and sustainability and allows for a more holistic theoretical understanding of the nonlinear impact of FPS on family SMEs' strategic decisions.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The data used in the paper was collected with the support of the Dutch Province of Limburg.

ORCID

Phuong-Anh Nguyen Duong http://orcid.org/0000-0002-8046-9081
Wim Voordeckers http://orcid.org/0000-0001-7041-3933
Jolien Huybrechts http://orcid.org/0000-0001-6520-7641
Frank Lambrechts http://orcid.org/0000-0003-0970-0372
Anita Van Gils http://orcid.org/0000-0001-8704-4951

References

Agostino, M., & Ruberto, S. (2021). Environment-friendly practices: Family versus non-family firms. *Journal of Cleaner Production*, *329*, 129689. https://doi.org/10.1016/j.jclepro.2021.129689

Aiello, F., Cardamone, P., Mannarino, L., & Pupo, V. (2021). Green patenting and corporate social responsibility: Does family involvement in business matter? *Corporate Social Responsibility & Environmental Management*, *28*(4), 1386–1396. https://doi.org/10.1002/csr.2146

Alessandri, T. M., Cerrato, D., & Eddleston, K. A. (2018). The mixed gamble of internationalization in family and nonfamily firms: The moderating role of organizational slack. *Global Strategy Journal*, *8*(1), 46–72. https://doi.org/10.1002/gsj.1201

Arena, C., & Michelon, G. (2018). A matter of control or identity? Family firms' environmental reporting decisions along the corporate life cycle. *Business Strategy and the Environment*, *27*(8), 1596–1608. https://doi.org/10.1002/bse.2225

Arora, P., & Dharwadkar, R. (2011). Corporate governance and corporate social responsibility (CSR): The moderating roles of attainment discrepancy and organization slack. Corporate Governance an International Review, *19*(2), 136–152. https://doi.org/10.1111/j.1467-8683.2010.00843.x

Bammens, Y., & Hünermund, P. (2020). Nonfinancial considerations in eco-innovation decisions: The role of family ownership and reputation concerns. *Journal of Product Innovation Management*, *37*(5), 431–453. https://doi.org/10.1111/jpim.12550

Bammens, Y., & Hünermund, P. (2023). Ecological community logics, identifiable business ownership, and green innovation as a company response. *Research Policy*, *52*(8), 104826. https://doi.org/10.1016/j.respol.2023.104826

Bammens, Y., Hünermund, P., & Andries, P. (2021). Pursuing gains or avoiding losses: The contingent effect of transgenerational intentions on innovation investments. *Journal of Management Studies*, *59*(6), 1493–1530. https://doi.org/10.1111/joms.12787

Barbieri, N., Ghisetti, C., Gilli, M., Marin, G., & Nicolli, F. (2016). A survey of the literature on environmental innovation based on main path analysis. Journal of Economic Surveys, *30*(3), 596–623. https://doi.org/10.1111/joes.12149

Basly, S., & Saunier, P.-L. (2020). Family members' commitment to the firm and family business continuity: Investigating the mediating role of family-to-firm identity fit and emotional attachment. *Journal of Small Business & Entrepreneurship*, *32*(1), 9–32. https://doi.org/10.1080/08276331.2018.1551458

Bergkvist, L., & Rossiter, J. R. (2007). The predictive validity of multiple-item versus single-item measures of the same constructs. *Journal of Marketing Research*, *44*(2), 175–184. https://doi.org/10.1509/jmkr.44.2.175

Berrone, P., Cruz, C., & Gomez-Mejia, L. R. (2012). Socioemotional wealth in family firms: Theoretical dimensions, assessment approaches, and agenda for future research. *Family Business Review*, *25*(3), 258–279. https://doi.org/10.1177/0894486511435355

Berrone, P., Cruz, C., Gomez-Mejia, L. R., & Larraza-Kintana, M. (2010). Socioemotional wealth and corporate responses to institutional pressures: Do family-controlled firms pollute less? *Administrative Science Quarterly*, *55*(1), 82–113. https://doi.org/10.2189/asqu.2010.55.1.82

Berrone, P., Fosfuri, A., Gelabert, L., & Gomez-Mejia, L. R. (2013). Necessity as the mother of 'green' inventions: Institutional pressures and environmental innovations. *Strategic Management Journal*, *34*(8), 891–909. https://doi.org/10.1002/smj.2041

Bossle, M. B., Dutra de Barcellos, M., Vieira, L. M., & Sauvée, L. (2016). The drivers for adoption of eco-innovation. *Journal of Cleaner Production*, *113*, 861–872. https://doi.org/10.1016/j.jclepro.2015.11.033

Brigham, K. H., Lumpkin, G. T., Payne, G. T., & Zachary, M. A. (2013). Researching long-term orientation: A validation study and recommendations for future research. *Family Business Review*, *27*(1), 72–88. https://doi.org/10.1177/0894486513508980

Broccardo, L., Truant, E., & Zicari, A. (2019). Internal corporate sustainability drivers: What evidence from family firms? A literature review and research agenda. *Corporate Social Responsibility & Environmental Management*, *26*(1), 1–18. https://doi.org/10.1002/csr.1672

Cainelli, G., Mazzanti, M., & Montresor, S. (2012). Environmental innovations, local networks and internationalization. *Industry & Innovation*, *19*(8), 697–734. https://doi.org/10.1080/13662716.2012.739782

Calabrò, A., Vecchiarini, M., Gast, J., Campopiano, G., De Massis, A., & Kraus, S. (2019). Innovation in family firms: A systematic literature review and guidance for future research. *International Journal of Management Reviews*, *21*(3), 317–355. https://doi.org/10.1111/ijmr.12192

Cameron, A. C., & Trivedi, P. K. (1986). Econometric models based on count data. Comparisons and applications of some estimators and tests. *Journal of Applied Econometrics*, *1*(1), 29–53. https://doi.org/10.1002/jae.3950010104

Campopiano, G., De Massis, A., & Chirico, F. (2014). Firm philanthropy in small- and medium-sized family firms: The effects of family involvement in ownership and management. *Family Business Review*, *27*(3), 244–258. https://doi.org/10.1177/0894486514538450

Cater, J., & Schwab, A. (2008). Turnaround strategies in established small family firms. *Family Business Review*, *21*(1), 31–50. https://doi.org/10.1111/j.1741-6248.2007.00113.x

Chan, C.-Y., Chou, D.-W., & Lo, H.-C. (2017). Do financial constraints matter when firms engage in CSR? *The North American Journal of Economics & Finance*, *39*, 241–259. https://doi.org/10.1016/j.najef.2016.10.009

Cheng, L., Xie, E., Fang, J., & Mei, N. (2022). Performance feedback and firms' relative strategic emphasis: The moderating effects of board independence and media coverage. *Journal of Business Research*, *139*, 218–231. https://doi.org/10.1016/j.jbusres.2021.09.021

Chrisman, J. J., Chua, J. H., Pearson, A. W., & Barnett, T. (2012). Family involvement, family influence, and family–centered non–economic goals in small firms. *Entrepreneurship Theory and Practice*, *36*(2), 267–293. https://doi.org/10.1111/j.1540-6520.2010.00407.x

Chrisman, J. J., Chua, J. H., & Sharma, P. (2005). Trends and directions in the development of a strategic management theory of the family firm. *Entrepreneurship Theory and Practice*, *29* (5), 555–575. https://doi.org/10.1111/j.1540-6520.2005.00098.x

Chrisman, J. J., & Patel, P. C. (2012). Variations in R&D investments of family and nonfamily firms: Behavioral agency and myopic loss aversion perspectives. *Academy of Management Journal*, *55*(4), 976–997. https://doi.org/10.5465/amj.2011.0211

Chua, J. H., Chrisman, J. J., Steier, L. P., & Rau, S. B. (2012). Sources of heterogeneity in family firms: An introduction. *Entrepreneurship Theory and Practice*, *36*(6), 1103–1113. https://doi.org/10.1111/j.1540-6520.2012.00540.x

Classen, N., Carree, M., Van Gils, A., & Peters, B. (2014). Innovation in family and non-family SMEs: An exploratory analysis. *Small Business Economics*, *42*(3), 595–609. https://doi.org/10.1007/s11187-013-9490-z

Combs, J. G., Jaskiewicz, P., Ravi, R., & Walls, J. L. (2022). More bang for their buck: Why (and when) family firms better leverage corporate social responsibility. *Journal of Management*, *49*(2), 575–605. https://doi.org/10.1177/01492063211066057

Cruz, C., Larraza–Kintana, M., Garcés–Galdeano, L., & Berrone, P. (2014). Are family firms really more socially responsible? *Entrepreneurship Theory and Practice*, *38*(6), 1295–1316. https://doi.org/10.1111/etap.12125

Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Prentice-Hall.

Dangelico, R. M., Nastasi, A., & Pisa, S. (2019). A comparison of family and nonfamily small firms in their approach to green innovation: A study of Italian companies in the agri-food industry. *Business Strategy and the Environment*, *28*(7), 1434–1448. https://doi.org/10.1002/bse.2324

Daspit, J. J., Chrisman, J. J., Ashton, T., & Evangelopoulos, N. (2021). Family firm heterogeneity: A definition, common themes, scholarly progress, and directions forward. *Family Business Review*, *34*(3), 296–322. https://doi.org/10.1177/08944865211008350

Daspit, J. J., Chrisman, J. J., Sharma, P., Pearson, A. W., & Mahto, R. V. (2018). Governance as a source of family firm heterogeneity. *Journal of Business Research*, *84*, 293–300. https://doi.org/10.1016/j.jbusres.2017.12.041

Davila, J., Duran, P., Gómez-Mejía, L., & Sanchez-Bueno, M. J. (2023). Socioemotional wealth and family firm performance: A meta-analytic integration. *Journal of Family Business Strategy*, *14*(2), 100536. https://doi.org/10.1016/j.jfbs.2022.100536

De Marchi, V. (2012). Environmental innovation and R&D cooperation: Empirical evidence from spanish manufacturing firms. *Research Policy*, *41*(3), 614–623. https://doi.org/10.1016/j.respol.2011.10.002

Delmas, M. A., & Gergaud, O. (2014). Sustainable certification for future generations: The case of family business. *Family Business Review*, *27*(3), 228–243. https://doi.org/10.1177/0894486514538651

Deng, X., & Long, X. (2019). Financial performance gaps and corporate social responsibility. *Sustainability*, *11*(12), 3438. https://doi.org/10.3390/su11123438

Díaz-García, C., González-Moreno, Á., & Sáez-Martínez, F. J. (2015). Eco-innovation: Insights from a literature review. *The Innovation*, *17*(1), 6–23. https://doi.org/10.1080/14479338.2015.1011060

Diaz-Moriana, V., Clinton, E., & Kammerlander, N. (2024). Untangling goal tensions in family firms: A sensemaking approach. *Journal of Management Studies*, *61*(1), 69–109. https://doi.org/10.1111/joms.12845

Diéguez-Soto, J., Campos-Valenzuela, M., Callejón-Gil, Á. M., & Aldeanueva-Fernández, I. (2021). Family firm heterogeneity on Csr approach: A socio-emotional (SEW) perspective. *BRQ Business Research Quarterly*, 1–24. https://doi.org/10.1177/23409444211063889

Dyer, W. G., & Whetten, D. A. (2006). Family firms and social responsibility: Preliminary evidence from the s&p 500. *Entrepreneurship Theory and Practice*, *30*(6), 785–802. https://doi.org/10.1111/j.1540-6520.2006.00151.x

European Commission. (2019). *Eco-innovation in the netherlands: Eco-innovation country profile 2018–2019*. https://wayback.archive-it.org/org-1495/20220907101057/https://ec.europa.eu/environment/ecoap/sites/default/files/field/field-country-files/eio_country_profile_2018-2019_netherlands.pdf

European Commission. (2021). *Special eurobarometer 513: Climate change*. https://ec.europa.eu/clima/system/files/2021-07/report_2021_en.pdf

Fabrizi, M., Mallin, C., & Michelon, G. (2014). The role of ceo's personal incentives in driving corporate social responsibility. *Journal of Business Ethics*, *124*(2), 311–326. https://doi.org/10.1007/s10551-013-1864-2

Ferreira, J. J., Fernandes, C. I., Schiavone, F., & Mahto, R. V. (2021). Sustainability in family business – A bibliometric study and a research agenda. *Technological Forecasting & Social Change*, *173*, 121077. https://doi.org/10.1016/j.techfore.2021.121077

Galbreath, J., Chang, C.-Y., & Tisch, D. (2021). Are exporting firms linked to cleaner production? A study of eco-innovation in taiwan. *Journal of Cleaner Production*, *303*, 127029. https://doi.org/10.1016/j.jclepro.2021.127029

Ghisetti, C., Marzucchi, A., & Montresor, S. (2015). The open eco-innovation mode. An empirical investigation of eleven European countries. *Research Policy*, *44*(5), 1080–1093. https://doi.org/10.1016/j.respol.2014.12.001

Gomez–Mejia, L. R., Campbell, J. T., Martin, G., Hoskisson, R. E., Makri, M., & Sirmon, D. G. (2014). Socioemotional wealth as a mixed gamble: Revisiting family firm R&D investments with the behavioral agency model. *Entrepreneurship Theory and Practice*, *38*(6), 1351–1374. https://doi.org/10.1111/etap.12083

Gómez-Mejía, L. R., Haynes, K. T., Núñez-Nickel, M., Jacobson, K. J. L., & Moyano-Fuentes, J. (2007). Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. *Administrative Science Quarterly*, *52*(1), 106–137. https://doi.org/10.2189/asqu.52.1.106

Gomez-Mejia, L. R., Makri, M., & Kintana, M. L. (2010). Diversification decisions in family-controlled firms. *Journal of Management Studies*, *47*, 223–252. https://doi.org/10.1111/j.1467-6486.2009.00889.x

Gomez-Mejia, L. R., Patel, P. C., & Zellweger, T. M. (2015). In the horns of the dilemma: Socioemotional wealth, financial wealth, and acquisitions in family firms. *Journal of Management*, *44*(4), 1369–1397. https://doi.org/10.1177/0149206315614375

Greene, W. H. (2003). *Econometric analysis* (5th ed.). Prentice Hall.

Hoogendoorn, B., Guerra, D., & van der Zwan, P. (2015). What drives environmental practices of SMEs? *Small Business Economics*, *44*(4), 759–781. https://doi.org/10.1007/s11187-014-9618-9

Horbach, J. (2008). Determinants of environmental innovation—New evidence from german panel data sources. *Research Policy*, *37*(1), 163–173. https://doi.org/10.1016/j.respol.2007.08.006

Horbach, J., Prokop, V., & Stejskal, J. (2022). Determinants of firms' greenness towards sustainable development: A multi-country analysis. *Business Strategy and the Environment*, *32*(6), 2868–2881. https://doi.org/10.1002/bse.3275

Horbach, J., Rammer, C., & Rennings, K. (2012). Determinants of eco-innovations by type of environmental impact — The role of regulatory push/pull, technology push and market pull. *Ecological Economics*, *78*, 112–122. https://doi.org/10.1016/j.ecolecon.2012.04.005

Hsu, W.-T., & Chen, H.-L. (2023). Family firms' social responsibility: Exercise of family control versus family dynasty succession. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, *41*(2), 179–193. https://doi.org/10.1002/cjas.1718

Hsueh, J. W.-J., De Massis, A., & Gomez-Mejia, L. (2023). Examining heterogeneous configurations of socioemotional wealth in family firms through the formalization of corporate social responsibility strategy. *Family Business Review*, *36*(2), 172–198. https://doi.org/10.1177/08944865221146350

Hussinger, K., & Issah, A.-B. (2019). Firm acquisitions by family firms: A mixed gamble approach. *Family Business Review*, *32*(4), 354–377. https://doi.org/10.1177/0894486519885544

Iyer, D. N., & Miller, K. D. (2008). Performance feedback, slack, and the timing of acquisitions. *Academy of Management Journal*, *51*(4), 808–822. https://doi.org/10.5465/AMJ.2008.33666024

Jansen, K., Michiels, A., Voordeckers, W., & Steijvers, T. (2023). Financing decisions in private family firms: A family firm pecking order. *Small Business Economics*, *61*(2), 495–515. https://doi.org/10.1007/s11187-022-00711-9

Javed, M., Wang, F., Usman, M., Ali Gull, A., & Uz Zaman, Q. (2023). Female ceos and green innovation. *Journal of Business Research*, *157*, 113515. https://doi.org/10.1016/j.jbusres.2022.113515

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263–291. https://doi.org/10.2307/1914185

Kallmuenzer, A., Bichler, B., Petry, T., & Valeri, M. (2023). Employee perceptions of corporate social responsibility activities: The case of family firms. *European Business Review*, *35*(5), 600–623. https://doi.org/10.1108/EBR-09-2022-0171

La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. (1999). Corporate ownership around the world. *The Journal of Finance*, *54*(2), 471–517. https://doi.org/10.1111/0022-1082.00115

Lambrechts, F., & Gnan, L. (2022). Human resources and mutual gains in family firms: New developments and possibilities on the horizon. *Journal of Family Business Strategy*, *13*(2), 100502. https://doi.org/10.1016/j.jfbs.2022.100502

Lambrechts, F., Huybrechts, J., De Massis, A., & Lehmann, E. E. (2022). The "open family firm": Openness as boundary work in family enterprises. *Small Business Economics*, 60(4), 1307–1322. https://doi.org/10.1007/s11187-022-00664-z

Leoncini, R., Marzucchi, A., Montresor, S., Rentocchini, F., & Rizzo, U. (2019). 'Better late than never': The interplay between green technology and age for firm growth. *Small Business Economics*, *52*(4), 891–904. https://doi.org/10.1007/s11187-017-9939-6

Lind, J. T., & Mehlum, H. (2010). With or without U? The appropriate test for a U-shaped relationship*. *Oxford Bulletin of Economics and Statistics*, *72*(1), 109–118. https://doi.org/10.1111/j.1468-0084.2009.00569.x

López Pérez, G., García Sánchez, I. M., & Zafra Gómez, J. L. (2024). A systematic literature review and bibliometric analysis of eco-innovation on financial performance: Identifying

barriers and drivers. *Business Strategy and the Environment*, *33*(2), 1321–1340. https://doi.org/10.1002/bse.3550

Mahto, R. V., & Khanin, D. (2015). Satisfaction with past financial performance, risk taking, and future performance expectations in the family business. *Journal of Small Business Management*, *53*(3), 801–818. https://doi.org/10.1111/jsbm.12088

Mariani, M. M., Al-Sultan, K., & De Massis, A. (2023). Corporate social responsibility in family firms: A systematic literature review. *Journal of Small Business Management*, *61*(3), 1192–1246. https://doi.org/10.1080/00472778.2021.1955122

Matthews, R. A., Pineault, L., & Hong, Y.-H. (2022). Normalizing the use of single-item measures: Validation of the single-item compendium for organizational psychology. *Journal of Business & Psychology*, *37*(4), 639–673. https://doi.org/10.1007/s10869-022-09813-3

Memili, E., Fang, H. C., Koç, B., Yildirim-Öktem, Ö., & Sonmez, S. (2018). Sustainability practices of family firms: The interplay between family ownership and long-term orientation. *Journal of Sustainable Tourism*, *26*(1), 9–28. https://doi.org/10.1080/09669582.2017.1308371

Miller, D., & Le Breton–Miller, I. (2014). Deconstructing socioemotional wealth. *Entrepreneurship Theory and Practice*, *38*(4), 713–720. https://doi.org/10.1111/etap.12111

Miroshnychenko, I., & De Massis, A. (2022). Sustainability practices of family and nonfamily firms: A worldwide study. *Technological Forecasting & Social Change*, *174*, 121079. https://doi.org/10.1016/j.techfore.2021.121079

Miroshnychenko, I., De Massis, A., Barontini, R., & Testa, F. (2022). Family firms and environmental performance: A meta-analytic review. *Family Business Review*, 35(1), 68–90. https://doi.org/10.1177/08944865211064409

OECD. (2005). *Oslo manual: Guidelines for collecting and interpreting innovation data* (3rd ed.). OECD Publications.

Parker, C. M., Redmond, J., & Simpson, M. (2009). A review of interventions to encourage SMEs to make environmental improvements. *Environment & Planning C, Government & Policy*, *27*(2), 279–301. https://doi.org/10.1068/c0859b

Patel, P. C., & Chrisman, J. J. (2014). Risk abatement as a strategy for R&D investments in family firms. *Strategic Management Journal*, *35*(4), 617–627. https://doi.org/10.1002/smj.2119

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, *12*(4), 531–544. https://doi.org/10.1177/014920638601200408

Price, D. P., Stoica, M., & Boncella, R. J. (2013). The relationship between innovation, knowledge, and performance in family and non-family firms: An analysis of SMEs. *Journal of Innovation and Entrepreneurship*, *2*(1), 14. https://doi.org/10.1186/2192-5372-2-14

Rees, W., & Rodionova, T. (2015). The influence of family ownership on corporate social responsibility: An international analysis of publicly listed companies. *Corporate Governance an International Review*, *23*(3), 184–202. https://doi.org/10.1111/corg.12086

Ref, O., & Shapira, Z. (2017). Entering new markets: The effect of performance feedback near aspiration and well below and above it. *Strategic Management Journal*, *38*(7), 1416–1434. https://doi.org/10.1002/smj.2561

Rennings, K. (2000). Redefining innovation — Eco-innovation research and the contribution from ecological economics. *Ecological Economics*, *32*(2), 319–332. https://doi.org/10.1016/S0921-8009(99)00112-3

Rossiter, J. R. (2002). The C-OAR-SE procedure for scale development in marketing. *International Journal of Research in Marketing*, *19*(4), 305–335. https://doi.org/10.1016/S0167-8116(02)00097-6

Scarpellini, S., Valero-Gil, J., & Portillo-Tarragona, P. (2016). The "economic–finance interface" for eco-innovation projects. *International Journal of Project Management*, *34*(6), 1012–1025. https://doi.org/10.1016/j.ijproman.2016.04.005

Schweiger, N., Matzler, K., Hautz, J., & de Massis, A. (2023). Family businesses and strategic change: The role of family ownership. *Review of Managerial Science*, 18(10), 2981–3005. https://doi.org/10.1007/s11846-023-00703-3

Sharma, P., & Sharma, S. (2011). Drivers of proactive environmental strategy in family firms. *Business Ethics Quarterly*, *21*(2), 309–334. https://doi.org/10.5840/beq201121218

Sharma, P., & Sharma, S. (2021). *Pioneering family firms' sustainable development strategies*. Edgar Elgar.

Souder, D., & Bromiley, P. (2012). Explaining temporal orientation: Evidence from the durability of firms' capital investments. *Strategic Management Journal*, *33*(5), 550–569. https://doi.org/10.1002/smj.970

Van Gils, A., Dibrell, C., Neubaum, D. O., & Craig, J. B. (2014). Social issues in the family enterprise. *Family Business Review*, *27*(3), 193–205. https://doi.org/10.1177/0894486514542398

Van Gils, A., Huybrechts, J., Minola, T., & Cassia, L. (2019). Unraveling the impact of family antecedents on family firm image: A serial multiple-mediation model. *Journal of Family Business Strategy*, *10*(1), 17–27. https://doi.org/10.1016/j.jfbs.2019.02.001

Wang, H., Choi, J., & Li, J. (2008). Too little or too much? Untangling the relationship between corporate philanthropy and firm financial performance. *Organization Science*, *19*(1), 143–159. https://doi.org/10.1287/orsc.1070.0271

Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology*, *82*(2), 247–252. https://doi.org/10.1037/0021-9010.82.2.247

Westhead, P., & Howorth, C. (2006). Ownership and management issues associated with family firm performance and company objectives. *Family Business Review*, *19*(4), 301–316. https://doi.org/10.1111/j.1741-6248.2006.00077.x

Zheng, L., & Iatridis, K. (2022). Friends or foes? A systematic literature review and meta-analysis of the relationship between eco-innovation and firm performance. *Business Strategy and the Environment*, *31*(4), 1838–1855. https://doi.org/10.1002/bse.2986

Zientara, P. (2017). Socioemotional wealth and corporate social responsibility: A critical analysis. *Journal of Business Ethics*, *144*(1), 185–199. https://doi.org/10.1007/s10551-015-2848-1

Appendix A. Robustness tests

The majority of the missing values are from firms that did not answer the questions related to eco-innovations or answered that eco-innovation activities were not applicable. The *t*-tests show no significant differences regarding financial performance satisfaction, CEO tenure and R&D intensity between firms that reported and did not report eco-innovation data. In contrast, firms with more family owners, male CEOs, collaborations, larger size, higher age, and in the construction sector are significantly more likely to report eco-innovation data. However, firms in the service sector are significantly less likely to report eco-innovation. Therefore, we first estimated a probit model wherein the binary dependent variable indicates whether eco-innovation data is reported/applicable and the predictors are family owners, CEO gender, collaboration, firm size, firm age, industry. Second, we constructed the inverse Mill's ratio and included it in second-stage negative binomial regression that has eco-innovations as the outcome variable and other predictors, namely, financial performance satisfaction, CEO tenure and R&D intensity. Adding the inverse Mill's ratio to the final model does not significantly alter our results. Since the inverse Mill's ratio is statistically significant, we included the results in Tables A1 and A2 below.

Table A1. Estimation results for dependent variable whether eco-innovation data is reported or applicable using probit regression

	(1)
Firm age	0.129
	(0.080)
Firm size	0.052
	(0.075)
Collaboration	0.308*
	(0.151)
Number of family owners	0.139
	(0.077)
CEO gender	−0.760***
	(0.215)
Manufacturing	−0.226
	(0.347)
Construction	−0.184
	(0.364)
Retail and wholesale	−0.362
	(0.309)
Service	−0.398
	(0.306)
Observations	441
Pseudo R^2	0.079

*$p < .05$, **$p < .01$, ***$p < .001$. Robust standard errors are in parentheses. Constant included. The base category for industry is primary.

Table A2. Estimation results for dependent variable eco-innovations including inverse Mill's ratio using negative binomial regression

	(1)
R&D expenditure 1–5% of sales	0.462***
	(0.110)
R&D expenditure 6–10% of sales	0.375**
	(0.144)
R&D expenditure 11–20% of sales	0.330
	(0.258)
R&D expenditure > 20% of sales	0.707
	(0.469)
CEO tenure	0.008*
	(0.003)
Financial performance satisfaction	0.199*
	(0.097)
Financial performance satisfaction squared	−0.024*
	(0.011)
Inverse Mill's ratio	−1.361***
	(0.245)
Log likelihood	−862.276
Wald chi-square	76.24*** (8)
Observations	345
Pseudo R^2	0.038

*$p < .05$, **$p < .01$, ***$p < .001$. Robust standard errors are in parentheses. Constant included. The base category for R&D expenditure is no R&D expenditure.