

Are family female directors catalysts of innovation in family SMEs?

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This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the [Version of Record](#). Please cite this article as doi: [10.1002/sej.1420](https://doi.org/10.1002/sej.1420)

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Keywords: *Women, upper echelons, innovation, socioemotional wealth, mixed gamble*

Research Summary: While family SMEs increasingly involve women in their boards, the role of female directors as catalysts of innovation is yet to be fully understood. Drawing on upper echelons theory, we examine directors' gender in conjunction with family affiliation to investigate the influence of family female directors on family SMEs' innovation. Moreover, by analyzing the contingent role of socioemotional wealth preferences, we open the black box of noneconomic aspects shaping the cognition and behavior of boards. Our analysis of a unique survey-based sample of 287 Belgian family SMEs reveals that family female directors do exert a positive influence on R&D intensity. However, according to the mixed gamble logic, this influence is filtered by the positive and negative moderation of their socioemotional wealth preferences.

Managerial Summary: We examine the role that women who are members of the family owning a business play in the decision making of small and medium enterprises (SMEs). Specifically, we investigate the influence that the involvement of family female directors in the board of family SMEs exerts on innovation decisions. To empirically address this line of inquiry, we conducted a survey on 287 Belgian family SMEs. Our analysis shows that the involvement of family female directors in the board fosters family SME's innovation investments. Yet, such an influence is weakened by the intention of the family to retain control over the business but is enhanced by the

identification of family members with the firm and by the desire to renew family bonds through dynastic succession. Therefore, our study cautions family SMEs' owners and managers to pay attention to these important dimensions of diversity when appointing directors to their board.

1 INTRODUCTION

Family enterprises are the most ubiquitous form of entrepreneurial ventures worldwide (e.g., Casillas, Acedo, & Moreno, 2007; Shanker & Astrachan, 1996). Their development and sustainability strongly depend on the ability to pursue innovative initiatives (De Massis & Rovelli, 2018), such as transforming current businesses or setting up new ones (Guth & Ginsberg, 1990; Zahra, Jennings, & Kuratko, 1999; De Massis, Eddleston, & Rovelli, 2020), which are the core of corporate entrepreneurship (e.g., Guth & Ginsberg, 1990; Sharma & Chrisman, 1999; Teng, 2007; Zahra et al., 1999). The presence of women in firms' upper echelons is typically found beneficial for entrepreneurship (e.g., Lyngsie & Foss, 2017; Chen, Crossland, & Huang, 2016). Indeed, research has identified a positive relationship between women's involvement in the upper echelons and innovative initiatives (Foss, Lee, Murtinu, & Scalera, 2021). Nevertheless, despite that family enterprises typically offer greater opportunities for women to be included in the firm – particularly those belonging to the owning family (e.g., Cole, 1997; Cromie & O'Sullivan, 1999) – they have traditionally held subtle, invisible, and informal roles (Hamilton, 2006; Eddleston & Sabil, 2019), more related to the family than the business (Salganicoff, 1990; Martinez Jimenez, 2009; Heilman, 2012; Chizema, Kamuriwo, & Shinozawa, 2015). Fortunately, we are witnessing an increase in female appointments to the board of directors of these firms (e.g., Amore, Garofalo, & Minichilli, 2014; Bianco, Ciavarella, & Signoretti, 2015; Samara, Jamali, & Lapeira, 2019), potentially to the benefit of their entrepreneurial activities.

However, the complexity of the effect on entrepreneurship of gender composition in the upper echelons is high and dependent on different individual and organizational characteristics (Foss et al., 2021). Board diversity associated with the presence of female directors is found to trigger higher levels of inclusion, communication, communal values, and knowledge sharing (Eagly & Carli, 2003). Yet, these benefits are conditional on other aspects, such as imposter fear (Ladge,

Eddleston, & Sugiyama, 2019), leadership style (Foss et al., 2021), and categorization processes (Lyngsie & Foss, 2017). Therefore, it is important to deepen the investigation of the individual and organizational characteristics that shape female directors' positive influence on entrepreneurship. We deem this especially crucial for family SMEs, typically seen as reluctant to innovate (e.g., Kellermanns & Eddleston, 2006; Strebel, 1996; Sydow, Schreyögg, & Koch, 2009), and generally not forced to include women in the board, since they are not subject to gender quotas (e.g., Terjesen, Aguilera, & Lorenz, 2015). Understanding the role of female directors in firms' engagement in innovation initiatives might contribute to overcoming the label of unsung heroes (Eddleston & Sabil, 2019), making them more visible both inside and outside family SMEs (Hamilton, 2006).

In this study, we draw on upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) to examine aspects beyond the sole gender-related demographic of female directors that shape their positive influence on family SMEs' entrepreneurial initiatives. First, we argue that female directors' ability to influence the board's decision-making depends on the power they hold in the board (Elstad & Ladegard, 2012; Finkelstein, 1992). Coherently with recent studies in family business research (e.g., Herdhyinta, Lau, & Shen, 2021; Cruz, Justo, Larraza-Kintana, & Garcés-Galdeano, 2019), we consider that female directors affiliated with the owning family (hereafter, *family female directors*) can leverage the power of this affiliation (Singh, Point, Moulin, & Davila, 2015) to be heard and play a relevant role in the board of family SMEs. Specifically, we argue that their involvement in the board positively spurs innovation initiatives thanks to their higher level of creativity, enhanced information search and exchange (Erhardt, Werbel, & Shrader, 2003; Watson, Kumar, & Michaelsen, 1993), and ensuring the power of their voices on the board. As such, we contend that the presence of family female directors increases cognitive diversity, enriches interpretations, and spurs innovation intensity.

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However, upper echelons theory suggests the presence of a black box of psychological and sociological aspects that influence the board's cognition and behavior (Hambrick, 2007). In this regard, Neely, Lovelace, Cowen, and Hiller (2020) call for the integration of conceptual models developed in related literature streams to advance research on directors' group cognition. This is particularly salient for family SMEs, since the presence of an owning family, with interests that extend beyond economic considerations, increases the complexity of the board dynamics up to altering the basis of the board's cognitive frames (Cruz et al., 2019). Specifically, due to the strong intertwined relationship between the family system and the business system in family SMEs (Eddleston & Kellermanns, 2007; Kellermanns & Eddleston, 2006), board decisions are often driven by the family owners' perceptions of potential gains and losses in their affective endowment; in other words, their socioemotional wealth (SEW) (Gomez-Mejia, Haynes, Núñez-Nickel, Jacobson, & Moyano-Fuentes, 2007), which is the most distinguishing feature of family firms (e.g., Alessandri, Cerrato, & Eddleston, 2018; Eddleston & Mulki, 2020; Vandekerckhof, Steijvers, Hendriks, & Voordeckers, 2015). We describe the SEW construct from a dispositional perspective, namely that the board's cognitive frames are shaped by their appraisal of SEW preferences in terms of its preservation and acquisition (Brigham & Payne, 2019), coherently with the mixed gamble logic or the dual prospect of future gains and losses in current wealth (Martin, Gomez-Mejia, & Wiseman, 2013). The decision to invest in R&D is indeed a mixed gamble as it has the potential to create both losses and gains in SEW (Gomez-Mejia, Campbell, Martin, Hoskisson, Makri, & Sirmon, 2014). We thus argue that the positive influence of family female directors on family SMEs' innovation is contingent on the board's appraisal of potential SEW gains and losses related to the R&D investment decision.

Although often conceptualized and captured as a single dimension with distal proxies (e.g., Hauck, Suess-Reyes, Beck, Prügl, & Frank, 2016), Berrone, Cruz, and Gomez-Mejia (2012)

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theorize five dimensions of SEW with the acronym FIBER: family control and influence (F), identification of family members with the firm (I), binding social ties (B), emotional attachment of family members (E), and renewal of family bonds (R). We acknowledge the multidimensionality of SEW (Swab, Sherlock, Markin, & Dibrell, 2020), and embrace the recent perspective of Martin and Gomez-Mejia (2016) that overcomes the traditionally assumed trade-off between economic and noneconomic goals in family business, considering the heterogeneous effects that each of the SEW dimensions might concurrently exert. Accordingly, we propose a contingency framework that disentangles the effects of the different SEW dimensions by taking into account the SEW gains and losses that the board cognitively perceives in relation to R&D investments. Therefore, we hypothesize negative (family control and influence, emotional attachment of family members) and positive moderating effects (identification of family members, binding social ties, and renewal of family bonds through dynastic succession) on the purported positive relationship between family female directors and innovation intensity in family SMEs.

Our empirical analyses of unique survey data from a sample of 287 Belgian family SMEs confirm that the involvement of family female directors is positively related to R&D intensity. Furthermore, the data reveal that this positive relation is contingent on some SEW dimensions, partially confirming our hypotheses. Specifically, family control and influence attenuate the positive main relationship, whereas identification of family members with the firm and renewal of family bonds through dynastic succession enhance the positive relation between family female directors and R&D intensity. Our findings thus reveal that involving family female directors in the board has a positive effect on family SMEs innovation initiatives, but this relationship depends on the contingency effects of the SEW dimensions.

Our study contributes to research on women in upper echelons, strategic entrepreneurship and innovation, and family business. First, we contribute to upper echelons theory by adding the SEW

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perspective to grasp the socioemotional aspects that, together with the more visible characteristics of board members, concur in shaping the board's cognition and innovation behavior (Hambrick & Mason, 1984; Hambrick, 2007; Neely et al., 2020). In so doing, we shed light on how the SEW preferences, as a reflection of the noneconomic aspects relevant to the family, can act as a contingency in filtering the stimuli that family female directors bring to the board. In addition, we provide insights on the “tokenism”, critical mass (Torchia, Calabrò, & Huse, 2011), and faultlines (Lau & Murnighan, 1998) debates. Second, we advance current understanding of the drivers of strategic entrepreneurial initiatives in terms of innovation investments by highlighting the role of family female directors in stimulating the board's cognition by enhancing creativity, information access and sharing through increased diversity, and thus fostering innovation. We also show that this is contingent on psychological and sociological aspects that characterize family business boards, namely the board's appraisal of SEW preferences in terms of preservation and acquisition (Brigham & Payne, 2019). Last, we offer important contributions to the family business literature, especially the stream concerned with gender issues, by shedding light on the role of women, highlighting that family affiliation plays an important role in making women's voices heard on the board. In so doing, we contribute to the call to incorporate gender considerations in examining family business dynamics (Cruz et al., 2019). Furthermore, in collecting data, hypothesizing and testing the effect of each of the FIBER dimensions on our main effect, we challenge the notion of SEW as an umbrella concept, considering its multidimensionality and mixed gamble logic when theorizing the contingency effect.

2 THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1 Family female directors on the board of family SMEs as catalysts of innovation intensity

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Women play a key role in entrepreneurship worldwide (e.g., Lyngsie & Foss, 2017; Wilson, Kickul, & Marlino, 2007). Considerable evidence suggests that the board of directors today has an even greater impact on entrepreneurial actions and performance than in the past (e.g., Mackey, 2008; Quigley & Hambrick, 2015; Neely et al., 2020). Since complex and uncertain situations, such as those characterizing entrepreneurship, are merely interpretable (Mischel, 1977), board directors frame and make decisions based on their personal interpretations of the strategic situation the firm faces. This perspective is at the core of upper echelons theory conceiving directors' experiences, values, and personalities as exerting great influence on their "interpretations of the situations they face and, in turn, affect[ing] their choices" (Hambrick, 2007, p. 334). Therefore, in line with upper echelons theory, complex decisions and organizational actions are the outcome of behavioral factors that reflect the idiosyncrasies of decision-makers (Hambrick & Mason, 1984). Upper echelons theory has focused on demographic characteristics and traits (Carpenter, Geletkanycz, & Sanders, 2004), and the role of the dominant coalition, e.g., the board of directors (Man Zhang & Greve, 2019), whose characteristics may be reflected in organizational decisions and performance (Hambrick & Mason, 1984). Focusing on directors' characteristics leads to stronger explanations of organizational decisions, and thus organizational outcomes, rather than merely focusing on individual executives (e.g., the CEO). Coherently, the board of director's cognition, shaped by its composition, is the key driver of the firm's entrepreneurial initiatives, such as setting up new businesses and transforming (Guth & Ginsberg, 1990; Zahra et al., 1999) through innovating their products and processes (Covin & Slevin, 1991).

Traditionally, research based on upper echelons theory has mainly focused on the visible characteristics of board directors, such as age, nationality, language, educational and professional background (e.g., Kanadli, Bankewitz, & Zhang, 2018). Building on recent research in the entrepreneurship, innovation, and family business fields, we hypothesize that innovation decisions

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in family SMEs are positively influenced by two main characteristics: directors' gender and family affiliation. Although women still face difficulties in accessing the upper echelons of organizations (Joshi, Neely, Emrich, Griffiths, & George, 2015), family enterprises offer a relatively more inclusive environment where women can overcome barriers and find a place in the firm (Bettinelli, Del Bosco, & Giachino, 2019; Campopiano, De Massis, Rinaldi, & Sciascia, 2017). Compared to their nonfamily counterparts, family firms offer women, particularly those belonging to the owning family (e.g., Cole, 1997; Cromie & O'Sullivan, 1999), greater opportunities to be appointed as members of the board (Martinez Jimenez, 2009; Salganicoff, 1990; Songini & Gnan, 2009). Despite the traditionally homogenous composition of family firm boards in terms of (male) gender, and the fact that women typically play subtle, hidden, and informal roles (Martinez Jimenez, 2009), anecdotal evidence and recent research point to greater board gender diversity (e.g., Amore et al., 2014; Bianco et al., 2015), namely an increase in the number of women appointed as board directors in family firms.

Research examining the link between the presence of women in firms' upper echelons and innovation typically finds positive relationships. Nevertheless, studies addressing this link are still scarce and mostly examine innovation outcomes (e.g., Chen, Leung, & Evans, 2018; Talke, Salomo, & Rost, 2010). At the individual level, women in leadership positions are found to foster innovation and creativity in their organizations (Idris, 2009; Tullett, 1995; Welbourne, Cycyota, & Ferrante, 2007) by bringing a more cooperative mindset (Bettinelli et al., 2019). At the group level, the involvement of more women contributes to increasing the group's diversity, in turn associated with high levels of creativity and innovation (Wiersema & Bantel, 1992). A more diverse group offers a broader range of perspectives, stimulates the search for information, enhances the quality of brainstorming, eases creativity, and generates more strategic alternatives (Erhardt et al., 2003; Watson et al., 1993). Boards with higher gender diversity are found to more deeply discuss and

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integrate information supplied by their members (Torchia, Calabrò, & Morner, 2015). Women on boards are in fact more likely to value benevolence, interdependence, and tolerance, fostering collaboration between board members (Bettinelli et al., 2019). This in turn is likely to foster creativity and affect innovation-related decisions (Kim & Starks, 2016; Laguir & Den Besten, 2016; Sheridan, McKenzie, & Still, 2011). Women may have had different experiences than men in their lives, and are thus more likely to see problems from different perspectives, often in a more creative way (Hoffman & Maier, 1961; Kakabadse et al., 2015).

Scholars have attempted to understand whether women are appointed to the board to contribute their expertise or only to enhance the firm's representation and reputation¹. Amore et al. (2014) show that female directors improve the operating profitability of female-led family firms. Similarly, Cruz et al. (2019) find positive implications of women's involvement in family firm boards in terms of corporate social performance, while Rodríguez-Ariza, Cuadrado- Ballesteros, Martínez-Ferrero, and García- Sánchez (2017) show that corporate social responsibility commitment does not vary according to the presence of female directors. Besides these mixed findings, scholars have mainly focused on the implications for performance and corporate social responsibility, leaving innovation and R&D relatively unaddressed (for a recent exception, see Hernández-Lara & Gonzales-Bustos, 2020).

As noted, family firms increasingly involve women in their boards (Bettinelli et al., 2019; Campopiano et al., 2017; KPMG, 2020; PwC, 2016), but despite the potential benefits they might bring to the family firm (e.g., Amore et al., 2014), female directors still seem to play marginal and hidden roles (Martinez Jimenez, 2009). Yet, including women in the board brings manifold positive outcomes. For instance, while male directors tend to emphasize goal-setting (Dezsö & Ross, 2012),

¹ For instance, increasing the number of women on the board might signal the firm's commitment to improving female representation to external stakeholders (Burke, 1994), in turn positively affecting its reputation.

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women in the upper echelons are usually characterized by a more inclusive and participatory leadership style, keeping communication channels open with more heterogeneous networks of ties (Ibarra, 1993). However, for these characteristics to manifest, women need power. We argue that being a female director affiliated with the family might grant them the power to be heard by other directors, thus shaping board cognition and decision-making (Singh et al., 2015). While a common assumption is that female directors have the power to affect the board, we suggest that family affiliation is of key importance in family SMEs where board composition is not enforced by government regulations, such as gender quotas. Moreover, scholars have found that female relatives are supportive and give their all to the family business, regardless of leadership style, which is instead crucial for non-family females and family males (Madison, Eddleston, Kellermanns, & Powell, 2021). Following recent developments in the literature (Herdhayinta et al., 2021; Cruz et al., 2019), we examine the presence of family female directors as catalysts of innovation intensity, since their family affiliation should make their voices heard on the board, with a beneficial impact in terms of ideas, creativity, communication, and leadership style.

Coherently, we argue that an increase in the number of family female directors helps family SMEs boost their innovation intensity. The involvement of more family female directors in the board (traditionally male-dominated) allows the family SME and the board itself to increase cognitive diversity (Foss et al., 2021) through access to a wider and more diverse knowledge base. As such, and due to their family affiliation (Herdhayinta et al., 2021; Cruz et al., 2019; Singh et al., 2015), family female directors are more likely to be considered in the board's decision-making process. These factors in turn stimulate richer discussions within the board, leveraging different and creative perspectives, identifying potential avenues for the firm's future development, and consequently increasing innovation intensity. In other words, we posit that family female directors

increase cognitive diversity in the board (Singh et al., 2015), which is beneficial for family SMEs' decision to boost innovation investments.

Hypothesis 1. *In family SMEs, family female involvement in the board is positively related to R&D intensity.*

2.2 The contingency effect of SEW

While the visible traits of directors, such as gender- and family-related demographic characteristics, have been used as valid proxies of their cognitive frames, scholars have shown the incompleteness of this approach (Hambrick, 2007). Focusing merely on these characteristics, albeit important, does not allow grasping the socioemotional aspects that concur in driving cognition and behavior, part of the black box of upper echelons research (Lawrence, 1977; Hambrick & Mason, 1984; Hambrick, 2007). In their recent upper echelons theory metacritique, Neely et al. (2020) call for further integrating conceptual models that have succeeded in advancing research on executives and directors' group cognition to open up this proverbial black box by linking directors' cognition to the firm's strategic actions and entrepreneurial moves (Bromiley & Rau, 2016; Felin, Foss, & Ployhart, 2015).

Addressing this call, we argue that understanding the effect of family female directors on innovation requires incorporating the SEW perspective (e.g., Gomez Mejia et al., 2007; Berrone, Cruz, Gomez-Mejia, & Larraza-Kintana, 2010; Eddleston & Kellermanns, 2007). This would allow grasping the moderating effect of socioemotional factors on demographic traits in shaping the cognitive framing of boards in family SMEs and their innovative behavior. The cognitive frames of family SME boards are known to be influenced by the appraisal of how decisions might affect their socioemotional endowment (Schepers, Voordeckers, Steijvers, & Laveren, 2014), i.e., the firm's nonfinancial aspects that meet the family's affective needs (Gomez-Mejia et al., 2007). The

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board's appraisal of SEW preferences might thus influence the contributions that family female directors bring to the board with respect to innovation, in turn affecting R&D investment decisions. In fact, R&D decisions involve trade-offs that require family SMEs to weigh potential SEW gains against potential SEW losses (Gomez-Mejia et al., 2014; Kotlar, Signori, De Massis, & Vismara, 2018). Therefore, we embrace SEW as a dispositional multidimensional construct (Brigham & Payne, 2019) to argue that the positive effect that family female directors exert on innovation investments is contingent on socioemotional considerations. In fact, the board's decisions in family SMEs are often influenced by socioemotional preferences (Basco & Pérez Rodríguez, 2009; Berrone et al., 2010), and together with the board's demographic characteristics, are likely to shape the board's cognition and subsequent innovation intensity decisions.

Therefore, we contend that understanding the relation between family female directors and family SMEs' innovation intensity requires considering the contingency effect of the SEW dimensions in terms of appraisal of SEW preferences, by looking at the potential SEW losses and gains (Samara et al., 2019; Lu, Kwan, & Zhu, 2020; Vandekerckhof et al., 2015). Although considered essential to studying family firm behavior, family business scholars often treat SEW as an umbrella construct, failing to fully capture its multidimensionality (Swab et al., 2020) and related contingency effects (e.g., Vandekerckhof et al., 2015). Berrone et al. (2012) instead argue for the aforementioned multidimensional FIBER construct (family control and influence, identification of family members with the firm, binding social ties, emotional attachment of family members, renewal of family bonds through dynastic succession), offering an alternative to the "predominant applied distal proxies" (Hauck et al., 2016, p. 134) often used to indirectly measure SEW preferences, e.g., family ownership and/or management (Gomez-Mejia, Cruz, Berrone, & De Castro, 2011). Accordingly, scholars have recently underlined the urgency of theorizing and empirically capturing the multidimensionality of the SEW construct (Brigham & Payne, 2019;

Swab et al., 2020). To respond to these calls, we argue that the extent to which the SEW dimensions vary among family SMEs is a useful perspective to grasp the contingency effect that the presence of family female directors exerts on the board's cognitive frame, in turn influencing innovation investment decisions.

In so doing, we point to the five SEW dimensions as key elements of the proposed contingency framework, pivotal to understanding how the involvement of family female directors affects innovation intensity in family SMEs. Specifically, we consider the decision of investing in R&D in a mixed gamble logic, as it might lead to both SEW gains and losses, thereby shaping the influence that family female directors exert on the board's cognition. Coherently, some SEW dimensions negatively moderate and others positively moderate this relationship depending on the potential losses and gains that R&D investments might cause to each SEW dimension.

In the next section, we discuss the moderating effects on this relationship by considering the appraisal of preferences in terms of SEW preservation and acquisition in relation to the cognitive framing of innovation investments of family SME boards. Coherently, we build two hypotheses to capture the contingency effects.

2.3 The negative moderating effect of family control and influence, and emotional attachment

Among the SEW dimensions, we argue that family control and influence as well as emotional attachment negatively moderate the relationship between the presence of family female directors and innovation in family SMEs. Family SME boards interpret R&D investments as leading to potential losses in these two SEW dimensions, thereby hampering the positive effect that family women directors promote in terms of innovation intensity.

According to the first SEW dimension – i.e., family control and influence (Berrone et al., 2012) – boards might deem it important to retain family control over the business in the future. Under

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such circumstances, investing in entrepreneurial initiatives would require bearing risk (Shane & Venkataraman, 2000) and exposing the financial and socioeconomic endowment to a potential loss. As such, family SMEs whose boards creatively identify potential innovation initiatives might be hampered in pursuing these by the fear of losing family control over the business (Rondi, De Massis, & Kotlar, 2019). We thus argue that the strong intention to maintain family control and influence over the family SME affects board members' cognition and behavior in a way that limits the likelihood of pursuing creative ideas. As such, the desire for preserving family control and influence hampers the purported beneficial effect of the increased presence of family female directors on innovation intensity by counterbalancing the assumed positive effect of a higher proportion of family female directors on board cognition and decision-making with respect to innovation.

Moreover, owning families experience a wide range of emotions, some positive, such as love and happiness, others negative, such as anger, fear, and anxiety (Shepherd, 2016). In family SMEs, usually dominated by family relationships, the long history and knowledge of shared experiences (Eddleston & Kellermanns, 2007), entailing both positive and negative emotions, permeates the business boundaries, thereby shaping the entrepreneurial processes (Baron, 2008). The blurred boundaries between the family and the business system may lead to situations in one system that affect emotions in the other (e.g., business loss, economic downturn, divorce, death) (Berrone et al., 2012). The family SME thus becomes the locus of satisfying family owners' affective, belonging, cohesion, and security needs (Hauck et al., 2016), engendering a sense of psychological appropriation of the firm that nurtures a positive self-concept for the family (Berrone et al., 2012). Under these circumstances, emotional attachment to the firm (Lawler, 2001) converges in preserving the heritage of a shared past, as the family's sense of legacy constrains the likelihood that the creativity and enhanced brainstorming brought to the board by family female directors

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turns into innovation investments (Berrone et al., 2010). Specifically, we suggest that in family SMEs, the higher the emotional attachment of family owners, the more the R&D investment is perceived as a potential loss because it alters the status quo and requires changes in the equilibrium of current activities and family relationships. Therefore, emotional attachment limits the implementation of innovation initiatives as a result of a higher number of family female directors on the board. Indeed, when family owners are emotionally attached to the family SME, board cognition will be affected in such a way that these initiatives are likely to be perceived as riskier for the family legacy due to the desire to preserve the status quo and past experiences, thus again counterbalancing the potentially positive effect of greater representation of family female members on the board.

In sum, we posit that the greater desire for control and influence, and higher emotional attachment affect family SMEs' board cognition and decision-making process by weakening the purported positive effect of family female involvement in the board on innovation intensity. Thus:

Hypothesis 2. *In family SMEs, (a) family control and influence, and (b) the family's emotional attachment negatively moderate the relationship between family female involvement in the board and R&D intensity.*

2.4 The positive moderating effect of family identification, binding social ties, and renewal of family bonds

Contrary to family control and influence, and emotional attachment, we contend that the remaining three SEW dimensions, i.e., family identification with the firm, binding social ties, and renewal of family bonds, positively moderate the relationship between the presence of family female directors and family SME innovation. This is because we argue that family SMEs frame the R&D intensity decision as favoring potential SEW gains in relation to these three dimensions.

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Due to the blurred boundaries between the family and the business system, family business members often perceive their identity as deeply intertwined with the firm, and are proud to be part of it (Campopiano & Rondi, 2019). While internally the family SME may care about the value generated by the business and the wellbeing of its employees, externally it might care about the image projected to customers, suppliers, and the local community (Cennamo, Berrone, Cruz, & Gomez-Mejia, 2012; Zellweger, Kellermanns, Eddleston, & Memili, 2012b). As such, the family SME is seen by its stakeholders as an extension of the family itself (Berrone et al., 2012), and directors who tie their identity to the family SME attribute strong importance to business survival and success. When the family highly identifies with the SME, the board is likely to perceive R&D investments as leading to gains in this SEW dimension, as innovation allows ameliorating the firm's competitive advantage that boosts its image, and avoiding the obsolescence of the current offer, which would conversely undermine the firm's image and reputation. Put differently, family identification with the firm is likely to shape the board's cognition and decision-making in such a way that it strengthens the positive effect exerted by having a higher proportion of family female directors on the board.

Furthermore, family SMEs can usually rely on strong social ties with their stakeholders, thus engendering social capital. Organizational feelings of closeness and solidarity are stimulated by the development of strong social ties based on kin networks that also involve nonfamily members (Cennamo et al., 2012). This sense of belonging, stability, and commitment allows family SMEs to rely on a trust climate that fosters information and knowledge exchange in the business and the board. Under such circumstances, the family is likely to perceive R&D investments as bringing potential gains in terms of institutional relationships and bonds with the community at large (Berrone et al., 2012). Moreover, the family-like climate ensures that the knowledge that family female directors bring to the board is properly exchanged and viewed more favorably, thus

boosting innovation initiatives. While female involvement in the business is likely to trigger benevolence and tolerance among board members (Bettinelli et al., 2019), the presence of binding ties allows their influence to explicitly enhance collaboration (Filser, De Massis, Gast, Kraus, & Niemand, 2018), amplifying the positive effect of family female directors on family SMEs' innovation.

Last, family SMEs are heterogeneous in their disposition to maintain and hand the business down to future generations (Berrone et al., 2012). When there is a greater desire to renew the family bonds through dynastic succession, the board is likely to cognitively adopt a long-term view in decisions pertaining to the firm. In this case, the time horizon in the family SME's decision-making process spans generations and affects investments that may be bequeathed to descendants (Berrone et al., 2012), generating patient capital (Sirmon & Hitt, 2003, p. 343). Therefore, transgenerational aspirations lead family owners to consider their firm as not merely an asset, but a representation of their hopes for the future (Lu et al., 2020). The long-term vision and planning horizon characterizing SEW preferences in terms of the family dynasty dimension are thus likely to shape the extent to which the board involving family female directors makes innovation decisions oriented toward the SME's future sustainability and competitiveness (Cennamo et al., 2012). Specifically, in family SMEs that desire renewing the family bonds through dynastic succession, R&D investments are likely to be perceived as strategic for long-term prosperity, as these potentially lead to SEW gains in terms of increasing the possibility of transferring value to the next generation(s). Therefore, the greater desire for renewing family bonds through dynastic succession is likely to affect the cognition and decisions of boards involving family female directors in terms of innovation investments.

In summary, we posit that an increase in family identification, binding social ties, and the desire to renew family bonds through dynastic succession influences family SMEs' board cognition and

decision-making process by strengthening the purported positive effect of family female involvement on R&D intensity. Thus:

Hypothesis 3. *In family SMEs, (a) identification of family members with the SME, (b) binding social ties, and (c) renewal of family bonds through dynastic succession positively moderate the relationship between family female involvement in the board and R&D intensity.*

Figure 1 provides a graphic representation of our hypotheses and model.

(Insert Figure 1 about here)

3 METHODS

3.1 Sample

To test our hypotheses, we used unique data derived from a cross-sectional online survey conducted in 2017. The survey examined the ownership and governance structures, as well as innovation issues, in Belgian private family firms. This setting is considered appropriate since the one-tier board structure adopted by Belgian firms is relatively common in other European Latin (e.g., France, Italy, Spain) and Anglo-Saxon (UK and US) countries, which should ease the generalizability of findings to similar contexts. Furthermore, the overall gender equality index score for Belgium (71.1)² is slightly higher than the average of EU countries (67.4), and the score of the domain of women's power in decision-making, incorporating women's active participation in the boardroom, has increased over the five past years, following the same trend as most EU countries (EIGE, 2019). Accordingly, Belgium is a relevant context to study women's involvement in the board.

The survey targeted private Belgian SMEs (with between 10 and 250 employees), excluding larger and micro firms, as well as listed companies, based on the information available in Bureau

² <https://eige.europa.eu/gender-equality-index/2019>.

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Van Dijk's Belfirst database. Indeed, SMEs account for a substantial part of the Belgian economy (Deman & Tchinda, 2017) and dedicate considerable resources to stimulate innovation (Teirlinck & Spithoven, 2019). We focus on SMEs in general because there is no existing database that enables scholars to directly identify family SMEs in Belgium. Starting from the population of 619,414 Belgian SMEs derived from the Belfirst database, we selected only limited liability SMEs with the legal form of "Société Anonyme" because they are legally obliged to establish a board of directors (Lardon, Deloof, & Jorissen, 2017). After stratifying the population by size and applying random selection to each stratum, we identified a target sample of 3,500 firms. The online survey was addressed to the CEOs of these SMEs using the contact information available in the Belfirst database. In the email invitation to participate in the online survey, we asked the recipient to forward the email to the CEO if he/she did not hold this position. We also included a control question asking the respondent to confirm his/her position as CEO to access the online survey. When email information was unavailable or when the firm asked for a printed questionnaire, we sent it by ordinary mail. Additionally, we enclosed a cover letter stating the purpose of the survey, assuring respondents' anonymity and confidentiality to increase the response rate and ensure the completeness and reliability of information. Moreover, one month after the launch of the survey, we sent a reminder to nonresponding firms.

In total, we collected 362 questionnaires, yielding a response rate of 10.34%, in line with similar surveys addressing CEOs (e.g., De Massis, Eddleston, & Rovelli, 2020; Garcés-Galdeano, Larrazakintana, Cruz, & Contín-Pilart, 2017; Zellweger, Kellermanns, Chrisman, & Chua, 2012a). The sample does not present nonresponse bias issues, which we assessed by comparing the mean of responding and nonresponding firms based on several firm characteristics derived from the Belfirst database (e.g., number of employees, firm age, return on assets), without observing significant differences. This was also consistent when comparing 20% of earlier respondents with 20% of later

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respondents. Moreover, as our study focuses on family firms, we replicated the analysis for nonresponse bias considering the subsample of family SMEs, without detecting any issues. To identify the subsample of family SMEs, we followed recent research (Ng, Dayan, & Di Benedetto, 2019) considering as family firms those where one family owns more than 50% of shares and at least one family member is involved in the management team. By family we mean the extended family including the nuclear family (e.g., a married couple with children) plus other adult(s) (e.g., grandparents, grandchildren, siblings) (Jaskiewicz & Dyer, 2017). Respondents were informed about this family firm conceptualization in the questionnaire to avoid any confusion in identifying family involvement in the firm. According to this definition, 319 SMEs in the sample are family firms.

To measure our moderating variables (i.e., the five SEW dimensions), we directly contacted by phone the family owners of these family SMEs, as the SEW variables refer to the family ownership level. Indeed, SEW captures the socio-affective value that family owners derive from their ownership position in the business (Gomez-Mejia et al., 2007), making them ideal respondents. Contacting family owners proved even more relevant given that 47.96% of responding CEOs in the initial round of the survey were nonfamily members whose perception of the family's SEW may be less accurate. To mitigate individual-level biases and obtain a more accurate appraisal of SEW preferences from family owners, we opted for a multiple-respondent approach (Simons & Peterson, 2000). The three largest family owners were asked to reply to the online questionnaire on the SEW dimensions based on Berrone et al.'s (2012) FIBER scale (see Table 1 below). We were able to obtain three respondents for 89 family SMEs, two respondents for 114 family SMEs, and a single respondent for 84 family SMEs. We computed the coefficient of agreement (r_{wg}) of the multi-item SEW dimensions for the group of family SMEs with multiple respondents (James, Demaree, & Wolf, 1993). As reported in Table 1, all coefficients are relatively high ($r_{wg} > 0.885$),

suggesting that the inclusion of single respondents in the analysis is not problematic (Kellermanns, Eddleston, Sarathy, & Murphy, 2012). We again repeated the analysis to assess the presence of non-respondent bias without finding any significant differences between earlier and later respondents. Therefore, our sample consists of 287 family SMEs with usable data for the purposes of this study.

3.2 Variables Description

Our dependent variable is *R&D intensity*. In line with prior research (Block, 2012), we measured it as the ratio of R&D expenditure to total assets. To compute this indicator, we employed the self-reported value of R&D expenditure that CEOs indicated in the questionnaire, since the disclosure of this information is not mandatory for most firms in our sample. The value of total assets was instead retrieved from the Belfirst database.

The independent variable *family female directors on the board* is measured as the number of family female members on the board over the total number of directors (Herdhayinta et al., 2021). This information was retrieved from the survey.

To measure the five SEW dimensions, which are moderating variables in our study, we referred to the FIBER scale of Berrone et al. (2012). Specifically, in the second data collection, family owners responded to statements assessing their SEW preferences using a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The score for each SEW dimension was calculated as the average sum of responses. The multi-item constructs are presented in Table 1. As Hauck et al. (2016) suggest, we explored the unidimensionality of each FIBER dimension by conducting an exploratory factor analysis (EFA) based on principal component analysis (PCA)³

³ To justify the PCA application, we computed Bartlett's test of sphericity ($p < 0.01$) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (KMO index = 0.764) indicating sufficient correlations in the data matrix.

with oblique (promax) rotation ($k = 4$) (Matsuno, Mentzer, & Rentz, 2000) using the Stata v.15 software. The EFA generated a five-factor model, accounting for 68.73% of total variance. We retained factors with an eigenvalue above 1 to determine the number of factors, considering items with factor loadings greater than 0.7 as belonging to a specific factor (Hair, Black, Babin, Anderson, & Tatham, 2010). Table 1 shows that the items of each of the FIBER dimensions loaded on their intended dimension. Furthermore, we calculated Revelle's beta (Revelle, 1979) for each dimension, obtaining values ranging from 0.69 and 0.77. As reported in Table 1, the discrepancy between Revelle's beta and Cronbach's alpha is lower than the usual 0.15 threshold (Cooksey & Soutar, 2006). Thus, our results support the unidimensionality of each dimension of Berrone et al.'s (2012) FIBER scale.

Subsequently, we conducted a confirmatory factor analysis (CFA) to check the validity of the multi-item constructs and the overall fit of the model. Again, all items loaded significantly on their intended constructs⁴, while the values for composite reliability (CR) are higher than the generally accepted threshold of 0.70 (Nunnally, 1978), showing good reliability. Based on the CFA estimates, we computed the average variance extracted (AVE) for all latent constructs. All AVE values are above the recommended threshold of 0.50 (Fornell & Larcker, 1981), indicating satisfactory convergent validity. For each construct, we compared the square root of the AVE with the construct's correlation with the other latent variables to assess discriminant validity. In line with Fornell and Larcker's (1981) recommendation, Table 2 indicates that the square roots of the AVE are greater than the correlation coefficients. Additionally, the correlations between the latent variables are below the usual benchmark of 0.85 (Kline, 1998), confirming good discriminant validity. Finally, we found a satisfactory level of fit between the model and the data (goodness of

⁴ The CFA factor loadings are available upon request.

fit index (GFI) = 0.972; comparative fit index (CFI) = 0.961; Tucker-Lewis index (TLI) = 0.955; root mean square error of approximation (RMSEA) = 0.054; standardized root mean square residual (SRMR) = 0.067).

(Insert Tables 1 and 2 about here)

As in other innovation studies (e.g., Block, 2012; Sciascia, Nordqvist, Mazzola, & De Massis, 2015), we included in our models firm-level and industry-level variables as controls. First, we considered *firm size*, measured as the logarithm of the number of employees (Sciascia et al., 2015), and *firm age* as the number of years since the firm's foundation (Chrisman & Patel, 2012). Given the type of SMEs we analyze, we controlled for *generation in control* by directly asking the CEOs to indicate the generation primarily responsible for managing the business. This variable takes value 1 when the first generation is in charge of management, and 0 for later generations (Werner, Schröder, & Chlosta, 2018). With regard to the presence of women in the firm, we added *female CEO*, a dummy equal to 1 if the CEO is a woman (Arena, Michelon, & Trojanowski, 2018), and *nonfamily female directors on the board* measuring the involvement of nonfamily female directors as their ratio over board size (Campopiano, Rinaldi, Sciascia, & De Massis, 2019). We accounted for the impact of board-related characteristics on innovation by including *frequency of board meetings* assessed by the number of board meetings per year (Brick & Chidambaran, 2010), *board age diversity* operationalized as the standard deviation of the age of board members divided by their mean age (Ali, Ng, & Kulik, 2014), and *board tenure diversity* computed as the standard deviation of board members' tenure divided by their mean tenure (Li & Wahid, 2018). Finally, we controlled for the firm's *past performance* measured as return on assets (net results/total assets) lagged by one year (Ashwin, Krishnan, & George, 2015), *financial slack* captured by the ratio of quick assets to liabilities (De Massis, Kotlar, Mazzola, Minola, & Sciascia, 2018), and *leverage*

calculated as the ratio of debts divided by total assets (Sciascia et al., 2015). We incorporated industry-level controls using the dummy variables *services*, *construction*, *manufacturing*, *transport*, *retail*, *high-technology*, and *other*.

4 RESULTS

4.1 Descriptive statistics

The descriptive statistics and correlations reported in Table 2 above show that the average family SME in our sample employs 37 workers and has been in business for 31 years. While presenting on average moderate preferences for *IFM* (identification of family members) at 14.32, *BST* (binding social ties) at 11.38, *EAFM* (emotional attachment of family members) at 12.72, and *RFB* (renewal of family bonds) at 12.48, family SMEs show a relatively higher preference for *FCI* (family control and influence) with a mean value of 17.13 out of 25. The family founder is still in charge of the business in 25.4% of cases. The mean level of *R&D intensity* is 3%, while 21% of board members are family female directors, and 16% of family firms are led by a female CEO. While *family female directors on the board* ($p < 0.01$), *IFM* ($p < 0.10$), *RFB* ($p < 0.10$), *generation in control* ($p < 0.05$), and *leverage* ($p < 0.10$) are positively correlated with *R&D intensity*, we observe a negative correlation between *FCI* ($p < 0.10$) and *R&D intensity*.

4.2 Regression analysis

To test our hypotheses, we used multiple regression analysis with the ordinary least squares method. To check for potential multicollinearity issues, we calculated the variance inflation factors (VIFs) and condition indexes. All VIF values are below the cut-off of 5 (Hair et al., 2010), and all condition indexes are below the acceptable limit of 15 (Young, 2017), suggesting that multicollinearity is not a major problem in our model. Moreover, as Podsakoff and Organ (1986) suggest, we used the Harman's one-factor test to ensure that common method bias is not a serious

concern. We entered all the study variables into a factor analysis, extracting 73.41% of total variance. Among the 7 factors identified, the first accounted for 24.75% of variance, and the remainder 48.66%. Since the analysis indicated that the first factor does not account for the majority of variance, common method bias is not a major concern.

Model 1 in Table 3 includes the control variables and accounts for 9.5% of variance. Interestingly, *nonfamily female directors on the board* does not significantly relate to *R&D intensity*. This result is aligned with our perspective focusing on only family female directors as more likely to have the power to affect the board's decision-making by virtue of their family affiliation (Cruz et al., 2019; Singh et al., 2015). Model 2 indicates that the direct effect of *family female directors on the board* on *R&D intensity* is positive and significant ($\beta = 0.044$; $p < 0.01$), confirming H1 positing that the involvement of family female directors in the board positively relates to family SMEs' innovation in terms of R&D intensity. Model 4 shows that the interaction between *family female directors on the board* and *FCI* has a negative and significant effect on *R&D intensity* ($\beta = -0.024$; $p < 0.01$), whereas Models 8 and 12 reveal a positive and significant interaction between *IFM* and *family female directors on the board* ($\beta = 0.022$; $p < 0.05$), and between *RFB* and *family female directors on the board* ($\beta = 0.021$; $p < 0.01$). These findings provide support for H2a, H3a, and H3c, highlighting that in family SMEs, family control and influence negatively moderates the relationship between *family female directors on the board* and *R&D intensity*, while identification of family members and the desire to renew family bonds through dynastic succession are positive moderators. Contrarily, Models 8 and 10 do not allow validating H2b and H3b, since the interactions of *BST* and *EAFM* with *family female directors on the board* are not significant. Therefore, neither the family's emotional attachment nor binding social ties moderate the positive relationship between involvement of family female directors in the board and R&D intensity.

(Insert Table 3 about here)

To further examine the moderating effect of *FCI*, *IFM*, and *RFB*, we employed the Johnson-Neyman technique (Hayes, 2013) to determine the range of values of these moderators for which the conditional effect of *family female directors on the board* on *R&D intensity* is statistically significant at the 0.05 threshold. Figures 2, 3, and 4 illustrate the conditional effect (solid line) and the upper and lower 95% confidence interval (dashed lines). The conditional effect is significant when both the upper and lower bounds of the confidence interval are above or below the X-axis. Figure 2 highlights that *family female directors on the board* has a significant positive relationship with *R&D intensity* up to *FCI* taking a value above 18.66. This means that the conditional effect is significant for 68.99% of the sample. Additionally, the positive effect decreases as the value of *FCI* increases, providing additional support for H2a. In contrast, Figure 3 shows that *family female directors on the board* has a positive and significant relationship with *R&D intensity* when *IFM* takes a value above 12.29, implying that the marginal effect is statistically significant for 62.37% of the total sample. Furthermore, the positive effect increases when the *IFM* value grows, corroborating H3a suggesting that the relationship between *family female directors on the board* and *R&D intensity* is more positive when the level of *IFM* increases. Figure 4 presents similar findings, showing that *family female directors on the board* is positively and significantly related to *R&D intensity* when the *RFB* value is above 11.46, corresponding to 61.67% of our sample. Again, the positive effect of *family female directors on the board* on *R&D intensity* becomes increasingly positive as the *RFB* value increases, in line with H3c.

(Insert Figures 2, 3, and 4 about here)

4.3 Robustness checks

We conducted several checks and analyses to ensure the robustness of our results. First, we considered the potential endogenous nature of *family female directors on the board* in our model. Indeed, while we assumed that the involvement of family female directors in the board influences the degree of R&D intensity, it could be that the level of R&D intensity also conditions the presence of family female directors. For instance, some scholars suggest that board gender imbalance is particularly salient in R&D intensive firms (Chau & Quire, 2018), arguing that the main reason is the lower inclination of women to opt for careers in such firms (Gorbacheva, Beekhuyzen, vom Brocke, & Becker, 2019). This phenomenon might even be more pronounced among family female members, since the family's propensity to own multiple businesses offers them a wider range of opportunities to join the board of less R&D intensive SMEs (Cruz & Justo, 2017). To solve this possible endogeneity problem, we replicated the regression analysis adopting a two-stage least-squares (2SLS) regression technique, an adequate solution to address reverse causality in cross-sectional models (e.g., Hill, Johnson, Greco, O'Boyle, & Walter, 2021; Zaefarian, Kadile, Henneberg, & Leischnig, 2017). In line with Semadeni, Withers, and Trevis Certo's (2014) recommendation, we employed multiple instrumental variables strongly related to the endogenous regressor (i.e., *family female directors on the board*) in the first-stage regression: the average number of children of family female directors (*AVCHILD*) (i.e., total number of children of family female directors divided by the number of family female directors), and the average number of family female directors whose partners are owners of the firm (*AVPART*) (i.e., number of family female directors with partners who are owners of the firm divided by the number of family female directors). To assess the validity of our instruments, we used the Kleibergen-Paap statistics (Kleibergen & Paap, 2006) and Sargan test (Sargan, 1988). The Kleibergen-Paap F-statistics are higher than the 10 or 15% critical values (Stock & Yogo, 2005), suggesting that the instruments are not weak. The Kleibergen-Paap LM statistics are significant, providing strong support for the

absence of under-identification concerns. The results of the Sargan test are not significant, confirming that over-identification is not a serious problem. The findings obtained in the second-stage regressions shown in Table 4 corroborate those observed in our initial analyses.

(Insert Table 4 about here)

Second, as the nature of the industry strongly determines R&D intensity (e.g., Janger, Schubert, Andries, Rammer, & Hoskens, 2017; O'Reilly & Tushman, 2013), we replicated our analysis with an industry-adjusted measure calculating the difference between the level of R&D intensity of each firm and the average level of R&D intensity in each respective industry using the data from our sample. We assume that positive (negative) discrepancies between firm-level and industry-level R&D intensity indicate that the firm displays a higher (lower) inclination towards R&D activities. As shown in Table 5, the results obtained with this industry-adjusted measure of R&D intensity corroborate our initial findings reported in Table 3. Third, we repeated our analysis with the R&D expenditure to sales ratio as dependent variable. The results obtained with this alternative indicator (see Table 6) are similar to the original results reported in Table 4. Fourth, as our sampled family SMEs have the legal obligation to hold at least one board meeting per year, we replicated the analysis after excluding six family SMEs whose boards only meet once per year, as this could indicate that the board has a purely formal role and acts as a rubber-stamp governance body. Again, the results (available upon request) confirm our initial findings.

(Insert Tables 5 and 6 about here)

4.4 Post hoc analyses

Prior research points out that the effect of women's involvement in the board on innovation is conditional on the size of the minority group of female directors (Saggese, Sarto, & Viganò, 2021), suggesting that the underrepresentation of women on the board would result in female directors

being viewed as “tokens” with no bearing on innovation decisions (Torchia et al., 2011). Therefore, we conducted a post hoc analysis exploring the impact on innovation of a board with one female director and more than one female director. We used the two dummy variables *one female director on the board* (taking value 1 if the board has only one woman, 0 otherwise), and *more than one female director on the board* (taking value 1 if the board has more than one woman, 0 otherwise). The group of boards without women was our reference group in the regressions. As expected, the results reported in Model 49 of Table 7 reveal that more than one female director is required for a positive and significant impact on R&D intensity. Subsequently, we refined the analysis by distinguishing the effect of a board with one family female director or more than one family female director, and a board with one nonfamily female director or more than one nonfamily female director. We used the four dummy variables *one family female director on the board* (taking value 1 if the board has only one family female director, 0 otherwise), *more than one family female director on the board* (taking value 1 if the board has more than one family female director, 0 otherwise), *one nonfamily female director on the board* (taking value 1 if the board has only one nonfamily female director, 0 otherwise), and *more than one nonfamily female director on the board* (taking value 1 if the board has more than one nonfamily female director, 0 otherwise). Again, the group of boards without women served as our baseline. Model 50 indicates that only more than one family female director on the board is conducive to higher levels of R&D intensity, providing additional support to our initial findings. In addition, we reiterated our moderation analysis in the four subsamples and found that the moderating effects of *FCI*, *IFM*, and *RFB* only manifest when more than one family female director sits on the board (results available upon request). We also checked whether the presence of too many family female directors could hurt innovation by testing for a potential nonlinear relationship between *family female directors on the board/number of family female directors* and *R&D intensity* by including the squared terms of *family female*

directors on the board and *number of family female directors* in the regression analyses (results available upon request). However, we did not find any significant effects.

We also explored whether the presence of female directors on the board influences R&D intensity in our subsample of nonfamily SMEs (results available upon request). Specifically, we excluded all family-related variables from our model and regressed R&D intensity on one female director on the board, more than one female director on the board, and the remaining control variables. We then reiterated the analysis with the percentage of female directors on the board as our main explanatory variable of R&D intensity. In both cases, we did not find any significant effects for the measures of female involvement in the board.

(Insert Table 7 about here)

5 DISCUSSION

Although a vibrant research stream has examined how the cognition, values, and dynamics of the upper echelons are reflected in the strategic choices of organizations (Hambrick & Mason, 1984), scholarly interest in how upper echelons' gender influences organizational actions, including strategic entrepreneurship and innovation, has only recently developed (Carpenter et al., 2004). This lack of attention is attributed to the relatively recent phenomenon of involving women in leading roles as board directors (Lyngsie & Foss, 2017). Fortunately, societal changes and women breaking the so-called glass ceiling has led them to become progressively more visible (Salganicoff, 1990) and involved in traditionally male-dominated upper echelons (Samara et al., 2019), as well as in promoting entrepreneurial ventures (Wilson et al., 2007). In this study, we show that although scholars have started to acknowledge the beneficial influence that female directors exert on entrepreneurial initiatives (e.g., Chen et al., 2016; Muller-Kahle & Schiehl, 2013), this influence is subject to different degrees of complexity (Foss et al., 2021).

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We examine family firms, as they typically offer greater opportunities for women to be involved in the business (compared to nonfamily firms), particularly if belonging to the owning family and having the power to make their voices heard on the board (e.g., Cole, 1997; Cromie & O’Sullivan, 1999). Therefore, we embrace upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) to examine how directors’ gender and family affiliation shape family SMEs’ entrepreneurial initiatives, particularly in relation to innovation. Our analyses of a sample of 287 Belgian family SMEs reveal that involving more women affiliated with the owning family in the board increases innovation investments. We attribute this influence to the board’s enhanced cognition and decision-making – by means of greater creativity, higher communication and inclusion, communal values, and knowledge sharing – in turn giving rise to more innovative ideas that can be pursued through R&D investments. By delving into this complexity, our study is one of the first to introduce and test the involvement of family female directors in the board as a catalyst of innovation investments in family SMEs.

Beside the visible traits of directors, such as gender- and family-related demographic characteristics, we acknowledged that psychological and sociological aspects are key drivers of upper echelons’ cognition and behavior (Lawrence, 1977; Hambrick & Mason, 1984; Hambrick, 2007). In the context of family SMEs, these aspects correspond to socioemotional preferences. Therefore, we integrate upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) with the SEW perspective (Gomez-Mejia et al. 2007; 2011), and examine the contingency effects of SEW preferences. Since R&D decisions are a mixed gamble (Martin et al., 2013), entailing potential SEW gains and losses (Gomez-Mejia et al., 2014), we hypothesize the positive and negative moderations of the different SEW dimensions on the main relationship influencing board cognition.

Our tests of the contingency effect of the five SEW dimensions reveal that family control and influence weakens the main positive effect, thus counterbalancing the potentially positive effect of the greater presence of family female directors on board cognition and decision-making pertaining to innovation. Instead, identification of family members with the firm and the desire to renew family bonds through dynastic succession strengthen it, amplifying the positive effect of having more family female directors. Indeed, the positive effect of involving family female directors in the board decreases with the increase of family control and influence, up to losing significance when the latter scores are very high. Despite that family female members should stimulate the pursuit of more R&D investments, the family's desire to preserve control and influence shapes board cognition in such a way that the decision to invest in R&D is perceived as a potential loss of this SEW dimension, thereby downplaying any innovation initiatives to avoid such loss (Rondi et al., 2019). We instead find the opposite moderating effect for identification of family members with the firm and renewal of family bonds through dynastic succession, as in this case, R&D investments are considered a potential gain for the family's future legacy in the business. While the influence of family female directors on innovation intensity strengthens with an increase in the desire for the renewal of family bonds through dynastic succession, it loses significance when the family SME scores below the average in this dimension. This means that the desire for the renewal of family bonds shapes board cognition and decision-making in such a way that a long-term view is preferred, enhancing the positive effect that family female directors exert, since the greater innovation these women stimulate is likely oriented towards the family SME's future sustainability and competitiveness. Interestingly, in finding support for the negative moderating effect of family control and influence, and the positive moderating effect of renewal of family bonds through dynastic succession, we highlight that these two dimensions – considered “necessary conditions for SEW to exist” (Swab et al., 2020, p. 10) – exert opposite forces in shaping board cognition and

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decision-making pertaining to innovation, filtering the influential effect of family female directors on the board. This result is coherent with the mixed gamble logic (e.g., Martin et al., 2013). While the former is a hindrance to translating innovative ideas stemming from the involvement of family female directors into innovation investments in family SMEs, the latter strengthens the main relationship. Scholars have conceptualized these two dimensions respectively as representing the control that family owners aim to retain in the mid-term and control they aspire to sustain for multiple generations (Swab et al., 2020). In the same vein, scholars refer to these two dimensions as current and transgenerational SEW priorities (Miroshnychenko, De Massis, Miller, & Barontini, 2021). Based on our findings, we argue that the board's temporal orientation (Magrelli, Rondi, De Massis, & Kotlar, 2020) in relation to mixed gambles is an important driver of strategic decision-making that requires further examination.

Our findings also confirm the positive moderating effect of family owners' identification with the firm. As for the renewal of family bonds through dynastic succession, also in this case, the effect of family female involvement in the board on innovation investments is not significant when the family SME scores below the average on this SEW dimension, while its effect is positive and increases for greater values. The positive moderating effect of family owners' identification with the firm empirically confirms the argument that family SMEs tied to their tradition and legacy are not forced to maintain the status quo (e.g., De Massis, Frattini, Kotlar, Petruzzelli, & Wright, 2016; Erdogan, Rondi, & De Massis, 2020), but can boost the translation of ideas generated by their board into R&D investments. Indeed, the identification of family members with the firm shapes board cognition and decision-making pertaining to innovation such that the positive effect that family female directors exert is amplified, fostering higher R&D investments.

Conversely, we do not find support for the negative moderating effect of emotional attachment and the positive moderating effect of binding social ties. The rejection of emotional attachment as

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a negative moderator is an interesting “non-result” (Bettis, Gambardella, Helfat, & Mitchell, 2014), suggesting that the relationship is more complex than hypothesized. For instance, we measure the extent of emotional attachment without distinguishing between positive and negative emotions, which are more likely to shape the context in which family female directors operate to orientate innovation decisions. A better understanding of the mechanisms through which family owners’ emotions and emotional attachment affect the relationship between involving family female directors and R&D intensity is certainly an interesting and important subject for future research.

Likewise, the hypothesis of the positive moderating effect of binding social ties is not supported. Again, it could be that binding social ties are less beneficial at the board level, as very strong social relationships might reduce the propensity of boards with female directors to invest in R&D due to groupthink (Rondi et al., 2019; Kellermanns & Eddleston, 2004), so that the proposed positive and this negative effect might combine to produce the insignificant net effect observed. While it behooves future researchers to dig deeper into these influences, the results highlight the need to treat SEW as a multidimensional rather than a unidimensional umbrella construct (e.g., Chua, Chrisman, & De Massis, 2015), since different SEW dimensions may exert different effects on the board’s cognition and related decisions.

5.1 Contributions and theoretical implications

This study contributes first to research on the role of women in the upper echelons. Thus far, research has shown that involving women in teams improves soft skills, decision-making processes, and creativity (Bagshaw, 2004; Dessler, 2001; Díaz-García, González-Moreno, & Saez-Martinez, 2013), thus beneficial for creative team tasks (Polzer, Milton, & Swann, 2002). We examine the role of female directors in the context of family SMEs, typically offering greater opportunities for women – particularly those belonging to the owning family (e.g., Cole, 1997;

Cromie & O'Sullivan, 1999) – to be included in the firm and appointed as members of the board (Martinez Jimenez, 2009; Songini & Gnan, 2009). Drawing on upper echelons theory, we expand the demographic characteristics of board members by considering gender in combination with family affiliation as a driver of family SMEs' board cognition. Since female directors need power to make their voices heard (Elstad & Ladegard, 2012; Ragins & Sundstrom, 1989; Zelechowski & Bilimoria, 2003), we show that the power deriving from their affiliation with the owning family (Singh et al., 2015) enables family female directors (e.g., Herdhayinta et al., 2021; Cruz et al., 2019) to play a positive role in family SME innovation, leading to higher innovation intensity. In addition, we contribute to upper echelons theory by addressing Neely et al.'s (2020) call for the adoption of perspectives that more visibly grasp the psychological and sociological aspects that concur in shaping board cognition and behavior. In fact, our study provides more clarity on how SEW preferences, disentangled according to the five FIBER dimensions, influence board cognition in family SMEs, concurring to filter the stimuli that family female directors bring to the board, and thereby influencing innovation decisions.

Interestingly, our post-hoc analyses contribute to the debate on women underrepresentation in boards resulting in female directors being viewed as “tokens” with no influence on innovation decisions (e.g., Torchia et al., 2011). In line with this view, our post-hoc analyses reveal that one woman on the board is not enough to influence board cognition on R&D investment decisions. Instead, a critical mass of women is needed (Torchia et al., 2011), as shown by the relationship turning significant when there are at least two female directors on the board. Nevertheless, these female directors must be part of the owning family to count and have the power (e.g., Singh et al., 2015) to influence board cognition and behavior. Prior literature tends to consider the involvement of family women in family business mostly in terms of balancing work and family responsibilities, to the point of considering their potential business duties as secondary to the administrative and

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executive tasks of the family's material, social, and emotional life (Gillis-Donovan & Moynihan-Bradt, 1990; Lyman, Salganicoff, & Hollander, 1985). Thus, women remained invisible, unrecognized, and "underused" resources in family business (Salganicoff, 1990, p. 136), the unsung heroes (Eddleston & Sabil, 2019). Nevertheless, our post-hoc analyses demonstrate that family women play a key role in family SME innovation decisions. These results echo and extend recent evidence of women's influence on family business power dynamics (e.g., Cosson & Gilding, 2021; Madison et al., 2021). Moreover, within the upper echelons theory debate, we also contribute to research on faultlines, i.e., "hypothetical dividing lines that may split a group into subgroups based on one or more attributes" (Lau & Murnighan 1998, p. 328). Prior literature has identified family affiliation of board members as a source of faultlines among factions of family and nonfamily directors (e.g., Minichilli, Corbetta, & Macmillan, 2010). While directors' gender, as a visible characteristic, becomes a source of classification of board subgroups (Tajfel & Turner, 2004), we contend that the combination of gender and family affiliation (i.e., involvement of family female directors) becomes a source of misalignment of diversity attributes. Specifically, in traditionally male-dominated family SME boards (those in our sample are on average composed of 73.3% males of which 53.82% family and 46.18% nonfamily), family affiliation is a source of faultlines between family and nonfamily male directors (Basco, Campopiano, Calabrò, & Kraus, 2019). However, the presence of family female directors introduces gender as a further attribute of diversity. Therefore, the misalignment between the two diversity attributes (gender and family affiliation) blurs the boundaries of subgroups in boards where gender is an element of diversity between family female and family male directors, while family affiliation is an element of similarity between family male and family female directors. As such, while gender and family affiliation might lead to faultlines, their misalignment allows surmounting this splintering into subgroups. Indeed, our study suggests that gender, combined with other individual diversity

attributes, allows overcoming the creation of such divide (Vandebeek, Vodeckers, Lambrechts, & Huybrechts, 2016). Future studies could therefore consider gender in relation to other characteristics, membership of multiple board subgroups, and the effect on decision-making, potentially accounting for less observable attributes.

Second, we contribute to the strategic entrepreneurship and innovation literature by studying the inclusion of family female directors as catalysts of innovation intensity. Strategic entrepreneurial initiatives require strong organizational interactions at the apex to seek new opportunities and advantages in strategically managing resources (Hughes, Hughes, Morgan, Hodgkinson, & Lee, 2021; Ireland, Hitt, & Sirmon, 2003). In this regard, we show that involving family female directors in the board stimulates a change in strategic impetus that orients strategic choices towards innovation intensity. In so doing, we extend the model of Ireland et al. (2003) by unpacking the relationship between the strategic management of resources and entrepreneurship behavior. In other words, we reveal that involving family female directors in the board enriches its decision-making resources, in turn affecting strategic decisions pertaining to innovation, and thus strategic entrepreneurship. Moreover, by considering the mosaic of SEW dimensions, we open a breach into the complexity of female influence on strategic entrepreneurship by shedding light on the nuances of the complex set of contingencies that might boost or limit the role of family female directors as catalysts of innovation. Indeed, the literature in this regard appears mixed. Some studies prove that the inclusion of more women allows teams to acquire more heterogeneous knowledge from diverse groups within and outside the organization (Erhardt et al., 2003; Post, Lokshin, & Boone, 2020; Wiersema & Bantel, 1992), and boards to make more scrutinized strategic decisions and lowering creativity, in turn hampering innovation outcomes (Hoffman & Maier, 1961). Some scholars find that female directors on the board tend to be more supportive than their male counterparts, encouraging experimentation and information-sharing (Arzubiaga, Kotlar, De Massis, Maseda, &

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Iturralde, 2018). Conversely, other studies highlight that greater heterogeneity leads to conflicts among individuals (Mensi-Klarbach, 2014; Tsui, Egan, & O'Reilly, 1992), difficulties in achieving consensus (Knight et al., 1999), and hampering quick decision-making (Hambrick, Cho, & Chen, 1996), which in turn might hinder innovation decisions and outcomes. Finally, our study also complements the perspective of women's influence on entrepreneurial outcomes by examining family SMEs' innovation intensity as a more immediate outcome of board decision-making, and an antecedent of entrepreneurial performance.

Third, our empirical investigation offers contributions to family business research. We have heeded the call of Cruz et al. (2019) for further work on the role that family female directors play in family firms' entrepreneurial initiatives by examining their role in innovation. Our study helps deepen our understanding of the drivers of within-family firm variance in R&D decisions by focusing on the key dimensions of governance and strategy, thereby contributing to explaining family firm heterogeneity (Chua, Chrisman, Steier, & Rau, 2012). Scholars have thus far considered the role of SEW preferences as inputs of strategic choices, disregarding whether and how SEW preferences can contingently affect other relations in play in family firms (Lu et al., 2020), with the few exceptions providing mixed findings (Lu et al., 2020; Schepers et al., 2014; Vandekerckhof et al., 2015). Our study reveals that SEW preferences can also compose a contingency framework in explaining how board characteristics affect strategic choices. Moreover, prior studies measure SEW with indirect proxies, such as family ownership and/or management (Chua et al., 2015; Gomez-Mejia et al., 2011). By directly measuring and capturing SEW as a multidimensional construct, we advance these studies by moving beyond the assumption that economic and noneconomic goals are mutually exclusive, embracing the mixed gamble logic to conceptualize the moderating role of SEW dimensions as drivers of potential losses and gains (Martin & Gomez-Mejia, 2016). Therefore, by considering the effect that each of the five SEW

dimensions exerts on the main relationship between involvement of family female directors in the board and innovation investments, we address the SEW multidimensionality debate calling for further knowledge on whether the five dimensions of SEW work in concert or sometimes come into conflict (e.g., Chua et al., 2015; Brigham & Payne, 2019; Swab et al., 2020). In so doing, we adopt a comprehensive rather than partial perspective (Lu et al., 2020), using primary data to examine how each dimension influences the effect of family SME innovation drivers (Swab et al., 2020). Indeed, R&D is a mixed gamble that involves trade-offs requiring the family to weigh potential SEW losses and gains (Gomez-Mejia et al., 2014). Finding support for the negative moderating effect of family control and influence, and a positive moderating effect of renewal of family bonds through dynastic succession, our results demonstrate that SEW dimensions can exert opposite forces. In so doing, we also contribute to research on the dark side of SEW (Kellermanns, Eddleston, & Zellweger, 2012). In particular, our results highlight that it is not a too-high or too-low level that defines whether SEW is dark or bright, but that amongst its five dimensions, some can emerge as boosters (i.e., bright) and others as detractors (i.e., dark) with respect to the specific strategic decisions examined.

5.2 Limitations and future research directions

As in any other research, our study has some limitations that offer interesting avenues for future research. First, in line with several other studies, we consider three important organizational and family characteristics: family female involvement in the board, SEW, and R&D investments. However, organizations and board members are embedded in a cultural context where being a family female director may have a different meaning and influence on organizational decision-making. Our empirical investigation relies on data from Belgium, but the role of women in organizations in this cultural context is likely to differ from other contexts, such as emerging

countries. While our results are generalizable to countries similar to Belgium (e.g., Anglo-Saxon), this may not be the case for other contexts. While countries might differ in terms of governance codes and practices, types of families, and gender norms, the latter might also change within a single country depending on the industry in which the firm operates. The generalizability of our results may be also determined by the specific type of family firm considered, in our case private family SMEs. While this choice allowed us to overcome the potential external distortion introduced by gender quotas (Terjesen et al., 2015), it also limits the generalizability of our findings to large family firms. Future studies considering different countries, cultures, industries, and larger firms are thus welcome.

Another limitation of our empirical setting is the cross-sectional survey-based design. Although cross-sectional design in this type of research is standard practice, a longitudinal study would be useful to gain a deeper understanding of how the involvement of family female directors, R&D investments, SEW preferences, and their relationships, might change over time. By embracing a temporal perspective, future research could examine whether R&D investments vary with the inclusion of more family female directors, and how board functioning changes in relation to innovation decisions. Furthermore, the diversity that women bring to the board might be relevant at the beginning and then progressively erode when the different contributions of ideas and networks become a commodity and board members align their perspectives. Finally, collecting data covering a longer time horizon will also allow investigating the performance implications of R&D investments triggered by the presence of family female directors. Indeed, R&D requires time to pay off and investigating the link with firm performance would thus need data with relatively long lags with respect to the sample timeframe (e.g., Ciftci & Cready, 2011; Le, Walters, & Kroll, 2006; Lee & Wu, 2016). Within this line of inquiry, it would be also insightful to understand what type of innovation strategy (e.g., Scholes, Hughes, Wright, De Massis, & Kotlar, 2021) is triggered

by the involvement of family female directors in the board, and what types of innovation outcomes ensue.

Third, in this study, we consider gender and family affiliation as factors that shape board diversity in family SMEs. Nevertheless, there may be other factors that facilitate a more diverse and creative board, such as individual characteristics or personality traits. Our research might thus be extended by pairing gender with other directors' characteristics that might also drive family SMEs' innovation investments. Moreover, we capture innovation input with R&D intensity. Research has found that family firms might formally allocate more or fewer financial or human capital resources to innovation (Schmid, Achleitner, Ampenberger, & Kaserer, 2014). Therefore, future research could examine the role of family female involvement in the board by considering other innovation input measures, such as employees allocated to R&D activities (Brinkerink & Rondi, 2020).

Fourth, an important assumption in our study is that the board has a service rather than a control role, namely advising and strategizing (Huse, 2000; Johannisson & Huse, 2000). While we assume that SMEs are less prone to disentangling the service and control roles, we were unable to clearly verify whether this is the case in the firms in our sample. Future research might thus tackle this point, investigating whether the relationship between the presence of family female directors and R&D intensity changes depending on the role the board plays. Moreover, as our study examines only the structural characteristics of family SMEs' board and innovation inputs, future studies could explore the functioning of the family SME board (Arzubiaga et al., 2018), how it develops cognitive frames, and how the negotiation of directors' interpretations shape decision-making.

Last, we focus on the involvement of family females in the board of family SMEs as a particular type of woman with the power to influence board decisions by bringing novelty and creativity to the board. However, the family business literature also acknowledges the nepotism phenomenon.

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Citing Bellow (2003), Jaskiewicz, Uhlenbruck, Balkin, and Reay (2013, p. 121) define it as, “the owner’s or manager’s preference for hiring family members (nepots) rather than unrelated job applicants”. As such, family women may be hired and involved in the board for reasons of family membership, lacking the competences and connections able to contribute to the board’s creativity and innovative initiatives. Alternatively, even when family female members are genuinely interested in being involved in the family firm, the energy and time they dedicate to the business might be limited due to having to simultaneously manage family issues (e.g., Lyman et al., 1985). This might in turn limit the contribution of family female directors to the board’s innovative initiatives. Moreover, our study assumes that being part of the family grants female directors power. However, the degree of power might depend on other factors, such as their shareholding or occupying managerial/operational roles within the firm. Overall, our study does not capture data on the actual contribution of each board member in terms of innovative ideas or the individual values and biases that influence the board’s appraisal of SEW preferences. As such, future research should examine how family female directors contribute to the board in terms of innovative ideas, and whether/how they exert power in the board to shape cognition and behavior. This endeavor would be a step forward in the adoption of a microfoundational perspective (e.g., Bromiley & Rau, 2016; Felin et al., 2015) in the context of family firms (e.g., De Massis & Foss, 2018) to understand how the connections among individuals, the board, and the firm contribute to explaining the relationship between the presence of family female directors and innovation.

Finally, we consider the presence of family female directors as a driver of board diversity. However, family SMEs are often portrayed as organizations with a paternalistic (Mussolino & Calabrò, 2014) and centralized leadership style (De Massis et al., 2020) where decisions are made by the founder/CEO, and the board exists only “on paper” without providing real contributions (Arzubiaga et al., 2018; De Massis et al., 2020), especially if the SME’s management does not

disclose information to the board (Uhlaner, De Massis, Jorissen, & Du, 2020). Thus, future research might explore and empirically acknowledge these issues (e.g., through qualitative studies) to provide a more comprehensive view of the role that family female directors play in family firm innovation

5.3 Managerial implications

Notwithstanding some limitations, we believe our study has important managerial implications. In terms of contributions to practice, we show that including family females in the board of directors positively influences R&D intensity, leading family SMEs to invest more in innovation, but this is subject to the SEW preferences characterizing the family SME. As such, our findings caution family SME owners and managers to pay attention to these important dimensions of diversity when appointing directors to their board. This positive finding might be a stimulus for family SMEs, but also firms in general, to increase their board's female representation and give them the power to have their voices heard. However, we also warn family SMEs that the results might not always be as expected, since SEW filters the positive influence of family female directors on innovation inputs. Family members' SEW preferences have a contingent role, enhancing the positive effect of involving family female directors (i.e., when both identification of family members with the firm and the desire to renew family bonds through dynastic succession are high), but also diminishing it (as in the case of high family control and influence).

6 CONCLUSION

Despite that the number of women on boards is increasing, whether female directors act as catalysts of innovation remained unclear. Building on upper echelons theory, we consider directors' gender

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together with their family status, showing that family female directors indeed act as catalysts of family SMEs' entrepreneurial initiatives, positively affecting innovation in terms of R&D intensity. Yet, this is contingent on the effect exerted by some dimensions of SEW, a peculiarity of family enterprises. Our results therefore show that the reality is more variegated than previously thought, extending and enriching research on women in upper echelons, strategic entrepreneurship, innovation, and family business.

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TABLE 1 Reliability and validity tests for the constructs

Exploratory factor analysis Constructs	Indicators	FCI	EAFM	IFM	BST	RFB	r_{wg}	α	β
Family control and influence (<i>FCI</i>)	FCI1. The majority of shares in my family business are owned by family members.	0.864	0.218	0.184	0.202	0.217	0.922	0.892	0.772
	FCI2. In my family business, family members exert control over the firm's strategic decisions.	0.859	0.214	0.195	0.196	0.304			
	FCI3. In my family business, most executive positions are occupied by family members.	0.836	0.223	0.213	0.224	0.214			
	FCI4. In my family business, nonfamily managers and directors are named by family members.	0.847	0.224	0.241	0.241	0.233			
	FCI5. The board of directors is mainly composed of family members.	0.787	0.198	0.174	0.208	0.195			
Emotional attachment of family members (<i>EAFM</i>)	EAFM1. Emotions and sentiments often affect decision-making processes in my family business.	0.312	0.784	0.284	0.296	0.304	0.885	0.822	0.692
	EAFM2. Protecting the welfare of family members is critical to us, apart from personal contributions to the business.	0.274	0.756	0.314	0.244	0.317			
	EAFM3. In my family business, the emotional bonds between family members are very strong	0.234	0.814	0.158	0.214	0.247			
	EAFM4. In my family business, affective considerations are often as important as economic considerations.	0.193	0.801	0.221	0.227	0.251			
Identification of family members (<i>IFM</i>)	IFM1. Family members have a strong sense of belonging to my family business.	0.217	0.254	0.754	0.412	0.214	0.943	0.853	0.724
	IFM2. Family members feel that the family business' success is their own success.	0.224	0.284	0.747	0.354	0.223			
	IFM3. My family business has a great deal of personal meaning for family members.	0.178	0.216	0.761	0.331	0.219			
	IFM4. Being a member of the family business helps define who we are.	0.236	0.222	0.732	0.328	0.351			
	IFM5. Family members are proud to tell others that we are part of the family business.	0.241	0.237	0.817	0.317	0.317			
Binding social ties (<i>BST</i>)	BST1. My family business is very active in promoting social activities at the community level.	0.258	0.241	0.187	0.789	0.175	0.957	0.871	0.741
	BST2. In my family business, nonfamily employees are treated as part of the family.	0.264	0.317	0.196	0.822	0.210			
	BST3. In my family business, contractual relationships are mainly based on trust and norms of reciprocity.	0.229	0.319	0.234	0.803	0.187			
	BST4. Building strong relationships with other institutions (i.e., other companies, professional associations, government agencies, etc.) is important for my family business.	0.231	0.326	0.209	0.815	0.198			
Renewal of family bonds (<i>RFB</i>)	RFB1. Continuing the family legacy and tradition is an important goal for my family business.	0.208	0.317	0.184	0.259	0.774	0.972	0.867	0.736
	RFB2. Family owners are less likely to evaluate their investment on a short-term basis.	0.225	0.284	0.296	0.315	0.791			
	RFB3. Family members would be unlikely to consider selling the family business.	0.302	0.286	0.184	0.248	0.742			
	RFB4. Successful business transfer to the next generation is an important goal for family members.	0.259	0.214	0.228	0.286	0.766			
Bartlett's significance test of sphericity	0.007								
KMO index	0.764								
Confirmatory factor analysis									
CR		0.733	0.822	0.701	0.708	0.717			
AVE		0.696	0.624	0.655	0.664	0.676			
GFI	0.972								
CFI	0.961								
TLI	0.955								
RMSEA	0.054								
SRMR	0.067								

Notes: r_{wg} : coefficient of agreement; α : Cronbach's α ; β : Revelle's β . KMO: Kaiser-Meyer-Olkin; CR: composite reliability; AVE: average variance extracted; GFI: Goodness of fit index; CFI: comparative fit index; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; SRMR: standardized root mean square residual.

TABLE 2 Descriptive statistics, correlation matrix, and square root of the average variance extracted (AVE)

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. R&D intensity	0.030	0.018	1.000																		
2. Family female directors on the board	0.213	0.104	0.256***	1.000																	
3. FCI	17.126	6.124	-0.123*	-0.089	0.834																
4. EAFM	12.718	7.143	0.091	0.076	0.142**	0.790															
5. IFM	14.317	0.518	0.114*	0.098	0.121*	0.113*	0.809														
6. BST	11.384	6.718	0.087	0.112*	0.087	0.075	0.100	0.815													
7. RFB	12.482	8.631	0.117*	0.098	0.119*	0.088	0.076	0.092	0.822												
8. Firm size	37.142	19.178	0.087	0.094	0.089	0.052	0.062	0.063	-0.054	1.000											
9. Firm age	31.372	12.441	0.076	0.085	0.076	-0.063	-0.072	-0.071	-0.123*	0.110*	1.000										
10. Generation in control	0.254	0.184	0.167**	0.072	-0.112*	-0.098	-0.088	-0.054	0.172**	0.124*	0.127*	1.000									
11. Family involvement	3.125	1.875	-0.076	0.134*	0.223***	0.121*	0.145**	0.132**	0.169**	0.084	0.079	0.109*	1.000								
12. Female CEO	0.157	0.036	0.102	0.132*	-0.067	0.058	-0.038	0.049	0.064	0.072	0.066	0.061	0.057	1.000							
13. Nonfamily female directors on the board	0.054	0.029	0.084	-0.156**	-0.054	0.041	-0.047	0.051	0.051	0.078	0.076	0.055	0.087	-0.106	1.000						
14. Frequency of board meetings	6.524	2.36	0.092	0.149**	0.057	0.089	0.095	0.077	0.145**	0.138**	0.135**	0.142**	0.084	0.095	0.102	1.000					
15. Board age diversity	0.123	0.072	0.127*	0.089	-0.057	0.032	0.045	0.072	0.054	0.140**	0.142**	0.089	0.057	0.096	0.102	0.124*	1.000				
16. Board tenure diversity	0.118	0.077	0.099	0.075	-0.085	0.026	0.034	0.065	0.062	0.119*	0.146**	0.076	0.064	0.123*	0.099	0.122*	0.119*	1.000			
17. Past performance	0.054	0.039	0.074	-0.076	-0.058	0.045	0.065	0.032	0.023	0.036	0.042	0.048	0.075	-0.057	-0.060	0.078	0.061	0.057	1.000		
18. Financial slack	0.082	0.063	0.223***	0.124*	0.085	0.075	0.064	0.047	0.089	0.127*	0.081	0.079	0.118*	0.095	0.087	0.075	0.078	0.065	0.084	1.000	
19. Leverage	0.274	0.146	0.107*	-0.063	-0.063	-0.067	0.072	-0.076	-0.058	0.047	0.038	0.030	-0.084	-0.048	-0.043	0.062	0.054	0.042	0.041	-0.120*	1.000

Notes: N = 287; FCI: family control and influence; EAFM: emotional attachment of family members; IFM: identification of family members; BST: binding social ties; RFB: renewal of family bonds; bold numbers on the diagonal indicate the square root of the average variance extracted; in the regression model, the natural logarithm of the number of employees and the number of years the firm has been in business are used to capture the effect of firm size and firm age; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

TABLE 3 Regression results on hypotheses testing (dependent variable: *R&D intensity*)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Constant	0.204*** (0.020)	0.217*** (0.024)	0.208*** (0.021)	0.222*** (0.027)	0.211*** (0.022)	0.225*** (0.028)	0.213*** (0.023)	0.209*** (0.021)	0.214*** (0.023)	0.220*** (0.026)	0.215*** (0.024)	0.224*** (0.028)
Firm size	0.097 (0.081)	0.088 (0.073)	0.090 (0.074)	0.097 (0.081)	0.086 (0.071)	0.083 (0.069)	0.085 (0.063)	0.079 (0.069)	0.083 (0.077)	0.095 (0.079)	0.089 (0.074)	0.082 (0.067)
Firm age	0.069 (0.065)	0.072 (0.068)	0.078 (0.073)	0.070 (0.066)	0.062 (0.058)	0.075 (0.071)	0.087 (0.082)	0.083 (0.078)	0.077 (0.072)	0.065 (0.061)	0.086 (0.081)	0.063 (0.059)
Generation in control	0.047** (0.017)	0.044** (0.016)	0.037** (0.012)	0.045** (0.016)	0.053** (0.020)	0.040** (0.015)	0.049** (0.018)	0.051** (0.020)	0.043** (0.016)	0.035** (0.013)	0.052** (0.020)	0.041** (0.016)
Female CEO	0.035 (0.021)	0.039 (0.025)	0.033 (0.020)	0.037 (0.023)	0.044 (0.030)	0.038 (0.024)	0.046 (0.032)	0.041 (0.027)	0.030 (0.018)	0.047 (0.033)	0.045 (0.031)	0.052 (0.037)
Nonfamily female directors on the board	0.057 (0.050)	0.048 (0.041)	0.055 (0.048)	0.046 (0.040)	0.056 (0.049)	0.040 (0.034)	0.052 (0.045)	0.044 (0.038)	0.049 (0.043)	0.042 (0.036)	0.058 (0.051)	0.062 (0.055)
Frequency of board meetings	0.142 (0.135)	0.124 (0.116)	0.134 (0.127)	0.152 (0.145)	0.158 (0.150)	0.144 (0.136)	0.127 (0.121)	0.125 (0.119)	0.128 (0.123)	0.135 (0.128)	0.122 (0.117)	0.146 (0.140)
Board age diversity	0.084* (0.039)	0.082* (0.038)	0.076* (0.035)	0.065 (0.034)	0.080* (0.038)	0.074* (0.034)	0.091* (0.043)	0.060 (0.032)	0.077* (0.036)	0.062 (0.033)	0.071* (0.033)	0.083* (0.039)
Board tenure diversity	0.055 (0.049)	0.059 (0.053)	0.047 (0.043)	0.042 (0.038)	0.051 (0.046)	0.053 (0.048)	0.057 (0.055)	0.046 (0.042)	0.049 (0.045)	0.058 (0.053)	0.042 (0.038)	0.050 (0.045)
Past performance	0.080 (0.069)	0.074 (0.063)	0.085 (0.073)	0.076 (0.065)	0.083 (0.071)	0.079 (0.068)	0.087 (0.075)	0.069 (0.059)	0.082 (0.070)	0.075 (0.064)	0.065 (0.055)	0.078 (0.067)
Financial slack	0.121*** (0.007)	0.110*** (0.006)	0.114*** (0.006)	0.119*** (0.007)	0.123*** (0.007)	0.109*** (0.005)	0.105*** (0.005)	0.127*** (0.007)	0.118*** (0.007)	0.104*** (0.005)	0.113*** (0.006)	0.118*** (0.006)
Leverage	0.050 (0.044)	0.053 (0.047)	0.048 (0.042)	0.055 (0.049)	0.058 (0.052)	0.045 (0.040)	0.063 (0.057)	0.054 (0.048)	0.061 (0.055)	0.074 (0.067)	0.057 (0.051)	0.052 (0.046)
Family female directors on the board		0.044*** (0.008)	0.041*** (0.007)	0.046*** (0.008)	0.043*** (0.008)	0.048*** (0.009)	0.047*** (0.009)	0.045*** (0.008)	0.050*** (0.010)	0.049*** (0.010)	0.042*** (0.008)	0.048*** (0.008)
FCI			-0.048* (0.022)	-0.044 (0.023)								
EAFM					0.040 (0.036)	0.044 (0.040)						
IFB							0.044* (0.021)	0.039* (0.018)				
BST									0.046 (0.040)	0.043 (0.038)		
RFB											0.014* (0.006)	0.018* (0.008)
Family female directors on the board*FCI				-0.024*** (0.005)								
Family female directors on the board*EAFM						0.025 (0.022)						
Family female directors on the board*IFB								0.022** (0.008)				
Family female directors on the board*BST										0.040 (0.032)		
Family female directors on the board*RFB												0.021*** (0.003)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.103	0.129	0.137	0.162	0.130	0.132	0.139	0.165	0.130	0.131	0.141	0.175
F-test	3.08***	3.68***	3.89***	4.19***	3.70***	3.74***	3.90***	4.14***	3.71***	3.72***	3.93***	4.15***
N	287	287	287	287	287	287	287	287	287	287	287	287

Notes: *FCI*: family control and influence; *EAFM*: emotional attachment of family members; *IFM*: identification of family members; *BST*: binding social ties; *RFB*: renewal of family bonds; standard errors reported in brackets; the suppressed firm industry category is services; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

TABLE 4 Two-stage least-squares regression analysis

Variable	Model 13 First-stage	Model 14 Second-stage	Model 15 Second-stage	Model 16 Second-stage	Model 17 Second-stage	Model 18 Second-stage	Model 19 Second-stage	Model 20 Second-stage	Model 21 Second-stage	Model 22 Second-stage	Model 23 Second-stage	Model 24 Second-stage
Constant	0.074** (0.019)	0.124*** (0.021)	0.128*** (0.023)	0.122*** (0.020)	0.130*** (0.024)	0.133*** (0.025)	0.129*** (0.024)	0.126*** (0.023)	0.120*** (0.020)	0.135*** (0.025)	0.118*** (0.018)	0.121*** (0.020)
Firm size	0.068 (0.060)	0.084 (0.070)	0.088 (0.074)	0.086 (0.072)	0.080 (0.066)	0.089 (0.075)	0.090 (0.076)	0.095 (0.080)	0.078 (0.065)	0.075 (0.062)	0.083 (0.069)	0.085 (0.071)
Firm age	0.060 (0.049)	0.075 (0.070)	0.072 (0.067)	0.070 (0.065)	0.084 (0.078)	0.072 (0.067)	0.080 (0.074)	0.077 (0.072)	0.089 (0.083)	0.085 (0.079)	0.076 (0.071)	0.078 (0.073)
Generation in control	0.040 (0.026)	0.053** (0.012)	0.057** (0.013)	0.050** (0.011)	0.048** (0.010)	0.044** (0.009)	0.054** (0.012)	0.049** (0.010)	0.056** (0.013)	0.045** (0.009)	0.052** (0.012)	0.042** (0.009)
Female CEO	0.042* (0.019)	0.048 (0.026)	0.043 (0.023)	0.047 (0.025)	0.045 (0.024)	0.038 (0.020)	0.049 (0.026)	0.052 (0.027)	0.040 (0.021)	0.055 (0.029)	0.049 (0.026)	0.042 (0.023)
Nonfamily female directors on the board	-0.068** (0.017)	0.024 (0.020)	0.036 (0.031)	0.029 (0.025)	0.030 (0.025)	0.026 (0.022)	0.034 (0.029)	0.038 (0.033)	0.041 (0.036)	0.037 (0.032)	0.045 (0.039)	0.042 (0.036)
Frequency of board meetings	0.084** (0.029)	0.142 (0.130)	0.139 (0.126)	0.145 (0.132)	0.140 (0.128)	0.134 (0.122)	0.120 (0.108)	0.114 (0.102)	0.129 (0.115)	0.124 (0.113)	0.142 (0.130)	0.133 (0.122)
Board age diversity	0.059 (0.048)	0.086* (0.039)	0.074* (0.034)	0.062 (0.033)	0.075* (0.035)	0.063 (0.032)	0.084* (0.040)	0.058 (0.030)	0.078* (0.036)	0.059 (0.028)	0.073* (0.034)	0.085* (0.040)
Board tenure diversity	0.038 (0.027)	0.057 (0.050)	0.045 (0.039)	0.048 (0.032)	0.053 (0.046)	0.058 (0.051)	0.044 (0.038)	0.042 (0.036)	0.050 (0.043)	0.055 (0.048)	0.040 (0.034)	0.056 (0.049)
Past performance	0.034 (0.031)	0.068 (0.054)	0.065 (0.051)	0.062 (0.048)	0.059 (0.046)	0.069 (0.055)	0.061 (0.047)	0.057 (0.044)	0.066 (0.052)	0.054 (0.041)	0.047 (0.035)	0.060 (0.046)
Financial slack	0.084 (0.062)	0.118*** (0.006)	0.112*** (0.006)	0.117*** (0.006)	0.122*** (0.007)	0.126*** (0.007)	0.104*** (0.005)	0.108*** (0.005)	0.125*** (0.007)	0.115*** (0.006)	0.106*** (0.005)	0.114*** (0.006)
Leverage	0.063 (0.057)	0.041 (0.035)	0.049 (0.043)	0.047 (0.041)	0.042 (0.036)	0.053 (0.046)	0.045 (0.039)	0.037 (0.032)	0.035 (0.030)	0.050 (0.044)	0.046 (0.041)	0.039 (0.034)
Family female directors on the board		0.043*** (0.008)	0.039*** (0.007)	0.045*** (0.009)	0.038*** (0.007)	0.043*** (0.008)	0.046*** (0.009)	0.039*** (0.007)	0.047*** (0.010)	0.041*** (0.007)	0.042*** (0.008)	0.038*** (0.007)
FCI			-0.042* (0.020)	-0.037 (0.019)								
EAFM					0.035 (0.030)	0.032 (0.027)						
IFB							0.035* (0.015)	0.031* (0.013)				
BST									0.035 (0.030)	0.032 (0.027)		
RFB											0.019* (0.008)	0.016* (0.007)
Family female directors on the board*FCI				-0.019*** (0.005)								
Family female directors on the board*EAFM						0.024 (0.019)						
Family female directors on the board*IFB								0.020** (0.004)				
Family female directors on the board*BST									0.034 (0.027)			
Family female directors on the board*RFB												0.015*** (0.003)
AVCHILD (<i>Instrument</i>)	0.061*** (0.004)											
AVPART (<i>Instrument</i>)	0.067*** (0.005)											
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sargan test	-	0.317	0.320	0.324	0.319	0.322	0.323	0.325	0.318	0.319	0.322	0.327
Kleibergen-Paap F-stat	-	24.55***	24.60***	24.72***	24.58***	24.66***	24.69***	24.76***	24.57***	24.57***	24.65***	24.82***
Kleibergen-Paap LM stat	-	38.47***	38.51***	38.59***	38.49***	38.57***	38.60***	38.64***	38.49***	38.48***	38.55***	38.81***
Adjusted R ²	0.148	0.127	0.135	0.160	0.134	0.137	0.137	0.176	0.137	0.140	0.143	0.176
F-test	3.97**	3.66***	3.85***	4.15***	3.72***	3.80***	3.88***	4.04***	3.79***	3.86***	3.94***	4.27***
N	287	287	287	287	287	287	287	287	287	287	287	287

Notes: *FCI*: family control and influence; *EAFM*: emotional attachment of family members; *IFM*: identification of family members; *BST*: binding social ties; *RFB*: renewal of family bonds; *AVCHILD*:

the average number of children of family female directors; *AVPART*: the average number of family female directors whose partners are owners of the company; *Family female on board* is the dependent variable in the first-stage regression; R&D intensity is the dependent variable in the second-stage regressions; standard errors reported in brackets; the suppressed firm industry category is services; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

TABLE 5 Regression results with a sector-adjusted measure of R&D intensity

Variable	Model 25	Model 26	Model 27	Model 28	Model 29	Model 30	Model 31	Model 32	Model 33	Model 34	Model 35	Model 36
Constant	0.142*** (0.011)	0.157*** (0.012)	0.152*** (0.012)	0.137*** (0.010)	0.146*** (0.011)	0.134*** (0.010)	0.150*** (0.012)	0.131*** (0.009)	0.134*** (0.010)	0.140*** (0.011)	0.143*** (0.011)	0.139*** (0.010)
Firm size	0.047 (0.036)	0.042 (0.031)	0.052 (0.040)	0.044 (0.033)	0.038 (0.028)	0.034 (0.025)	0.046 (0.035)	0.040 (0.030)	0.036 (0.026)	0.032 (0.023)	0.041 (0.031)	0.049 (0.038)
Firm age	0.029 (0.023)	0.024 (0.019)	0.027 (0.021)	0.031 (0.025)	0.033 (0.027)	0.030 (0.024)	0.038 (0.031)	0.037 (0.030)	0.026 (0.020)	0.023 (0.018)	0.034 (0.028)	0.039 (0.033)
Generation in control	0.024** (0.008)	0.020** (0.007)	0.022** (0.007)	0.025** (0.008)	0.029** (0.009)	0.021** (0.007)	0.019** (0.006)	0.026** (0.008)	0.028** (0.009)	0.030** (0.010)	0.023** (0.007)	0.018** (0.006)
Female CEO	0.030 (0.025)	0.031 (0.026)	0.024 (0.019)	0.025 (0.020)	0.022 (0.017)	0.029 (0.024)	0.032 (0.027)	0.036 (0.030)	0.028 (0.023)	0.021 (0.016)	0.025 (0.020)	0.020 (0.016)
Nonfamily female directors on the board	0.035 (0.026)	0.038 (0.029)	0.031 (0.022)	0.028 (0.020)	0.026 (0.018)	0.034 (0.025)	0.039 (0.030)	0.035 (0.026)	0.030 (0.021)	0.027 (0.018)	0.024 (0.016)	0.037 (0.028)
Frequency of board meetings	0.098 (0.095)	0.084 (0.080)	0.087 (0.084)	0.092 (0.089)	0.094 (0.090)	0.076 (0.074)	0.072 (0.069)	0.090 (0.088)	0.095 (0.093)	0.077 (0.074)	0.087 (0.084)	0.091 (0.089)
Board age diversity	0.059 (0.048)	0.052 (0.043)	0.055 (0.046)	0.061 (0.052)	0.063 (0.054)	0.048 (0.040)	0.051 (0.042)	0.066 (0.055)	0.047 (0.039)	0.056 (0.047)	0.059 (0.050)	0.063 (0.053)
Board tenure diversity	0.035 (0.025)	0.037 (0.028)	0.032 (0.022)	0.044 (0.035)	0.049 (0.039)	0.045 (0.036)	0.033 (0.024)	0.036 (0.026)	0.030 (0.021)	0.038 (0.029)	0.041 (0.032)	0.049 (0.040)
Past performance	0.024 (0.020)	0.028 (0.024)	0.019 (0.016)	0.021 (0.018)	0.025 (0.021)	0.027 (0.023)	0.017 (0.014)	0.020 (0.017)	0.019 (0.016)	0.024 (0.020)	0.029 (0.025)	0.023 (0.019)
Financial slack	0.094*** (0.004)	0.088*** (0.004)	0.092*** (0.004)	0.085*** (0.004)	0.079*** (0.003)	0.092*** (0.004)	0.083*** (0.004)	0.075*** (0.003)	0.089*** (0.004)	0.080*** (0.004)	0.074*** (0.003)	0.077*** (0.003)
Leverage	0.019 (0.014)	0.016 (0.011)	0.017 (0.012)	0.023 (0.017)	0.020 (0.014)	0.018 (0.013)	0.021 (0.015)	0.026 (0.020)	0.024 (0.018)	0.019 (0.014)	0.027 (0.021)	0.029 (0.023)
Family female directors on the board		0.024*** (0.004)	0.023*** (0.004)	0.025*** (0.005)	0.020*** (0.004)	0.022*** (0.004)	0.025*** (0.005)	0.027*** (0.005)	0.022*** (0.004)	0.019*** (0.003)	0.026*** (0.005)	0.028*** (0.005)
FCI			-0.034 (0.027)	-0.036 (0.029)								
EAFM					0.032 (0.028)	0.035 (0.031)						
IFB							0.018 (0.012)	0.016 (0.010)				
BST									0.024 (0.019)	0.021 (0.016)		
RFB											0.024 (0.018)	0.019 (0.014)
Family female directors on the board*FCI				-0.011*** (0.002)								
Family female directors on the board*EAFM						0.017 (0.014)						
Family female directors on the board*IFB								0.014** (0.004)				
Family female directors on the board*BST										0.020 (0.018)		
Family female directors on the board*RFB												0.012*** (0.002)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.098	0.127	0.130	0.155	0.128	0.130	0.126	0.152	0.131	0.132	0.131	0.158

<i>F</i> -test	3.01***	3.52***	3.57***	4.11***	3.56***	3.62***	3.54***	4.03***	3.58***	3.60***	3.58***	4.17***
<i>N</i>	287	287	287	287	287	287	287	287	287	287	287	287

Notes: *FCI*: family control and influence; *EAFM*: emotional attachment of family members; *IFM*: identification of family members; *BST*: binding social ties; *RFB*: renewal of family bonds; standard errors reported in brackets; the suppressed firm industry category is services; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

TABLE 6 Regression results with an alternative measure for R&D intensity (R&D intensity = R&D expenditures/total sales)

Variable	Model 37	Model 38	Model 39	Model 40	Model 41	Model 42	Model 43	Model 44	Model 45	Model 46	Model 47	Model 48
Constant	0.178*** (0.013)	0.171*** (0.012)	0.167*** (0.011)	0.164*** (0.011)	0.175*** (0.013)	0.172*** (0.012)	0.177*** (0.013)	0.163*** (0.010)	0.152*** (0.009)	0.158*** (0.010)	0.165*** (0.011)	0.168*** (0.011)
Firm size	0.072 (0.066)	0.070 (0.064)	0.077 (0.071)	0.082 (0.076)	0.077 (0.071)	0.083 (0.077)	0.080 (0.074)	0.075 (0.070)	0.088 (0.082)	0.076 (0.071)	0.072 (0.067)	0.085 (0.079)
Firm age	0.060 (0.051)	0.054 (0.045)	0.065 (0.056)	0.063 (0.054)	0.056 (0.048)	0.059 (0.050)	0.064 (0.055)	0.072 (0.063)	0.074 (0.064)	0.069 (0.060)	0.062 (0.053)	0.050 (0.042)
Generation in control	0.035** (0.010)	0.040** (0.011)	0.039** (0.010)	0.044** (0.013)	0.048** (0.014)	0.045** (0.013)	0.049** (0.014)	0.050** (0.015)	0.034** (0.010)	0.041** (0.011)	0.053** (0.016)	0.047** (0.014)
Female CEO	0.058 (0.055)	0.053 (0.050)	0.060 (0.057)	0.052 (0.049)	0.062 (0.059)	0.057 (0.054)	0.067 (0.064)	0.048 (0.045)	0.056 (0.053)	0.059 (0.056)	0.063 (0.060)	0.065 (0.062)
Nonfamily female directors on the board	0.055 (0.045)	0.050 (0.041)	0.047 (0.038)	0.053 (0.043)	0.056 (0.046)	0.063 (0.053)	0.044 (0.035)	0.059 (0.049)	0.055 (0.046)	0.064 (0.054)	0.042 (0.034)	0.046 (0.038)
Frequency of board meetings	0.055 (0.049)	0.058 (0.053)	0.050 (0.045)	0.062 (0.057)	0.065 (0.059)	0.052 (0.047)	0.060 (0.056)	0.073 (0.067)	0.053 (0.046)	0.070 (0.066)	0.066 (0.061)	0.065 (0.059)
Board age diversity	0.048* (0.021)	0.038 (0.020)	0.045* (0.020)	0.035 (0.018)	0.039 (0.020)	0.049* (0.022)	0.028 (0.017)	0.045* (0.022)	0.029 (0.017)	0.025 (0.015)	0.034 (0.018)	0.022 (0.014)
Board tenure diversity	0.028 (0.026)	0.035 (0.032)	0.024 (0.022)	0.019 (0.017)	0.025 (0.023)	0.030 (0.028)	0.037 (0.034)	0.038 (0.035)	0.029 (0.027)	0.017 (0.015)	0.034 (0.031)	0.020 (0.018)
Past performance	0.051 (0.034)	0.063 (0.045)	0.059 (0.041)	0.043 (0.026)	0.052 (0.035)	0.056 (0.038)	0.070 (0.052)	0.054 (0.037)	0.041 (0.024)	0.049 (0.034)	0.050 (0.032)	0.058 (0.040)
Financial slack	0.068** (0.022)	0.065** (0.021)	0.062** (0.020)	0.058** (0.019)	0.071** (0.023)	0.055** (0.018)	0.066** (0.021)	0.074** (0.024)	0.075*** (0.024)	0.066*** (0.022)	0.070*** (0.023)	0.063** (0.021)
Leverage	0.033 (0.032)	0.034 (0.033)	0.045 (0.043)	0.047 (0.045)	0.039 (0.038)	0.050 (0.048)	0.041 (0.040)	0.049 (0.047)	0.053 (0.051)	0.036 (0.035)	0.055 (0.053)	0.046 (0.044)
Family female directors on the board		0.035*** (0.007)	0.033*** (0.006)	0.037*** (0.008)	0.034*** (0.007)	0.036*** (0.008)	0.039*** (0.009)	0.035*** (0.007)	0.038*** (0.009)	0.033*** (0.006)	0.032*** (0.006)	0.035*** (0.007)
FCI			-0.038 (0.027)	-0.036 (0.025)								
EAFM					0.035 (0.027)	0.031 (0.023)						
IFB							0.024 (0.015)	0.022 (0.013)				
BST									0.038 (0.036)	0.037 (0.034)		
RFB											0.024 (0.017)	0.020 (0.016)
Family female directors on the board*FCI				-0.016*** (0.004)								
Family female directors on the board*EAFM						0.019 (0.015)						
Family female directors on the board*IFB								0.015** (0.004)				
Family female directors on the board*BST										0.034 (0.030)		

Family female directors on the board*RFB												0.015*** (0.003)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.096	0.125	0.127	0.153	0.126	0.128	0.124	0.150	0.124	0.130	0.129	0.156
F-test	2.99***	3.49***	3.53***	4.08***	3.51***	3.55***	3.47***	4.02***	3.48***	3.58***	3.56***	4.13***
N	287	287	287	287	287	287	287	287	287	287	287	287

Notes: *FCL*: family control and influence; *EAFM*: emotional attachment of family members; *IFM*: identification of family members; *BST*: binding social ties; *RFB*: renewal of family bonds; standard errors reported in brackets; the suppressed firm industry category is services; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

TABLE 7 Post hoc analysis on tokenism (R&D intensity = R&D expenditures/total assets)

Variable	Model 49	Model 50
Constant	0.189*** (0.015)	0.175*** (0.013)
Firm size	0.088 (0.075)	0.084 (0.071)
Firm age	0.064 (0.060)	0.073 (0.067)
Generation in control	0.035** (0.010)	0.039** (0.011)
Female CEO	0.028 (0.019)	0.024 (0.017)
Frequency of board meetings	0.124 (0.094)	0.117 (0.087)
Board age diversity	0.075* (0.036)	0.078* (0.038)
Board tenure diversity	0.051 (0.045)	0.054 (0.049)
Past performance	0.052 (0.049)	0.057 (0.053)
Financial slack	0.108*** (0.006)	0.102*** (0.006)
Leverage	0.047 (0.035)	0.042 (0.030)
One female on board	0.053 (0.043)	
More than one female on board	0.051*** (0.003)	
One family female on board		0.042 (0.029)
More than one family female on board		0.053*** (0.002)
One nonfamily female on board		.0028 (0.026)
More than one nonfamily female on board		0.033 (0.025)
Industry	Yes	Yes
Adjusted R ²	0.132	0.139
F-test	3.17***	3.26***
N	287	287

Notes: Standard errors reported in brackets; the suppressed firm industry category is services; the suppressed board category is the group of boards without women; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

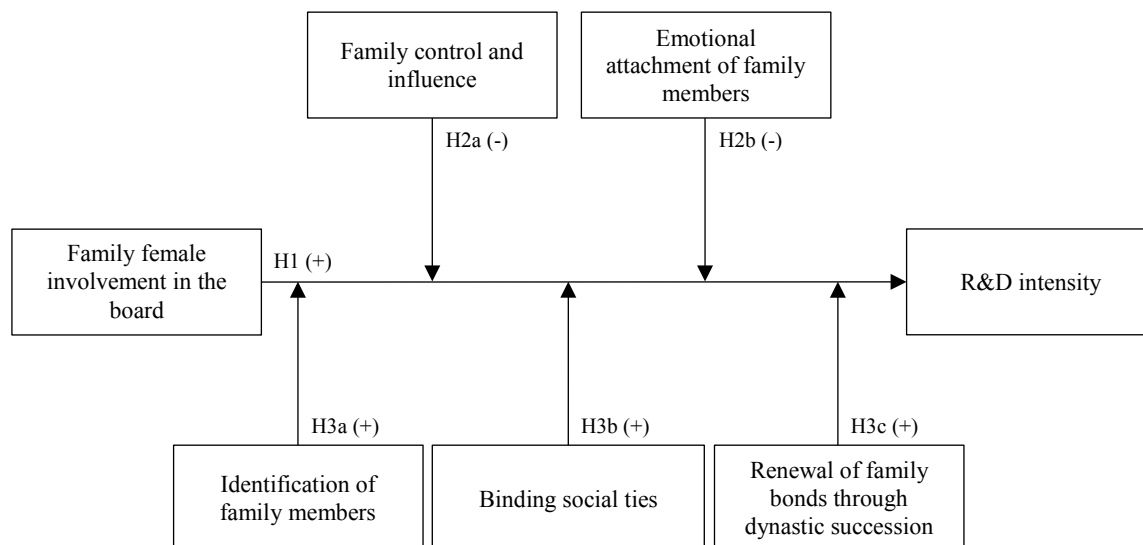


FIGURE 1 The moderation model

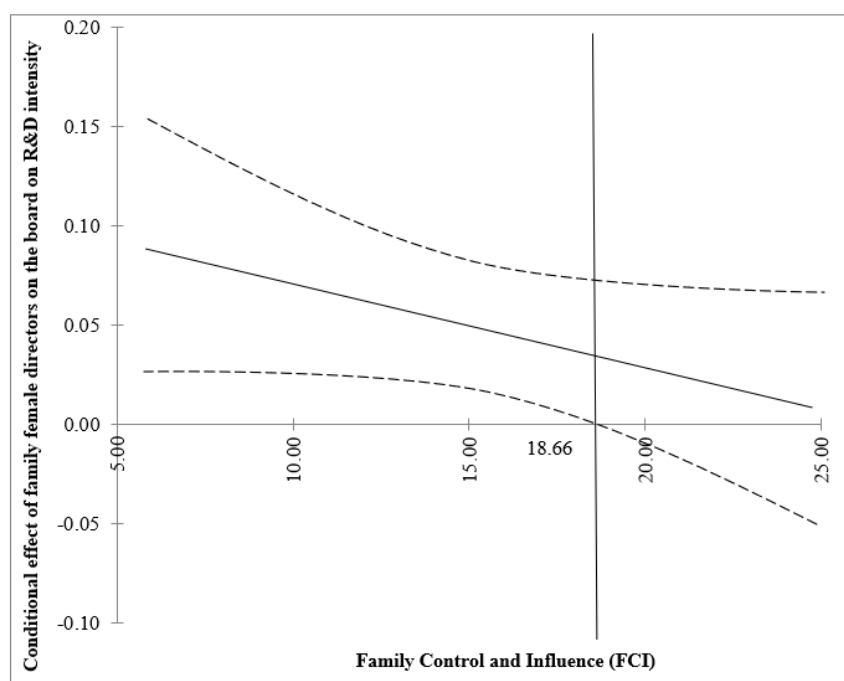


FIGURE 2 Conditional effect of *family female directors on the board* on *R&D intensity* at different values of family control and influence (FCI).

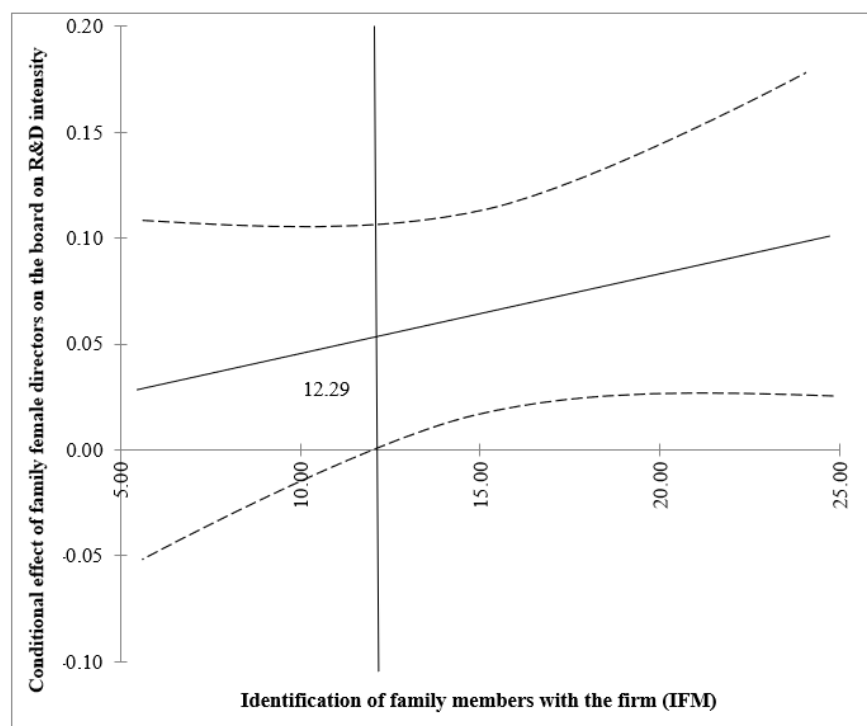


FIGURE 3 Conditional effect of *family female directors on the board* on *R&D intensity* at different values of identification of family members with the firm (*IFM*).

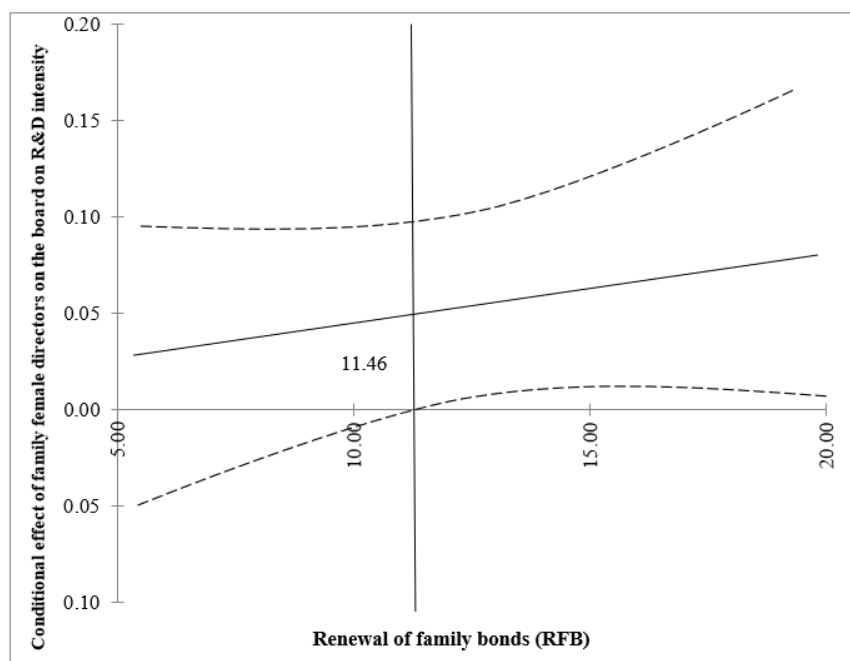


FIGURE 4 Conditional effect of *family female directors on the board* on *R&D intensity* at different values of renewal of family bonds through dynastic succession (*RFB*).