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RESEARCH ARTICLE

Does market power drive business model innovation? Evidence from Italian family manufacturing firms

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Abstract The increasingly dynamic and uncertain environment in which firms operate has strengthened the need to understand how firms react to changing conditions and unpredicted events. Using the information on business model innovation collected through a unique survey on Italian manufacturing companies, we study if and how variations in the firm's competitive position in the product market, proxied by the corporate markup, prompt proactive or reactive changes in the firms' business model. Drawing upon the performance feedback approach, we find that markup variations foster business model innovation, and that the degree of family involvement shapes this influence. In particular, family firms turn out to be significantly more proactive (they react proactively to both negative and positive performance feedback) than family firms with lower family involvement and non-family firms. Interestingly, positive performance feedback encourages family firms to invest and strengthen those areas of the business model that are often considered weak in this type of company.

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Plain English Summary In recent years, firms have been faced with unprecedented challenges, prompted, for instance, by increasing competition end globalization, but also by particularly adverse and unpredicted events, including the well-known COVID-19 pandemic. This strengthened the importance of understanding how companies react to unexpected changes. To tackle this issue, in this study, we assess whether firms reduce or increase the extent of innovation in their business models as a response to both positive and negative variations in their market power (proxied by their price–cost margin, or markup). Using a sample of Italian manufacturing companies and unique survey data, we show that markup variations foster business model innovation, but that this link significantly changes with the degree of family involvement. In particular, family firms stand out for their proactive response to both increases and decreases in their market power, and seem to view the improvement in their competitive position in the product market as an incentive to strengthen those areas of the business model that are often considered weak in this type of company. Hence, our study portraits a favourable account of (virtuous) family businesses which should prompt policymakers to provide adequate support to these companies.

Keywords Business model innovation · Markup · Performance feedback · Family firms

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1 Introduction

The last few decades have been marked by rising globalization and competition, together with particularly adverse events, such as the financial crisis in 2009, the economic recession and, more recently, the COVID-19 pandemic. Such an uncertain scenario has reinforced the need to understand how and to what extent companies react to unexpected events and changes in their performance (e.g., Iwasaki et al., 2022; Islam & Fatema, 2023; Ng et al., 2022).

An extensive line of research, pioneered by the early contributions of Henrich R. Greve (2003), has postulated and empirically shown that companies often implement various organizational and strategic adjustments in response to a performance that falls below (or above) the management's aspiration level, namely, to negative or positive performance feedback. This literature includes a number of studies co-authored by Greve (e.g., Ben-Oz & Greve, 2015; Gaba & Greve, 2019; Greve, 2011; Rowley et al., 2017; Vissa et al., 2010), as well as several other studies addressing various forms of strategic and organizational change, such as innovation/R&D investment (e.g., Lu & Fang, 2013; Rhee et al., 2019; Wang et al., 2021; Chen & Li, 2021; He et al., 2021; Saemundsson et al., 2022) and internationalization (e.g., Jiang & Holburn, 2018; Kaleka & Morgan, 2019; Li et al., 2018; Lin, 2014; McCormick & Fernhaber, 2018; Wennberg & Holmquist, 2008; Zhong et al., 2022).

Despite its theoretical relevance and potential empirical application, this broad literature presents some limitations. First, it focuses on very specific types of strategic behaviour, mainly R&D investments and internationalization, which reflect the companies' reaction to adverse situations in important but very definite and narrow areas. Little is known, instead, on how firms adjust their whole distinctive set of resources and strategies after a major event, i.e., how they innovate their business model (BM). Business models and business model innovation (BMI) have been receiving growing attention and acknowledgement in the fields of economics, management, strategy and entrepreneurship as they are widely recognized as relevant determinants of competitive advantage and firm performance (e.g., Anwar, 2018; Chen et al., 2021; Chesbrough, 2010; Latifi et al., 2021; Saqib & Satar, 2021; Teece, 2010; Waldner et al., 2015; Wannakrairoj & Velu, 2021; Zott & Amit, 2007; Zott et al., 2011),[1] as well as a source of post-crisis firm survival (Cucculelli & Peruzzi, 2020; El-Haddad & Zaki, 2023).

Second, this body of literature has mostly employed accounting indicators of firm performance, such as the Return on Assets (ROA) or sales growth, to model the trigger of change, thus largely neglecting the role played by other more rigorous measures of the firm's actual competitive position in the market. In this regard, corporate market power, i.e., the ability of the company to set the price above the marginal cost, has long been recognized as one of the most consistent and revealing measures of the company's status in competitive markets. However, despite even being mentioned in the introduction of Greve's (2003) seminal study[2] on performance feedback, the use of market power has been almost inexistent so far, primarily because of the difficulties regarding its computation. Third, even though the literature has acknowledged the crucial role of corporate governance in shaping the link between performance feedback and strategic change (e.g., Blagoeva et al., 2020; Chen et al., 2022; Lv et al., 2019), evidence on the impact of the firm ownership and management on the above-mentioned relationship is still very scant. The lack of information on this relevant aspect can represent a major limitation, especially in those economic settings where executives play a very critical role—as family firms—in shaping the company's strategic profile and driving its adaptation process after a major event.

Our paper aims to address these gaps by examining the impact of markup-driven performance feedback

[1] Even though there is no broad consensus on the definition, nature, structure, and other relevant aspects of this construct (Zott et al., 2011), academics seem to converge on viewing a business model as an interrelated sum of "building blocks" (Lanzolla & Markides, 2021; Osterwalder & Pigneur, 2010; Osterwalder et al., 2005; Teece, 2010) and, in turn, consider business model innovation (BMI) as the change in the combination of these building blocks (Foss & Saebi, 2017). Notably, Corrado et al. (2022) argue that investments in business models should be regarded as investments in intangible capital, which play a significant role for the enterprise's strategy and success.

[2] Greve (2003) reports some examples of well-known companies (e.g., General Motors and Intel) that innovated their market strategy in response to a fall in their market share, which is a widely used (albeit not very accurate) proxy of product market power.

on business model innovation (BMI) when different types of governance and heterogeneous levels of family involvement are at play. To this end, we proceed in the following sequential steps. First, to model the "trigger" of the decision to reshape and adapt the business model of the firm, we use the changes in corporate markup, which we estimate through the methodology developed by De Loecker and Warzynski (2012). The estimated markup captures the ratio between the price applied by a firm and its marginal cost and can be seen as a timely indicator of the firm's competitive position in the product market. Second, to measure the innovation in the business model of the company, we use first-hand information on different forms of business model change obtained through a unique survey administered to a large sample of Italian manufacturing firms. This survey, which allows us to assess changes that occurred in key building blocks of the business model (Osterwalder & Pigneur, 2010; Osterwalder et al., 2005), is illustrated in detail in Sect. 3.1 and Appendix 1. Third, we relate the changes in the markups observed during the period 2014–2017 to the changes in the business models that took place between 2017 and 2020. In line with the performance feedback mainstream approach, we consider both the cases of a decline and an increase in corporate markups, as they may differently affect the response of companies. Specifically, companies are expected to significantly react to a contraction in the markup by renewing and reshaping their organizational and business profile, as they try to reduce the risk of exiting the market; conversely, a minor or null reaction is likely to be observed after a positive markup performance. Finally, as different degrees of family involvement are potentially associated with different responses to the same triggering event (Bennedsen et al., 2010; Block et al., 2013; Laffranchini et al., 2022; Migliori et al., 2020), we explore whether the heterogeneity in the family involvement (Barbera et al., 2022) does affect the intensity and the direction of business model changes prompted by external events.

The presence of family members in the ownership and/or management of a company is widespread across countries and has significant implications for corporate goals, behaviour and performance (see, for instance, the reviews conducted by Azila-Gbettor et al., 2018; Heino et al., 2019; Hansen & Block, 2020; Fries et al., 2021; Gupta & Chauhan, 2023). Following a well-established body of literature (e.g., Allen & Panian, 1982; Daily & Dollinger, 1993; Gómez-Mejía et al., 2003; Le Breton-Miller et al., 2015), we divide family-related businesses into two categories: "family firms", i.e., those companies in which a family holds the majority of the ownership shares and two or more family members are also members of the Board of Directors (BoD); and "low-involvement family firms", namely, those companies in which the ownership criterium is fulfilled, but with less than two family members involved in the management of the company, i.e., without a significant family involvement in the company governance. As the former family business typically exhibits a relatively high degree of stewardship (Block & Ulrich, 2023), we expect these family firms to be the most responsive ones in the face of triggering events. Specifically, we assume that family firms are not only more reactive to negative feedback and, in particular, more likely to change their BM in response to adverse conditions, but also more proactive than other (low-involvement) family firms even in case of positive feedback, i.e., when performance is above the expected levels. Under these circumstances, an increase in market power may potentially attenuate the risk-averse nature of the family governance and induce them to engage in BMI, which usually implies significant efforts, costs, and risks.

We test our hypotheses on a sample of Italian manufacturing firms surveyed between September 2019 and March 2020. The dataset includes survey data on several business features that have been retrieved from questionnaire-based interviews on key informants and summarizes major aspects of the firm's business model and its changes. Survey data have been matched with financial data from Bureau van Dijk. In the empirical model, we use the changes in individual markups observed between 2017 and 2014 as the main identification variable for business model innovation. We also include the level of the firm's markup in 2014 to control for trend-reverting factors that can affect firm competitiveness, as well as the 3-digit sectoral markup to account for the influence of conformity and/or emulative behaviour of firms within their industrial setting.

Our evidence provides a comprehensive framework for the analysis of firms' responses to performance feedback and sheds light on the complex scenario in which family firms, i.e., the most frequent type of governance in the global economy, actually operate. To preview our results, we find that, as expected, companies react to contractions in the markup by performing more BMI and respond to markup increases by making less BMI. These findings are rather consistent with the extant literature on performance feedback, even when traditional triggers (i.e., financial indicators) and narrowly defined strategic responses (R&D and/or internationalization) are considered.

However, when we delve into the role of family involvement, we obtain a significantly different and more nuanced picture. Specifically, we observe that the conservative behaviour that prevails after positive feedback is mostly driven by family businesses with low involvement in the management, whereas high-involvement family firms are considerably more proactive than non-family firms. Moreover, and more interestingly, these family firms are more proactive even after a performance improvement, as these firms invest significantly in reshaping their product and organizational areas. In other words, high involvement in the management, i.e., high stewardship, boosts the probability of observing changes in the business model even after an increase in market power, a result that shows how stewardship-driven family firms are willing to fill the gaps in their business profile by taking advantage of the resources and assets generated by past good performance. Overall, and in contrast to the literature that indicates family management as the main responsible for poor performance, our findings show that strong involvement can represent a major asset for family firms that are willing to transform their BM and make these firms leading players not only when faced with adverse circumstances, but also—and more interestingly—when corporate perspectives are good.

This work contributes to the extant literature in several ways. First, it provides accurate empirical evidence on a relevant but still elusive and hardly measurable concept—business model innovation—that includes all the potential responses of the company to past competitive position. In this respect, this wide-ranging type of reaction is not limited to specific strategic areas or functional activities, such as international expansion, the R&D policy or decisions concerning layoffs and capital investment but concerns the whole set of business actions prompted by past performance. Second, to the best of our knowledge, this is the first study that uses markups to model the trigger of performance feedback. Not only is this indicator based on a sound methodology but is also marginally affected by the computational bias that is typical of the most frequently used measures of accounting and financial performance; hence, the selected approach is supposed to be suitable for exploring the influence of changes in the competitive position of the firm on business models. Third, this study ties well to that composite strand of heterogeneous literature that jointly analyses market power and business models (see, for instance, Sudrajad & Hübner, 2019), but that mainly focuses on business model diversity, i.e., its static profile, rather than on business model innovation. In contrast to this literature, which does not permit drawing causal implications between triggers and outcomes, our approach allows us to identify more clearly the influence of changes in the firm's competitive position on the decision to reshape the business model. Finally, it provides a fine-grained analysis of the antecedents of BMI in family firms by exploring the role of the intensity of family involvement in the management as a driver for the innovation of the business profile.

The balance of this paper is organized as follows. Section 2 reviews the pertinent literature; Sect. 3 presents the empirical strategy; Sect. 4 illustrates the results of the regression analysis; Sect. 5 concludes.

2 Literature review and research hypotheses

2.1 Market power and business models

Despite the growing interest in both market power and business models, the literature that addresses these two topics simultaneously is still relatively limited, quite heterogeneous and centred on few very narrowly defined sectors.

Some conceptual and qualitative studies in the field of business economics and law view market power as a component of business models or argue that the presence of a certain degree of market power is related to some peculiar types of business models, such as the data-centred business model of digital platforms (e.g., Buiten, 2021; Jarsulic, 2019; Kiesling, 2014; Klimek & Funta, 2021; Russo & Stasi, 2016; Schweizer, 2005; Wunker, 2012).

Likewise, sectoral studies on airlines, banking and the digital industry have included both business models and market power in their analysis but using the former as a part of the economic scenario and without providing any evidence on the connections between previous performance and the strategic response of the firm. Melo Filho et al. (2014) assess how increases in wage premiums affect market power and performance in two well-defined types of business model in the airline industry, namely Full-Service Carriers (FSC) and Low-Fare Carriers (LFC). The authors show that the latter are associated with different average levels of market power and that the markups are more affected by the impact of changes in wage premiums in the FSCs compared to the LFCs. Marques and Alves (2021) examine the impact of the diversity of business models operating in the banking sector on bank resilience, also accounting for the link between market power (proxied by the Lerner Index) and business model diversity. Similarly, Sudrajad and Hübner (2019) investigate the effect of bank market power on bank business models (as well as the impact of bank business models on banking stability and performance) in six ASEAN countries by focusing on business model diversity, rather than on business model innovation, and analyzing a type of business model which is proxied by a well-defined and easily measurable variable, i.e., the non-interest and non-deposit short-term funding share income. In a similar vein, Huynh and Dang (2021) conducted a quantitative analysis that accounts for both business models and market power in the banking sector of an ASEAN country (Vietnam) to assess how market power (proxied by the bank-level Lerner index) and business models moderate the relationship between two other variables, i.e., loan portfolio diversification and bank returns.

Finally, two recent OECD reports that address the dynamics of market concentration and markups in the specific field of digital technologies and digitalization hint at a link between market power and business models. Bajgar et al. (2019) present a framework for measuring the digital transformation of manufacturing industries and map the impact of digital technologies across several dimensions, including industry concentration and corporate markups (which are estimated at the firm level drawing upon De Loecker & Warzynski's methodology)[3]; Bajgar et al. (2021) document rising industry concentration (measured at the industry level through an array of indicators, including the firm-level markups of top firms) across the majority of countries and sectors over the period 2002–2014, and show that this trend is strongly associated with intensive investment in intangibles. In this latter contribution, the authors posit that intangibles are an increasingly important part of leading firms' business models, thus suggesting that there is a positive relationship between business model innovation and change in markups.

To sum up, the extant literature hints at some association between business models and market power; however, the few studies that quantitatively scrutinize the aforementioned link consider very specific sectors; moreover, the two variables under scrutiny are mainly assessed in levels and the direction of causality is mixed, making it difficult to derive some robust and clear-cut conclusions. Accordingly, we aim to make a step forward in the appraisal of the nexus between market power and business model innovation by exploring their causative connection through the performance feedback approach.

2.2 Performance feedback and business model innovation

The main conceptual framework on which our study rests is that of Performance Feedback Theory, which in turn builds upon the behavioural theory of the firm (BTOF). After the publication of the seminal book by Cyert and March in 1963, the BTOF has become the central tenet for explaining search and change as a response to performance feedback in the organizational context (Sobrepere i Profitos et al., 2022). An outgrowth of Cyert and March's theory is the theory of performance feedback developed by Greve (1998, 2003). According to Greve, organizations learn from their experience by collecting performance measures and create aspiration levels (i.e., performance standards) based on their past performance ("historical aspiration") and/or that of other organizations ("social aspiration"). If firm performance differs from the aspiration level, the firm will probably modify some of its organizational activities and strategic choices.

Since the publication of Greve's seminal book ("Organizational Learning from Performance Feedback: a Behavioural Perspective on Innovation and Change"; Greve, 2003) and other subsequent

[3] Although this report does not directly address the business model-product market power nexus, the authors state that the digital transformation forces companies to re-think their business models, and that manufacturing business models are undergoing a transition "from bolts to bits".

studies authored or co-authored by Greve (e.g., Ben-Oz & Greve, 2015; Gaba & Greve, 2019; Greve, 2008, 2011; Rowley et al., 2017; Vissa et al., 2010), a noticeable bulk of empirical research has resorted to Performance Feedback Theory to explain firms' organizational and strategic change. Examples of the selected strategic variables are as follows: the identification of partnerships and alliances (e.g., Baum et al., 2005; Han, 2022; Martínez-Noya & García-Canal, 2021; Shipilov et al., 2011), internationalization (e.g., Wennberg & Holmquist, 2008; Lin, 2014; McCormick & Fernhaber, 2018; Jiang & Holburn, 2018; Li et al., 2018; Kaleka & Morgan, 2019; Xie et al., 2019; Fletcher et al., 2021; Ref et al., 2021; García-García et al., 2022; Zhong et al., 2022), corporate venture capital (Wan et al., 2022) and technological innovation and R&D investments (e.g., Chen, 2008; Lu & Fang, 2013; Rhee et al., 2019; Lv et al., 2019; Jirásek, 2020; Wang et al., 2021; Chen & Li, 2021; He et al., 2021; Chung & Shin, 2021; Jirásek, 2021; Qi & Wu, 2022; Chen et al., 2022; Saemundsson et al., 2022).

The relationship between performance feedback and corporate strategic response may take different functional forms. However, most scholars identify a negative monotonic relationship, i.e., an increase (decrease) in the number of organizational changes when firm performance is below (above) the aspiration level. Intuitively, if firm performance is lower than the aspiration level, namely if performance feedback is negative, firms are typically motivated to make strategic and organizational decisions that may imply significant risks and costs, but which may benefit the company's performance in the coming years. Conversely, if performance is above the aspiration level, namely, if performance feedback is positive, firms can be discouraged to undertake costly and risky actions, and then can be more inclined to organizational inertia.

As this is a well-established stream of empirical literature, we do not explore the issue further; rather, we intend to test whether our dataset and findings are consistent with previous empirical results, and whether Performance Feedback Theory still holds in our sample, where the trigger is measured by markup increases/decreases and the firm response is proxied by business model innovation. Accordingly, we put forward the two following basic hypotheses on how markup variations (i.e., the "trigger" event) relate to business model innovation ("the outcome"):

Hypothesis 1a [H1a]: There is a positive association between negative performance feedback (a markup decrease) and BMI;

Hypothesis 1b [H1b]: There is a negative association between positive performance feedback (a markup increase) and BMI.

2.3 Performance feedback and the role of family involvement

Several scholars have shown that the link between performance feedback and strategic/organizational change can be significantly shaped by external or internal factors. Examples of external factors—mostly analyzed within the line of research on innovation/R&D decisions—are the level of government environmental regulation and subsidy (Chen & Li, 2021), or "communitarianism", i.e., the degree to which group goals are considered more important than individual goals (Ploeg et al., 2022). As for the internal factors, scholars have stressed the impact of variables such as the firm risk profile (Madadian &Van den Broeke, 2022), organizational slack (Wang et al., 2021) and business strategy (Madadian & Van den Broeke, 2022), among the others.

Within this stream of research, a growing literature (e.g., Blagoeva et al., 2020; Chen et al., 2022; He et al., 2021; Sun & Qiu, 2022) has highlighted the role of internal decision-makers, such as the firm's owners, the CEO, the board of directors or the (top) management team, on firm behaviour. Specifically, recent systematic reviews and meta-analyses (see, for instance: Azila-Gbettor et al., 2018; Heino et al., 2019; Hansen & Block, 2020; Fries et al., 2021; Gupta & Chauhan, 2023) have emphasized the role of family involvement, or the implications of corporate governance in family firms, in shaping strategic decisions, but without providing definite evidence on the topic of markup-driven strategic responses on business model innovation. This makes the influence of family governance on business model changes in response to performance feedback an issue that deserves further investigation.

A valuable contribution to this topic is made by Chrisman and Patel (2012), who show that, when performance is below aspiration levels, family goals and economic goals tend to converge and, compared to non-family enterprises, the R&D investments of family firms increase and the variability of those investments declines. However, in Chrisman and Patel's study, performance feedback was not used as the key regressor but interacted with the variables capturing family involvement (i.e., the focal regressors). By contrast, De Massis et al. (2018) and Santulli et al. (2022) use family involvement as the key regressor and interact it with a variable capturing performance feedback. De Massis and co-authors examine family involvement and R&D expenses in what they view as a context of weak property rights protection, i.e., China, demonstrating that reported R&D expenditure rise with family involvement in nonstate-owned listed family firms due to severe Type II agency problems. In addition, they show that negative performance feedback does not affect the R&D behaviour of Chinese family firms and assert that this is likely to be related to the Chinese peculiar context, in which the pursuit of socioemotional wealth by family firms is relatively low due to uncertain property rights. Santulli et al. (2022) aim to contribute to the debate on the family involvement-performance relationship by considering the mediating role of the propensity towards merger and acquisition (M&A) and the moderating role of performance feedback; they find evidence that a higher percentage of family managers is positively related to the propensity towards M&A and, in turn, exerts a positive effect of firm performance, especially when performance feedback is negative.

More related to our approach are the contributions by Lv et al. (2019) and Qi and Wu (2022), who explore the role of performance feedback on R&D and innovation and then assess how this link is influenced by family involvement. Specifically, Lv and co-authors look at the impact of both consistent and inconsistent negative feedback on R&D intensity and also examine how inconsistent feedback is shaped by family control (defined as family involvement in ownership and management). The authors show that the negative impact of inconsistent negative feedback on R&D investment is stronger in family enterprises; however, they do not test whether family control affects the role of consistent performance feedback (which is found to have a positive impact on R&D investments). Likewise, Qi and Wu (2022) analyze the link between performance feedback and innovative activities within family firms, also across multiple stages of intergenerational succession, but they do not compare family firms with non-family firms.

Family businesses are generally dissimilar to non-family businesses in several respects. To explain that, scholars have largely resorted to the stewardship theory, according to which households, who have invested a significant portion of their wealth in the enterprise, care not only about firm survival and performance, but also about a set of non-economic aspects, such as identity, the ability to exercise family influence and the perpetuation of the family dynasty, which meet the family's affective needs, and which form what Gómez-Mejía et al. (2007) has termed Socioemotional Wealth.

According to the stewardship theory (Davis et al., 1997), family managers should be regarded as stewards whose motives are aligned with the interests of the firm and shareholders, are long-term oriented and have both economic and non-economic incentives (Siebels and Knyphausen-Aufseβ, 2012). Consistently, several studies have shown that family firms are significantly resilient when faced with adverse events, including natural disasters, the economic crisis and the COVID-19 pandemic (e.g., Salvato et al., 2020; Kraus et al., 2020; Soluk et al., 2021; Amato et al., 2023). This resilience has been attributed to several factors such as the importance of family social capital (e.g., Arrègle et al., 2007), the close collaboration of family members aimed to keep transgenerational control and preserve the socioemotional wealth endowment (e.g., Gómez-Mejía et al., 2011; Zellweger et al., 2012), the enduring interpersonal relationships among family members sharing coherent goals (Lim et al., 2010) and the strong connections among family, firm, local community and government systems (Danes et al., 2009).

The stewardship role of family owners and managers may favour the firm's propensity to take strategic changes and even adopt risky behaviours for several reasons: first, family members are particularly motivated to ensure the continuity of their business over time, and thus are more prone to adopting actions that prevent them from losing the control over their company. Second, stewardship encourages interactions with both the firm's internal and external stakeholders; as a result, family businesses can find ample support from their network of relationships when they face challenges concerning the loss of competitiveness or the exploitation of new opportunities (Miller & Le Breton-Miller, 2005; Miller et al., 2008; Salvato et al., 2010; Block & Ulrich, 2023); likewise, some scholars have shown that, during crisis periods, family businesses benefit from easier access to external capital due to their close relationship with banks (D'Aurizio et al., 2015; Block & Ulrich, 2023). Third, stewardship generally spurs organizational flexibility, as the concentration of ownership and control in the same individuals provides family businesses with more power and flexibility which, in turn, facilitates the implementation of strategic changes. Finally, stewards' pro-organizational attitude reduces the likelihood of observing opportunistic behaviours by some family members. In this regard, it should be noted that family owners and/or managers may be motivated by self-interest, and then pursue personal gain through their enterprise (Le Breton-Miller & Miller, 2009; Le Breton-Miller et al., 2011; Schulze et al., 2003); nonetheless, recent studies have shown that dealing with external shocks, such as the economic crisis and COVID-19 (Block & Ulrich, 2023) or, more in general, with turbulent environments (Chirico & Bau, 2014) can prevent family members from engaging in opportunistic behaviours, and prompt them, instead, to act as stewards of their business. This is consistent with previous work (e.g., Aragon-Correa & Sharma, 2003; Lumpkin & Dess, 2001; Zahra et al., 2008) reporting that stewardship fosters proactiveness, especially in turbulent environments.

It is worth recalling that there may exist relevant heterogeneity not only between family and non-family firms but also within the vast and composite realm of family companies. In this respect, some scholars argue that the differences between family firms are even greater than those between family and non-family firms (e.g., Bennedsen et al., 2010; Chrisman & Patel, 2012; Daspit et al., 2021), and can also concern the degree of stewardship. Following the mainstream literature on the definition of family firms, we expect stewardship to be significant when at least two family members are part of the board of directors, a condition which is satisfied by the mainstream definition of "family firm" proposed by the literature (see, for instance: Allen & Panian, 1982; Daily & Dollinger, 1993; Gómez-Mejía et al., 2003) and adopted in our work. Notably, to account for differences between family firms, in our empirical analysis we assess also whether family firms differ, in terms of their BMI response to markup changes, not only from non-family firms but also from companies that fit a milder definition of family firm and that we term "low-involvement family firms." These companies are likely to present lower levels of stewardship and are expected to be more prone to inertia when faced with negative markup changes or, even more, with positive markup changes. The considerations above prompt the following research hypotheses:

> **Hypothesis 2a [H2a]**: Family firms, i.e., firms with high involvement of family members, are more likely to innovate their business model than non-family and low-involvement family firms in response to negative markup changes;
>
> **Hypothesis 2b [H2b]**: Family firms are more likely to innovate their business model than non-family and low-involvement family firms in response to positive markup changes.

3 Analytical framework

3.1 Data and main variables

The majority of the extant literature on business model innovation has resorted to case studies or has focused on narrowly defined sectors, for which large records of data (based, for instance, on private documents, interviews, corporate reports, specialized press and other direct sources) are usually available. However, information on this important variable is not available for most of the firms operating in the small-business sector. With the partial exception of company accounts, publicly available data sources typically do not allow us to uncover either the profile of the business model, or its main changes, and interviews often represent the only feasible option. In light of these considerations, for the purpose of our analysis, we build a dataset by merging two complementary sources: a cross-sectional survey dataset, based on information collected directly from companies using questionnaire-based interviews, and a longitudinal dataset based on Moody's—Bureau van Dijk data on company accounts.

The first dataset collects firm-level information from a survey that we administered between October 2019 and February 2020 to a sample of Italian manufacturing firms. We conceived this survey with the main goal of shedding light on relevant business aspects that are often hardly assessable due to limited data availability, such as the firm's position in the value chain, business links with clients and suppliers, technological and environmental innovation, investment policy and other aspects, including business model innovation. A compact overview of the survey, including information on sample selection and data collection, can be found in Appendix 1.

Regarding business model innovation, which is the main dependent variable of our empirical model, the survey aims at understanding whether and to what extent a company has recently undertaken changes in four main areas that are viewed as central for exploring alternative business models by a large and well-established empirical literature (Al-Debei & Avison, 2010; Johnson et al., 2008; Ramdani et al., 2019). Specifically, we consider the following areas: the Product and Production Processes area, which includes changes in the elements associated with the firm's value proposition, i.e., the value produced and offered to customers; the Organization area, which summarizes changes associated with the firm's organizational structure, such as human capital and business processes used to create and deliver value to customers; the Network area, which refers to the number, the role and the nature of the relationship with external actors (e.g., customers or suppliers) involved in the business model of the firm, and which also affects the value capture process; the Finance area, which considers changes in elements related to the firm's value appropriability strategy, such as price-setting mechanisms and value-capture revenue models. A detailed illustration of the four areas and the items included in each section is presented and discussed in Appendix 1.

For each of these four areas, a set of six to eight questions was put forward with the purpose of extracting information on the presence or absence of significant changes that occurred in the 3-year time interval ending at the beginning of 2020. To give an example, in the Products and Production Processes area, we asked questions such as: "Has the firm introduced any new product?", or "Has the firm added ancillary or complementary services to the firm's main products?", or "Has the firm introduced a more efficient production process?". Similarly, in the Organization area, we investigated, among the other things, whether the company has introduced new business functions or whether it has strengthened its array of technical and commercial skills by hiring new workers and/or training current employees. Likewise, in the Network area, we explored whether the company has internalized upstream or downstream activities that were previously carried out by other players of the supply chain, or whether it has modified or added direct or indirect sales channels. Finally, in the Finance area, we asked questions concerning the pricing policy, the adoption of niche product market strategy, and other related variables. The complete list of 28 questions, clustered into the four selected BMI areas, is reported in Appendix 1.

To construct the variables capturing the various dimensions of BMI, we counted and added up all the changes indicated by the firm in each of the four areas. In particular, we computed the variable *BMI_Products* by counting all the answers that identify a change in the products and process profile of the company. Similarly, *BMI_Organization* measures the changes related to the firm's internal organization; *BMI_Network* lists the adjustments in the business network and commercial relationships of the firm, while *BMI_Finance* captures the number of variations observed in the business finance activities. Finally, by adding up the four above-mentioned variables (i.e., *BMI_Products*, *BMI_Finance BMI_Organization* and *BMI_Network*), we built the variable *BMI_Overall* as a proxy for the extent of the firm's overall business model innovation. More details on these variables are provided in Sect. 3.4.

The second data source that we employ in our empirical analysis is the database Moody's Aida—Bureau van Dijk, from which we retrieved financial and economic data for the company (for the years 2012–2020) on revenues, labour costs, the number of employees, capital stock, intermediate inputs, sectoral affiliation and date of incorporation. We resort to this information to estimate, for all the years between 2012 and 2020, firm-level markups, which we merge later with the survey-based dataset. Finally, we exploit the corporate governance section of Aida—Bureau van Dijk to gather information on firms' managers and owners, which we use to group the sample firms into three categories, i.e., family firms, low-involvement family firms and non-family firms. Because of the intense data cleaning required by the estimation of markups, the number of observations that form our final sample is considerably lower than the number of surveyed companies included in the original dataset.

3.2 Estimation of corporate markups

We estimate the parameter of corporate markup drawing upon De Loecker and Warzynski's (2012) methodology. This approach assumes that firms minimize costs and at least one input (materials) is adjusted freely, while the other factors (capital and labour) may show frictions in their adjustment. Unlike previous contributions, this framework requires neither assumptions on demand and how firms compete, nor the computation of the user cost of capital, and provides firm-level, time-varying estimates while controlling for unobserved productivity.

By combining the optimal input demand conditions obtained from cost minimization with the standard definition of markup (i.e., price over marginal cost), De Loecker and Warzynski (2012) show that the price–cost margin can be identified as the ratio of the output elasticity of materials and the material revenue share:

$$\mu_{it} = \frac{\theta_{it}^{M}}{\alpha_{it}^{M}}, \tag{1}$$

where μ_{it} is the markup of firm i at time t, θ_{it}^{M} is the output elasticity of materials and α_{it}^{M} is the revenue share of materials, also known as cost share or expenditure share of materials. If $\mu_{it} = 1$, the firm operates in a product market characterized by perfect competition; if $\mu_{it} > 1$, there is imperfect competition in the product market and the firm owns some degree of market power, namely, it charges a price that is higher than the marginal cost.

While the revenue share can be easily computed using data from firms' balance sheets, the output elasticity needs to be estimated. Therefore, we estimate a production function by employing the methodology developed by Wooldridge (2009) and implemented in Petrin and Levinsohn (2012). We adopt a translog specification, which yields firm-level time-varying output elasticities and perform estimations sector by sector at a very disaggregated sectoral level (at the Ateco six-digit level) to account for differences in technology. Additional details on this estimation procedure are provided in Appendix 2.

3.3 Main regressors and empirical model

Once the corporate markups are estimated, we need to build an empirical setting which permits us to appraise how markup-related relative performance influences the firm propensity to innovate its business model. To avoid the overlap between the performance measurement period and the observed changes in the business model, we compute individual markups at the beginning of the period of analysis, i.e., 2014–2017, a choice which should also attenuate simultaneity issues in the regression analysis and helps in providing a causal interpretation of the results. Then, we define a "relative markup", namely, the difference between the firm i's markup and the sectoral median markup (defined at the Ateco/Nace Rev.2 six digit-level), $\mu_{i\ net\ t}=\mu_{it}-\mu_{sect\ t}$, to control for systematic inter-sectoral differences in markup levels and trends attributable to sectoral specificities. Following the performance feedback approach, the net markup can be regarded as an indicator of the competitors' performance, on which the firm's social aspiration level is generally based. Likewise, according to this literature, firm behaviour is also determined by historical aspirations, which build on the company's own past performance. Consequently, we decompose the variable $\mu_{i\ net\ t}$ to account for both social and historical aspirations and rewrite the relative markup as:

$$\mu_{i\ net\ t} = \mu_{it} - \mu_{it-n} + \mu_{it-n} - \mu_{sect} = \mu_{it-n} - \mu_{sect\ t} + \Delta\mu_{t-n/t} \tag{2}$$

Equation (2) describes the net individual markup as the sum of three terms: the initial level of firm markup ($\mu_{it\text{-}n}$), the sectoral markup ($\mu_{sect\ t}$), and the change in the individual markup between the initial and the final period ($\Delta\mu_{\ t\text{-}n/t}$). Setting the initial and the final years of analysis at 2014 and 2017 in Eq. (2), we get:

$$\mu_{inet2017} = \mu_{i2014} - \mu_{sect2017} + \Delta\mu_{i2014-2017} \tag{3}$$

Equation (3) splits the individual relative markup into three terms: μ_{i2014}, namely the firm's markup in 2014, which represents the benchmark for the firm's expectations about its markup performance; $\mu_{sect2017,}$ which is the median sectoral markup in 2017 and proxies for the competitive structure of the sector; $\Delta\mu_{i2014-2017}$, which measures the change in the firm's markup that occurred between 2014 and 2017 and that provides the main regressor for the empirical model. As the deviation of the current level of markup from the initial level provides feedback to corporate decision-makers for the selection of future strategies, we focus our attention on $\Delta\mu_{i2014\text{–}2017}$.

Moreover, by applying a procedure that, since Greve (1998), has been extensively adopted within the literature on performance feedback, we introduce a spline function and divide the variable $\Delta\mu_{i2014\text{–}2017}$ in negative and positive changes as follows: $\Delta\mu_{i\ neg2014\text{–}2017}$, which is equal to $\Delta\mu_{i2014\text{–}2017}$ when the latter is negative and zero otherwise, and $\Delta\mu_{i\ pos2014\text{–}2017}$, which is equal to $\Delta\mu_{i2014\text{–}2017}$ when the latter is positive and zero otherwise.

Finally, to assess how markups and markup changes are related to business model innovation, we perform various sets of regressions based on the following model:

$$
\begin{aligned}
BMI_{i2017-2020} &= \beta_0 + \beta_1 \Delta\mu_{i\,neg\,2014-2017} \\
&+ \beta_2 \Delta\mu_{i\,pos\,2014-2017} + \beta_3 \mu_{sect2017} + \beta_4 \mu_{i2014} + \\
&+ \beta_5 X_i + \beta_{6i} GOV_k + \beta_{7i} GOV_k * \Delta\mu_{i\,pos/neg2014-2017} + f_j + e_i,
\end{aligned} \tag{4}
$$

where $BMI_{i,t\text{-}n}$ is a count variable capturing the extent of business model innovation undertaken between 2017 and 2020, $\Delta\mu_{i\ neg2014\text{–}2017}$, $\Delta\mu_{i\ pos2014\text{–}2017}$, $\mu_{sect2017}$ and μ_{i2014} are the previously discussed regressors based on the markup, X_i is a set of firm-level controls, which include the number of employees and firm age, GOV_k is the set of dummies capturing the k firm types based on the extent of family involvement in the governance (i.e., non-family firms, family firms and low-involvement family firms), f_j is a vector of sectoral fixed effects, and e_i is the unobserved error term. To investigate how the link between markup changes and BMI is shaped by the governance variable, we augment Eq. (4) by interacting the two variables capturing markup changes with the governance-related dummies, using non-family firms as the reference category.

As for the estimation method, we perform the regression analysis using both the OLS and the Poisson pseudo maximum likelihood estimators, which produce very similar results. In the next section, we present only the estimates based on the Poisson model, which also accounts for the count nature of the dependent variable.

3.4 Basic descriptive statistics

Table 1 summarizes the basic summary statistics of the selected variables. We can observe that the average firm size is relatively small, which is consistent with a distinctive trait of the Italian economy, namely, the prevalence of small and medium-sized enterprises (SMEs). As for the governance variables, about 80% of the sampled firms are classified as family firms (with either a low or a high involvement in the governance), thus confirming the prevalence of family businesses at the country level also in the sample. Regarding BMI, between 2017 and 2020, sample firms have introduced on average seven BMI changes out of a total of 28 potential changes (i.e., 25.0% of all the potential changes). The mean number of changes for each business area is around 2.0 for *BMI_Products* (34.4%), 2.1 for *BMI_Organization* (30.3%), and around 1.5 for both *BMI_Network* (18.7%) and *BMI_Finance* (29.8%). As for the markups, the average markup in 2017 was 1.21, which is slightly higher than the mean markup in 2014; also, about 36% (64%) of the companies experienced a decrease (rise) in the markup during the 3 years under scrutiny. This evidence is in line with other studies that use a much larger sample of Italian manufacturing companies (e.g., Ciapanna et al., 2022; Mondolo, 2022).

Figure 1 displays the distribution of the variable *BMI_overall* (mean values) by firm type and across the three tertiles of the variable $\Delta\mu_{i2014\text{–}2017}$. In line with our first two hypotheses (H1a and H1b), we observe that the number of BMIs is higher in the first tertile (when performance is relatively poor) and decreases as performance improves. It is interesting to note that family firms are the only ones in which BMI exhibits higher values in the extreme tertiles compared to the central one. Hence, it seems that family firms are more active in business model innovation when performance is either relatively bad or good.

Differences between firm types also occur across the four business areas in which changes were implemented, as illustrated in Fig. 2. For example, we can see that, in the first tertile, family firms display the highest BMI value in the organizational area, whereas non-family enterprises exhibit the highest value in the product area. Finally, in the bottom tertile, family firms are more proactive in all areas.

These descriptive statistics reveal that, as markup performance shifts, the intensity of BMI varies, and that firm governance influences this relationship. In the next section, we move from univariate to multivariate analysis to test these dynamics.

Table 1 Summary statistics of the variables of interest

Variables	Mean	Std. Dev	Min	Max
BMI_Products	2.066	1.279	0	6
BMI_Finance	1.494	1.034	0	5
BMI_Organization	2.132	1.685	0	7
BMI_Network	1.496	1.274	0	8
BMI_Overall	7.188	4.201	0	21
Markup 2014	1.202	0.144	0.615	2.503
Markup 2017	1.214	0.140	0.714	2.232
Median sectoral markup in 2017	1.196	0.083	0.617	1.541
Negative markup change (dummy)	0.357	0.479	0	1
Negative markup change (abs. value)	0.015	0.039	0	0.508
Positive markup change (abs. value)	0.027	0.042	0	0.400
Employees (2017)	33.661	58.706	1	710
Firm age (2017)	27.378	14.592	6	95
Family firm (dummy)	0.385	0.487	0	1
Low-involvement family firm (dummy)	0.408	0.492	0	1
Non family firm (dummy)	0.206	0.405	0	1

Sources: authors' elaboration from survey data and data from Moody's—AIDA Bureau Van Dijk

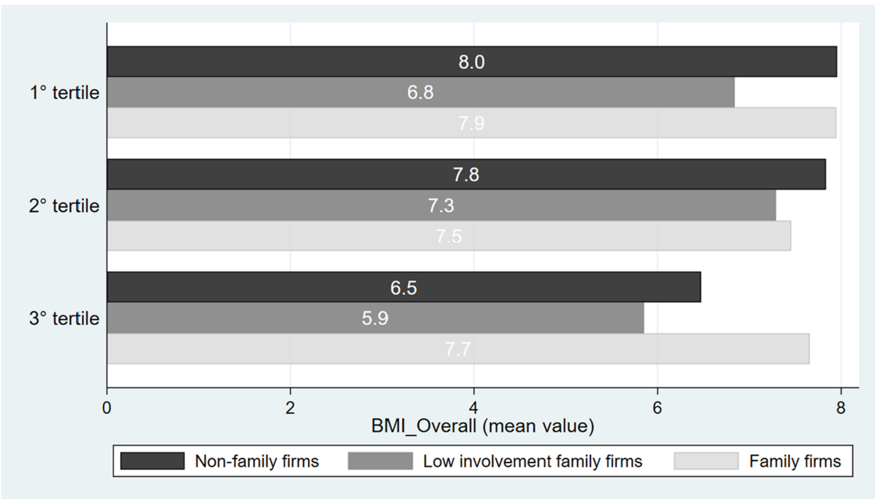

Fig. 1 Distribution of total BMI by markup performance and firm type. Sources: authors' elaboration from survey data

4 Regression analysis

4.1 Changes in the overall business model

We start to explore the link between markup performance and BMI by estimating Eq. (4) for the overall changes in the business model. The results of the Poisson estimates that use *BMI_overall* as the dependent variable are presented in Table 2. Looking at Model 1 (the baseline model), we can posit that, consistent with our hypotheses (H1a and H1b), a contraction in the markup is associated with more subsequent BMI, whereas an increase in the markup significantly discourages firms to invest further resources in BMI (Model 1).

Model 2 introduces the interactions between markup performance and types of firm governance to evaluate whether the reactions to markup changes vary with the extent of family involvement. In the case of negative markup performance, we do not observe any statistically significant difference between non-family firms and the two types of family firms. This suggests that family firms are not more reactive than the other two types of firms

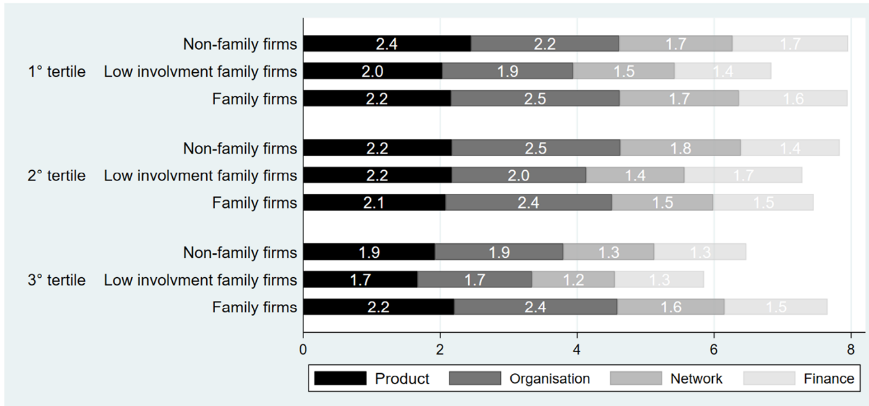

Fig. 2 Distribution of BMI in the four BM areas by markup performance and firm type. Sources: authors' elaboration from survey data

Table 2 Determinants of business model innovation, Poisson estimates—dept. variable: BMI

Variables	Model 1	Model 2
Negative markup change	1.355***	1.211*
	(0.514)	(0.651)
Negative markup change * low-inv. family firm		−0.480
		(0.956)
Negative markup change * family firm		1.182
		(1.208)
Positive markup change	−0.968*	−1.926**
	(0.517)	(0.977)
Positive markup change * low-inv. family firm		0.380
		(1.234)
Positive markup change * family firm		2.519*
		(1.313)
Low-inv. family firm	−0.049	−0.049
	(0.049)	(0.062)
Family firm	−0.021	−0.093
	(0.048)	(0.060)
Median sectoral markup (2017)	0.752*	0.880*
	(0.449)	(0.457)
Markup (2014)	−0.508**	−0.526**
	(0.218)	(0.218)
Firm age	−0.009	−0.010
	(0.036)	(0.037)
Firm size	0.154***	0.152***
	(0.019)	(0.019)
Constant	1.193**	1.117**
	(0.499)	(0.504)
Log pseudo-likelihood	−2552.2	−2547.3
Observations	896	896

Notes: industry fixed effects (Ateco 3 digit) are included in the estimates; robust standard errors in parentheses; ***$p<0.01$, **$p<0.05$, *$p<0.1$

under scrutiny to negative markup changes and, therefore, hypothesis 2a is not supported. Conversely, in the case of positive performance, family firms show a positive coefficient that outweighs the negative coefficient associated with non-family firms. The p-values reported in Table 3 for the

Table 3 Determinants of BMI by BM area. Poisson estimates—dept. variable: BMI

Variables	Model 3 Product	Model 4 Organization	Model 5 Network	Model 6 Finance
Negative markup change	2.004***	−0.104	−0.692	2.323***
	(0.503)	(1.460)	(1.434)	(0.649)
Negative markup change * low-inv. family firm	−0.976	1.709	0.701	−2.677**
	(0.891)	(1.643)	(1.801)	(1.320)
Negative markup change * family firm	−0.905	3.977**	3.804**	−1.448
	(1.152)	(1.877)	(1.849)	(1.351)
Positive markup change	−3.071*	−1.568	−2.686*	−0.657
	(1.586)	(1.357)	(1.559)	(1.530)
Positive markup change * low-inv. family firm	1.444	0.184	1.064	−0.965
	(1.812)	(1.661)	(1.763)	(1.734)
Positive markup change * family firm	3.857**	3.078*	1.745	1.006
	(1.896)	(1.643)	(2.098)	(1.893)
Low-inv. family firm	−0.088	−0.088	−0.105	0.088
	(0.069)	(0.087)	(0.092)	(0.080)
Family firm	−0.139**	−0.118	−0.147	0.036
	(0.068)	(0.084)	(0.093)	(0.079)
Median sectoral markup (2017)	1.420***	0.606	0.867	0.506
	(0.510)	(0.612)	(0.606)	(0.490)
Markup (2014)	−0.643***	−0.412	−0.599*	−0.391
	(0.245)	(0.304)	(0.309)	(0.243)
Firm age	0.003	−0.012	0.011	−0.037
	(0.039)	(0.048)	(0.055)	(0.047)
Firm size	0.113***	0.255***	0.167***	0.033
	(0.021)	(0.023)	(0.030)	(0.025)
Constant	−0.656	−0.017	−0.805	0.346
	(0.565)	(0.711)	(0.775)	(0.537)
Log pseudo-likelihood	−1407.6	−1532.6	−1305.4	−1258.2
Observations	896	896	896	896

Notes: industry fixed effects (Ateco 3 digit) are included in the estimates; robust standard errors in parentheses; $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$

interaction between positive markup changes and low-involvement family firms and family firms, respectively, confirm the hypothesis that the amount of BMI associated with each of these interaction terms is significantly different from the amount of BMI associated with the interaction between positive markup changes and non-family firms (i.e., the reference category). In addition, the Wald $\chi 2$-test (not shown) rejects the hypothesis of coefficient equality between *Positive markup change * low-involvement family firm* and *Positive markup change * family firm* ($\chi 2=6.85$, $p=0.0009$): this confirms that family firms are more proactive than the other two firm types when it comes to innovating their business model in case of positive performance feedback, a result that supports hypothesis 2b.

Figure 3 illustrates, for each firm type, the marginal effects for underperforming (Panel a) and outperforming firms (Panel b) on BMI at the extremes of the distribution, i.e., at the fifth (Low) and ninety-fifth (High) percentiles. Panel a shows that, as negative performance feedback widens, the marginal effect increases for all firm types; by contrast, as positive performance feedback amplifies (Panel b), the marginal effect increases only for family firms, whereas it decreases for the remaining two types of firms.

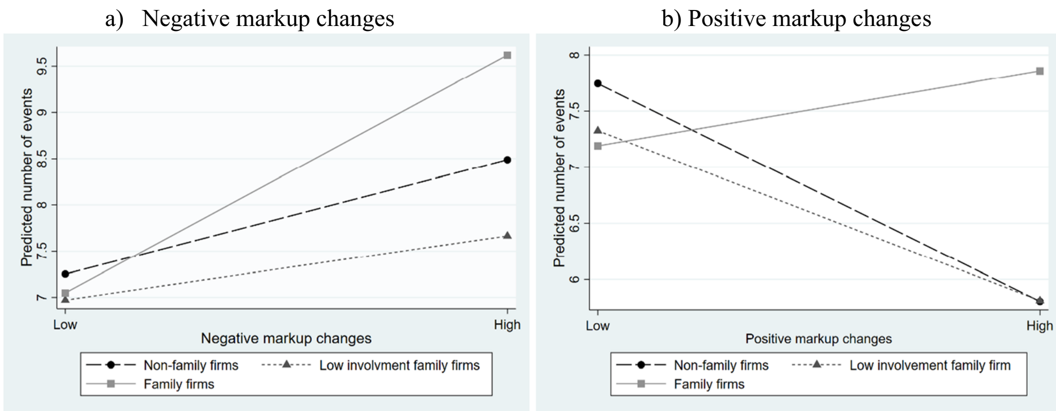

Fig. 3 Marginal effects of firm types on business model innovation at different levels of negative and positive markup changes. Sources: authors' elaboration from survey data and data from Moody's—AIDA Bureau Van Dijk

Regarding the control variables, the positive and significant coefficient of the sectoral markup (*Sectoral_Markup*) can be attributed to the relative importance of behavioural adaptations across phases of the industry life cycle: growing industries (those with a high level of markup) are expected to exhibit a higher intensity of innovation activities (also in terms of business model), whereas mature industries tend to have on average a lower business model innovation intensity. When it comes to the initial markup conditions, the negative and significant coefficient of the variable *Markup_level* confirms the expected result that firms with a higher level of initial markup show a lower intensity of business model change.

Finally, we observe that the dummy variables family firms and low-involvement family firms are not significant. This suggests that, in contrast with the mainstream literature emphasizing that family firms engage in less innovative activities than non-family firms, both family firms and low-involvement family firms are not significantly different from non-family firms (our baseline category) in the intensity of business model innovation. Accordingly, it seems that mild or strong family involvement (vs absence of family involvement) is not a determinant of business model innovation per se (i.e., regardless of past performance).

4.2 Changes in specific areas of the business model

The findings reported in Sect. 4.1 refer to the overall change in business models. As a further step, we assess whether the relationship between firm types and the intensity of BMI varies across the four business model areas. To this purpose, we perform Poisson estimates of Eq. (4) for each of the four areas of business model innovation. The results are shown in Table 3.

Even though, from Model 2 of Table 2, it emerges that the three types of firms do not respond differently to negative performance in terms of intensity in overall BMI, Table 3 shows substantial differences across the business areas in which BM changes took place. The three main results of this more disaggregated analysis, when performance feedback is negative, are as follows. First, non-family firms react more to negative events by intensifying changes in the product and finance areas (see Models 3 and 6), whereas their behaviour does not significantly differ from family businesses in the other two areas. This is probably due to the superior ability of non-family firms to manage product and process innovation (see Table 1), as well as their capacity to manage the company's pricing policies, its distributive channels and the selection of niche and mass markets. Second, family firms exhibit a significant reaction to negative performance feedback in the organizational and network areas. As for organizational BMI, previous research (e.g., Bloom & Van Reenen, 2007) shows that family enterprises, particularly those run by family members, are often poorly managed, and our findings suggest that the implementation of more efficient management practices and the improvement of the company's organizational profile can be viewed as efficient responses to negative markup performance. Likewise, the strengthening of network-related aspects may be seen as the exploitation of the superior ability of family businesses to leverage solid family bonds with external stakeholders (such as suppliers or local banks) and, more generally, to resort to family stewardship when performance is poor. Finally, the negative and significant coefficient of business model innovation in the financial area displayed by low-involvement family firms (Model 6); this suggests that, unlike non-family and family businesses, these companies are not willing, or able, to update their financial profile (e.g., pricing policies, distribution channels, market selection and other aspects) in response to negative markup performance.

When we move to the case of positive markup variations, we realize that the reaction to past performance is even more heterogeneous across the three types of governance under scrutiny. First, non-family firms—as well as low-involvement family firms—respond to positive feedback by reducing their extent of innovation in the product and network areas, thus embracing strategic inertia: in other words, it seems that good past performance induces these firms to slow down the pace of their innovation intensity and focus on routine activities, or perhaps increase profitability. Second, in contrast and interestingly, family firms are found to be significantly more proactive than non-family firms after positive performance, especially in the areas of product and organization. These results suggest that higher-than-expected market performance in family firms may mitigate family firms' traditional resistance to riskier long-term investments and relax the constraints due to survival concerns. Accordingly, it may prompt these companies to change their business models, and in particular to invest in the areas where they often underperform. By freeing up resources and new assets, better market performance mitigates family firms' traditional resistance to riskier long-term investments and relaxes constraints due to survival concerns: this makes family firms more likely to invest in BMI to improve their product and organizational profile and to pursue the desire to explore new opportunities in higher-value products, new industries, or new geographic markets.

All in all, we can posit that business model innovation is more complex and intense in family firms compared to non-family and low-involvement family firms. Family firms are considerably more proactive to both positive and negative markup performance. Also, family firms respond to performance changes by pursuing a range of business model innovations, including the improvement of weak functional areas in case of negative performance, the leveraging of their superior relational capabilities after positive feedback (through innovation in the networking area), or the strengthening of the organizational profile regardless of the sign of past performance.

4.3 Robustness checks

The regression results of Table 3 reveal that low-involvement family firms are less proactive than family firms. To further delve into this issue, we check whether this finding is mainly attributable to young companies (which often take the form of funder-run companies) or to mature companies. In particular, young firms may be less prone to BMI because their business model is relatively new and is supposed to already match the current market conditions. In addition, these firms are unlikely to have undergone previous crises, and thus they may find it particularly hard to deal with unexpected negative events. To conduct this robustness check, we perform additional sub-sample estimates of the determinants of BMIs in which we split the group of low-involvement family firms into young and non-young firms using a cut-off value of 10 years (calculated in 2017). We choose this value because it has been demonstrated that approximately two-thirds of companies exit the market after about 10 years (Coad et al., 2018), and those that survive longer are regarded as companies endowed with a sustainable business model. The results of these estimates (not shown here but available upon request) confirm that the proactiveness of family firms compared to low-involvement family firms does not depend on firm age.

Additionally, from Tables 2 and 3, it emerges that both family firms and low-involvement family firms are not significantly different from non-family firms (our baseline category) in the intensity of business model innovation. To ensure that there is no sample selection bias, we check whether the propensity for R&D activities differs across firm types. According to the findings reported in Table 4, family firms and low-involvement family firms engage in fewer R&D activities than non-family firms (Estrin et al., 2022; Patel &

Table 4 Determinants of BMI and R&D

Variables	BMI overall Poisson estimates	R&D intensity Tobit estimates	R&D dummy Probit estimates
Low-inv. family firms	−0.081	−3.596**	−0.685***
	(0.059)	(1.670)	(0.219)
Family Firms	−0.085	−2.564*	−0.658***
	(0.055)	(1.532)	(0.217)
Constant	−0.930	−29.007	−1.906
	(1.319)	(23.609)	(2.858)
Log pseudo-likelihood	−1591.77	−378.78	−159.90
Observations	604	604	604

Notes: R&D intensity is the ratio between R&D expenditures and number of employees, while the R&D dummy is set to 1 when R&D intensity is greater than 0. The number of observations is lower than 896 because of missing data on R&D expenditures. Results for the control variables (included in the estimates) are not shown here for the sake of clarity; ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively, based on two-tailed tests; robust standard errors in parentheses

Chrisman, 2014), but not in less business model innovation. Thus, we can safely assume that our results are not influenced by sample selection bias and that BMI and R&D activities do not completely overlap.

Table 4 indicates that family firms' lower propensity to invest in intangible assets is not associated with lower BM innovation, suggesting that family and non-family firms likely differ in terms of organizational capabilities. Since these capabilities are generally influenced by the specific firm and industry context, we conduct further analysis to determine whether firm- and industry-level characteristics, i.e., firm size, sectoral capital intensity, and sectoral technology content, influence the relationship between markup performance and BMI in family and non-family firms.[4]

Concerning the first question, i.e., firm size, we conduct two subsample estimations using the median number of employees in the firm in 2007 (i.e., 20 employees) as the cutoff point. As for the second question, i.e., capital intensity, we tested whether the behaviour of family firms varies across sectors with different capital intensity. To this end, we run regressions for two subsamples whose capital intensity—proxied by the ratio of total assets to sales in 2017—is lower ("Light sectors") and higher ("Heavy sectors") than the median value, respectively.[5] Finally, following the EUROSTAT classification of high-technology manufacturing sectors (EUROSTAT, 2022), we distinguish between firms operating in low/medium technology sectors and firms operating in medium/high technology sectors and run additional regressions for these two subsamples.

The results are presented in Table 5, where we also report the regression coefficients of Model 2 to facilitate comparisons with the main results. Focusing on firm size (columns 1–2), we see that (relatively) large family firms, that is, those with more than 20 employees, are more proactive than non-family firms when the markup change is positive. Thus, larger family businesses are more proactive in responding to positive performance feedback when they need to address problems and shortcomings associated with increases in business size. In contrast, no significant differences are found for smaller businesses. When we break down industries by capital intensity (columns 3–4), we find that family firms are more proactive only in capital-intensive sectors. This can be explained by the fact that investments in capital-intensive sectors are larger and generally require more financial capital than in sectors with low capital intensity. Since firms often rely on external finance to invest and support innovation programs, good past performance resulting from an increase in market power may play a greater role in gaining additional resources in capital-intensive sectors, an aspect which mitigates the general reluctance of family firms to seek external finance. Finally, when we consider firms in low-tech and high-tech sectors separately (columns 5–6), we find that only family firms operating in low-tech sectors are

[4] We thank an anonymous reviewer for suggesting these research extensions.

[5] Capital intensity is computed at the sectoral level using data from all BVD-AIDA firms as the median values of the ratio between total assets and sales.

Table 5 Determinants of Business Model Innovation by class size and industry type, Poisson estimates—dept. variable: BMI

Variables	Firm size		Type of industry		Type of industry		Table 2
	Smaller	Bigger	Light	Heavy	Low-tech	High-tech	Model 2
Negative markup change	1.265	0.041	1.708	0.883	0.877	2.615**	1.211*
	(0.838)	(1.398)	(1.296)	(0.703)	(0.706)	(1.287)	(0.651)
Negative markup change * low-inv. family firm	−1.672	1.118	−1.401	1.251	0.335	−3.030	−0.480
	(1.755)	(1.654)	(1.340)	(2.248)	(1.116)	(1.980)	(0.956)
Negative markup change * family firm	−0.179	2.810	0.448	1.751	1.153	0.868	1.182
	(2.290)	(1.942)	(2.106)	(1.418)	(1.683)	(1.408)	(1.208)
Positive markup change	−0.576	−4.269**	−1.492	−2.310*	−2.177*	−1.066	−1.926**
	(1.002)	(1.967)	(1.385)	(1.385)	(1.304)	(1.461)	(0.977)
Positive markup change * low-inv. family firm	−1.475	3.077	0.447	0.016	0.906	−4.085	0.380
	(1.715)	(2.126)	(1.678)	(1.679)	(1.502)	(2.939)	(1.234)
Positive markup change * family firm	1.677	4.661**	1.587	3.625*	3.616**	−0.449	2.519*
	(1.910)	(2.264)	(1.828)	(1.907)	(1.687)	(2.206)	(1.313)
Low-inv. family firm	−0.014	−0.093	0.002	−0.105	−0.101	0.100	−0.049
	(0.099)	(0.089)	(0.078)	(0.105)	(0.077)	(0.106)	(0.062)
Family firm	−0.021	−0.167*	−0.009	−0.205*	−0.136*	−0.016	−0.093
	(0.098)	(0.085)	(0.075)	(0.107)	(0.079)	(0.089)	(0.060)
Median sectoral markup (2017)	0.497	1.576**	1.079**	0.565	0.988*	0.519	0.880*
	(0.662)	(0.634)	(0.535)	(0.769)	(0.515)	(0.770)	(0.457)
Markup (2014)	−0.465	−0.640**	−0.526*	−0.603*	−0.404*	−1.050**	−0.526**
	(0.316)	(0.278)	(0.276)	(0.360)	(0.235)	(0.454)	(0.218)
Firm age	−0.024	−0.002	−0.018	−0.005	−0.021	0.013	−0.010
	(0.058)	(0.049)	(0.048)	(0.055)	(0.047)	(0.057)	(0.037)
Firm size	0.180***	0.123***	0.171***	0.111***	0.157***	0.146***	0.152***
	(0.062)	(0.031)	(0.023)	(0.037)	(0.027)	(0.025)	(0.019)
Constant	0.969	0.745	0.791	1.865**	0.930	1.930**	1.117**
	(0.714)	(0.682)	(0.574)	(0.884)	(0.590)	(0.767)	(0.504)
Observations	464	432	550	346	645	251	896
Log pseudo-likelihood	−1310.04	−1182.49	−1567.41	−966.08	−1854.08	−683.85	−2547.28

Notes: robust standard errors in parentheses; $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$

significantly more proactive than non-family firms. In this case, the difference in behaviour of family firms may be explained by the difference in profitability between the two sectors. Since low-technology sectors tend to have lower levels of profitability, a good past performance may represent a unique opportunity for companies in low-profitability sectors to recoup the invested funds[6]; this aspect can be particularly relevant for family businesses, as they generally prefer to rely on internal resources and thus see the positive financial impact produced by better market power as an opportunity to invest in BMI.

5 Conclusions

Businesses operate in a rapidly changing and challenging environment and, in recent years, have also experienced some particularly harsh negative shocks, such as the economic recession and the COVID-19 pandemic. Such a complex and uncertain scenario has reinforced the need to understand exactly how and to what extent organizations respond to undesirable and/or unforeseen

[6] This profitability disparity also emerged in our sample of manufacturing companies, where the average ROA (used as a proxy for profitability) in 2009 is 5.9 in low-tech industries and 7.3 in high-tech industries.

events that may impact organizational behaviour and performance. A useful framework for evaluating the strategic and organizational changes that companies make in this context is provided by Performance Feedback Theory. Such a theory has been extensively used in the literature, which, so far, has mostly relied on accounting measures of firm performance (e.g., return on equity) to proxy for the trigger, and on indicators of very specific strategies (e.g., R&D investment and internationalisation) to model behavioural change.

Our study differs from and contributes to previous research in the following ways. First, it considers a significant form of change that has been neglected in the performance feedback literature, namely, business model innovation, and measures it using detailed information on business models that is collected through a unique survey. Second, unlike previous studies, it resorts to an accurate indicator of market power, i.e., the markup, as a proxy for the trigger. Third, it sheds light on the differences in the response to markup changes that exist not only between family firms and non-family firms, but also between two different types of family business, namely high-involvement family firms, which in this paper are simply referred to as family firms and which are expected to exhibit a relatively high degree of stewardship and, thus, to respond proactively to change, and family businesses with a low involvement of family members in management decisions and operations.

The regression analysis shows that, on average, firms react to negative markup changes by performing more BMI (especially in products and processes), while respond to positive markup changes with less BMI. However, it turns out that the latter result is driven by family companies with low involvement, whereas family firms respond significantly more to negative markup changes than other family businesses and even non-family firms in some business areas. Moreover, and most importantly, family firms respond with more BMI not only to negative changes but also to markup increases, thus proving to be very proactive. Hence, it appears that these companies use their market power as a lever to address their inherent weaknesses and undertake risky business model innovations, the costs and risks of which are likely to be partially mitigated by a stronger position in the product market. These considerations particularly hold for relatively large family firms and for family firms operating in low-tech and capital-intensive sectors.

This study extends our knowledge of the drivers of business model innovation and expands the set of variables that can be used as triggers for strategic change within the performance feedback framework. It also shows that the use of multiple BMI indicators related to different business areas allows us to obtain a more accurate and comprehensive picture of this important but elusive object, namely the business model. In addition, it highlights the importance of also considering the heterogeneity between companies that belong to a particular category—in this case, the broad group of family businesses.

As far as family involvement is concerned, we offer a positive picture of family businesses run by at least two family members, namely, those that fulfil the common definition of family firms. Interestingly, it seems these companies see markup increases as an incentive for strategic change that can benefit not only the business itself but also its internal and external stakeholders and the overall economy. This should alleviate policymakers' concerns about the potentially negative welfare effects of markup increases, especially when they are particularly severe or widespread, and/or when the initial markup level is already high. Accordingly, policymakers should be motivated to provide adequate support to virtuous family firms, which account for a significant share of the economy in several countries around the world, including Italy. Moreover, our results also highlight the leading role of very dynamic and proactive family firms in reorganizing and reactivating their value chains after a major downturn. The less reassuring findings concerning low-involvement family firms suggest that their family owners/managers should strengthen the company's resources, competencies and network, which in turn can help them make risky but potentially effective and successful strategic decisions when faced with positive or negative changes.

This work presents some limitations which can be hardly addressed in our empirical context. First, our dataset covers a relatively small number of firms, even though it is meant to be representative of the universe of SMEs operating in the Italian manufacturing sector. Moreover, the data on business model innovation are self-reported and are inevitably affected by a certain degree of subjectivity. More direct and unbiased measures of business model change should be used and compared to our survey-based proxies of business model innovation. Finally, a more fine-grained breakdown based on the ownership and management structure of the firm might be useful to better relate governance factors to firm-level responses and changes. Nonetheless, this study may provide a useful starting point for future research, which could, for example, use a larger sample, a different geographic area, a different and/or longer time frame, and/or examine other forms of strategic and business change.

Appendix 1. The survey

Most of the studies on firms' behaviour focus on large, public companies listed in the official market. Generally, significant amounts of data are available for such companies: useful information that enables, for instance, to assess the stock market's response to the major changes in the firm's business conduct, and to understand how firms compete in the market, can be gathered from various sources, such as corporate balance sheets, stock-market transactions, companies' annual reports and the specialized press. This type of information, however, cannot be retrieved for the majority of the firms operating in the small-business sector: in this case, except for corporate accounts, publicly available data sources do not usually report the major factors affecting the business conduct, and most of the data can only be gathered through direct interviews. In light of these considerations, for the purpose of this study, we built a dataset by matching two complementary sources, namely, a cross-sectional survey dataset based on first-hand information collected directly from the companies using questionnaire-based interviews, and a dataset from Bureau van Dijk consisting of company accounts.

In this Appendix, we shortly present our survey; in particular, we provide some information on the sample selection and data collection, the sample representativeness and baseline statistics, and also report the questions employed to build the variables of business model innovation used in our regression analysis.

Sample selection and data collection

In early 2019, we devised a survey aimed to shed light on relevant business aspects of Italian manufacturing companies that are often hardly assessable due to limited data availability, such as the firm's position in the value chain in terms of the major type of production, value contribution and ties with clients, business model innovation, technological innovation and eco-innovation. To this end, between May and June 2019, we first ran a pilot test aimed to assess the functionality of the online platform on which we intended to upload the questionnaire. Then, using the AIDA-Bvd database, we selected Italian companies operating in the manufacturing sector and industry-related sectors according to the Ateco/NACE Rev.2 classification (i.e., firms whose 2-digit Ateco/NACE ranges between 10 and 33 and firms with Ateco/NACE 62, 63 and 71), and whose number of employees in 2019 ranged between 10 and 1000. By applying these criteria, we expected to obtain an initial sample characterized by a good degree of representativeness of the Italian manufacturing sector and which, at the same time, would have been handleable for our purpose. The number of companies that fulfilled both the criteria amounted to 55,124. The sample distribution by NUTS-2 region and class size is shown in Appendix Table 6.

The data collection process was carried out between October 2019 and February 2020. In order to obtain more accurate and reliable answers and to increase the chances of obtaining a reply, we set up a team of post-graduate students with professional experience in the field; under our supervision, they contacted the entrepreneurs or managers of the selected companies and provided assistance during the answering process. The firms were reached either via telephone or via e-mail. Through the first method, which we applied to the selected companies whose number of employees in 2019 was equal or higher than 50 (i.e., about 11,700 firms), the analysts managed to establish a direct, effective and customized communication, during which they could provide useful information and clarify potential doubts; at the end of the conversation, they asked the respondents to provide them with a corporate e-mail address to which they would electronically send the link to the questionnaire. Throughout the data collection process, the analysts meticulously monitored the completion status of the questionnaires and the response rate and sent reminders to the companies whose questionnaire was still incomplete. This method thus increased the probability to successfully involve the selected firms and obtain accurate and timely responses. Regarding the second approach, an e-mail was sent

Table 6 Distribution of the initial sample by region and size class (2019)

NUT-2 region (headquarters)	Number of employees					
	10–49	50–99	100–249	250–1.000	Not available	Total
Piemonte	3472	580	377	138	16	4583
Valle d'Aosta/Vallée d'Aoste	36	7	5	2	0	50
Lombardia	11,781	2044	1230	469	24	15,548
Trentino-Alto Adige/Südtirol	613	111	83	38	1	846
Veneto	6233	1091	549	184	9	8066
Friuli-Venezia Giulia	1060	182	107	44	1	1394
Liguria	508	73	39	14	1	635
Emilia-Romagna	4845	785	479	189	7	6305
Toscana	3662	410	214	68	10	4364
Umbria	652	96	58	14	1	821
Marche	1942	240	127	40	2	2351
Lazio	2004	293	153	67	15	2532
Abruzzo	803	81	51	25	2	962
Molise	107	6	3	1	0	117
Campania	2258	263	151	33	14	2719
Puglia	1586	175	62	34	7	1864
Basilicata	179	24	8	3	0	214
Calabria	285	22	8	1	0	316
Sicilia	889	87	38	8	3	1025
Sardegna	356	29	18	6	3	412
Total	43,271	6,599	3,760	1,378	116	55,124

Source: authors' elaboration of data from Aida-Bvd

to small companies, i.e., with a number of employees in 2019 lower than 50, containing information about the questionnaire and the link to the online platform. To ensure a higher response rate, reminder e-mails were sent to the companies that had not completed the questionnaire within the established deadlines.

At the conclusion of the data collection process, we ended up with 16,492 questionnaires (out of the initial sample of 55,124 firms); hence, the response rate amounted to about 29.9%. We then checked the answers and discarded the questionnaires that were significantly incomplete ($n.=2705$) or that contained potentially unreliable information, as well as duplicates and firms that, in the meantime, exited the market ($n.=5278$); in doing so, we obtained 8509 usable questionnaires. In our paper, we focused on the manufacturing sector and estimated corporate markups. As the markup estimation requires intensive data cleaning, and information on some of the variables used is not available for at least some of the years considered, the number of observations in our main regressions amounts to 896.

We checked the representativeness of both the whole sample of respondents (made up of 8509 companies) and the subsample of companies emerging from the regressions by comparing the firms' distribution of both these samples with the distribution observed in our initial dataset collected from Aida (i.e., the 55,124 firms stated above) and the distribution based on national data on Italian manufacturing firms compiled by the Italian National Statistical Office (ISTAT), which are supposed to convey the most exhaustive picture. To this end, for each of these four samples, we computed the share of small and medium-sized enterprises (SMEs), i.e., firms with more than 10 employees but less than 250 employees. We find that the share of SMEs is at least equal to 97% in all the four datasets under scrutiny, confirming a well-known feature of the Italian economy. Also, as shown in Appendix Fig. 4, the firms' distribution across Italian NUTS-2 regions is quite comparable across the datasets. This also holds when we consider the final sample used in the regression analysis, with the exception of a small over-representation of the regions of Veneto and Marche and, to a lesser extent, Emilia Romagna.

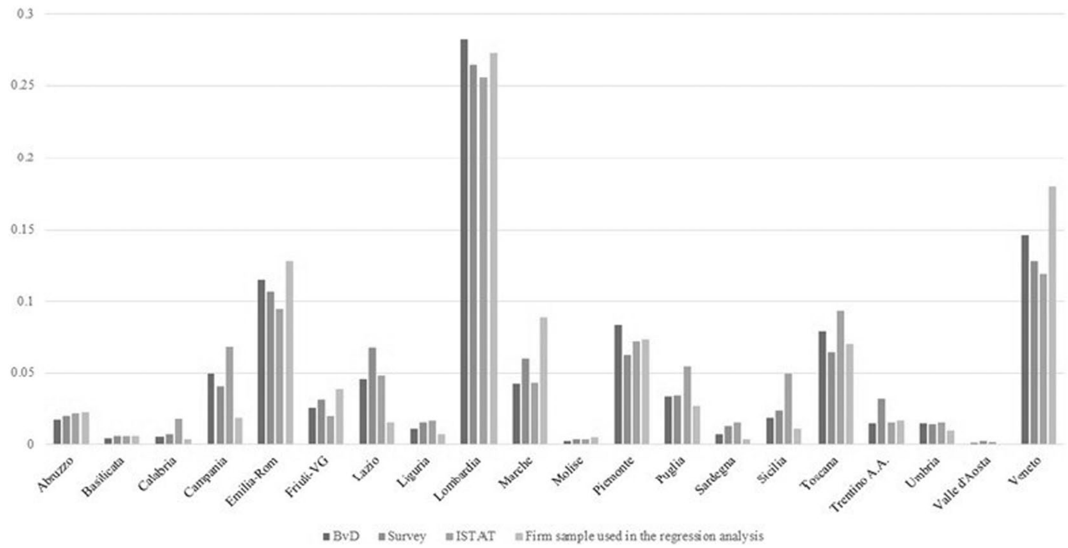

Fig. 4 Distribution of firms by NUTS-2 regions (regional share) across different datasets. Source: authors' elaboration of data from the survey, Aida BvD and Istat

The structure of the survey

The survey questionnaire comprises the following six distinct sections, each addressing specific aspects of the companies' operations and strategies:

1) Company's General Information: it aims to provide an overview of the companies' financial performance and market dynamics by collecting information on variables such as firm turnover, export activities, and the impact of key customers on revenue generation;
2) Business model innovation: this section focuses on the changes made by companies to their business model in the previous years in four relevant functional areas;
3) Adopted or Planned Industry 4.0 Technologies: this part of the questionnaire explores the effective or planned development and implementation of new digital and enabling technologies, such as Big Data, Cloud Computing, Cyber Security, Additive Manufacturing and Collaborative Robots;
4) Data Management: the fourth section aims to shed light on the importance of data analysis for the surveyed companies; to this end, it investigates the companies' approaches to data management and their utilization of data-driven decision-making processes;
5) Eco-Innovation: this part explores the companies' alignment with environmentally friendly and "green" policies and practices;
6) Investment Policy: the sixth section aims to advance our understanding of the company's willingness to invest in innovative technologies, processes, or market expansion;

Finally, the survey included a final section gathering information (e.g., age, gender, role within the company) about the interviewee.

A focus on the survey section "Business model innovation"

Below, we report the questions that are contained in the part of the survey devoted to business model innovation and which we used to build the dependent variables of our regression model.

Products and production processes

Since the last 3 years, the firm (report significant changes only):

- It has introduced new products
- It has added ancillary or complementary services to its main products

- It has specialized on a main product, extending its selling to markets or clients not previously served
- It has modified its client portfolio and the markets it serves
- It has introduced new and/or more efficient production processes
- It has reduced the "Time to Market" (i.e., the length of time from the conception of a product until it is released to the market)
- None of the previous answers

Finance

Since the last 3 years, the firm (report significant changes only):

- It has modified its pricing policies (e.g., prices that vary with product demand, discount policies)
- It has modified its sales methods (e.g., pay-per use, rental, license or other methods)
- It has increased its revenues thanks to the introduction of ancillary or complementary services
- It has focused on mass markets
- It has focused on niche markets
- It sets fixed prices
- It sets dynamic prices (e.g., based on negotiation, based on the available supply, auction)
- None of the previous answers

Business relationships and business network

Since the last 3 years, the firm: (report significant changes only).

- It has internalized upstream activities that were previously carried out by other actors of the supply chain (suppliers of raw materials, semifinished products and equipment)
- It has internalized downstream activities that were previously carried out by other actors of the supply chain (services, sales network or clients)
- It has internalized ancillary activities that support the main business
- It has outsourced activities that were previously carried out within the company
- It has modified or introduced new direct sales channels (e.g., online, e-commerce or digital, new sales networks)
- It has modified or introduced new indirect sales channels (e.g., wholesalers, distributors or other intermediaries)
- It has formalized new partnerships with clients, suppliers or competitors
- It has benefited from incentives and/or tax relieves for investments in innovation (e.g., Industry 4.0)
- None of the previous answers

Organization and processes

Since the last 3 years, the firm (report significant changes only):

- It has added new business processes/functions
- It has removed business processes/functions that are no longer needed
- It has introduced new technological skills (by hiring/training the employees)
- It has introduced new commercial skills (by hiring/training the employees)
- It has initiated training courses (within or outside the company) for the employees
- It has reorganized the business processes
- It has modified the hierarchy levels
- None of the previous answers

Appendix 2. Estimation of the production function

In Sect. 3, following De Loecker and Warzynski (2012), we defined the firm-level markup as the ratio between of the output elasticity of materials and its revenue share:

$$\mu_{it} = \frac{\theta_{it}^{M}}{\alpha_{it}^{M}}, \tag{5}$$

where μ_{it} is the markup of firm i at time t, θ_{it}^{M} is the output elasticity of materials and α_{it}^{M} is the revenue share of materials, also known as cost share or expenditure share of materials. While the expenditure share of materials can be easily computed using firm-level data, the related output elasticity needs to be estimated. In order to get unbiased estimates of θ_{it}^{M} at the firm-year level, we consider the following general production function Q for firm i at time t:

$$Q_{it} = Q_{it}\left(L_{it}, M_{it}, K_{it,} w_{it}\right), \tag{6}$$

where L_{it}, M_{it} and K_{it} are the firms' inputs (i.e., labour, materials and capital, respectively) and w_{it} is firm's productivity. Unobserved productivity shocks are potentially correlated with input choices, and if not controlled for, can lead to inconsistent estimates of the production function. Accordingly, we employ the Wooldridge-Levinsohn-Petrin (WLP) estimator, as derived from Wooldridge (2009) and implemented in Petrin and Levinsohn (2012). The WLP estimator does not assume constant returns to scale, is robust to the Ackerberg et al. (2015) criticism of Levinsohn and Petrin's (2003) estimator and is programmed as a simple instrumental variable estimator. The potential endogeneity issues related to the simultaneous determination of inputs and unobserved productivity are addressed by introducing lagged values of specific inputs as proxies for productivity. The estimation strategy used in this paper consists of two steps. First, we run the following:

$$q_{it} = g\left(l_{it}, k_{it}, m_{it}\right) + \in_{it}, \tag{7}$$

where we use a third-order polynomial on all inputs to remove the random-error term $\in_{it}$ from the output and thus to obtain estimates of the expected output $\hat{q}_{it}$. Then, we use a general production function of the following type:

$$\hat{q}_{it} = f_s\left(l_{it}, k_{it}, m_{it}, \mathrm{B}\right) + \omega_{it} + \varepsilon_{it}, \tag{8}$$

where $\hat{q}_{it}$ is the natural log of real sales of firm i at time t, l_{it}, k_{it} and m_{it} are, respectively, the natural logarithms of the quantities of labour, capital and materials which are used by the firm and get transformed into the output according to the production function f_s, B is the parameter vector to be estimated in order to calculate the output elasticities, ω_{it} is the firm-level productivity term that is observable by the firm but not by the econometrician, and ε_{it} is an error term that is unobservable to both the firm and the econometrician. Productivity is, thus, assumed to be Hicks-neutral and specific to the firm, as in the approach using inputs to control for unobservables in production function estimations (Ackerberg et al., 2015; Levinsohn & Petrin, 2003; Olley & Pakes, 1996). We assume that labour is a variable input, and instrument current labour and materials and their interactions with the first and second lags of labour as well as the second lags of capital and materials. To control for time-variant shocks common to all plants, we add year-fixed effects.

We adopt a translog specification, which, unlike the Cobb–Douglas, permits us to recover firm-level time-variant output elasticities. The production function is a revenue function, since data on firms' output prices are not available, and is allowed to change across different sectors, as implied by the subscript s. Leaving subscripts i and t aside for simplicity, the translog function f_s can be written as follows:

$$\begin{aligned} f_s = {} & \alpha + \beta_L l + \beta_K k + \beta_M m + \beta_{L^2} l^2 + \beta_{M^2} m^2 \\ & + \beta_{K^2} k^2 + \beta_{KL} kl + \beta_{KM} km + \beta_{LM} lm \end{aligned} \tag{9}$$

Thus, the parameter vector is made up of nine parameters for each sector. The estimated parameters of the translog production function allow us to compute the output elasticity of materials. Using the estimates of the output elasticity and the calculated revenue shares of materials, we can now compute markups at the firm-year level based on Eq. (1).

Data Availability Data are available from authors upon request.

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References

Ackerberg, D. A., Caves, K., & Frazer, G. (2015). Identification properties of recent production function estimators. *Econometrica, 83*(6), 2411–2451. https://doi.org/10.3982/ECTA13408

Al-Debei, M., & Avison, D. (2010). Developing a unified framework of the business model concept. *European Journal of Information Systems, 19*, 359–376. https://doi.org/10.1057/ejis.2010.21

Allen, M. P., & Panian, S. K. (1982). Power, performance and succession in the large corporation. *Administrative Science Quarterly, 27*, 538–547. https://doi.org/10.2307/2392529

Amato, S., Patuelli, A., Basco, R., & Lattanzi, N. (2023). Family firms amidst the global financial crisis: A territorial embeddedness perspective on downsizing. *Journal of Business Ethics, 183*, 213–236. https://doi.org/10.1007/s10551-021-04930-0

Anwar, M. (2018). Business model innovation and SMEs performance-does competitive advantage mediate? *International Journal of Innovation Management, 22*(7), 1850057. https://doi.org/10.1142/S1363919618500573

Aragon-Correa, J. A., & Sharma, S. (2003). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review, 28*(1), 71–88. https://doi.org/10.2307/30040690

Arrègle, J. L., Hitt, M. A., Sirmon, D. G., & Very, P. (2007). The development of organizational social capital: Attributes of family firms. *Journal of Management Studies, 44*, 73–95. https://doi.org/10.1111/j.1467-6486.2007.00665.x

Azila-Gbettor, E. M., Honyenuga, B. Q., Berent-Braun, M. M., & Kil, A. (2018). Structural aspects of corporate governance and family firm performance: A systematic review. *Journal of Family Business Management, 8*(3), 306–330. https://doi.org/10.1108/JFBM-12-2017-0045

Bajgar, M., Calligaris, S., Calvino, F., Criscuolo, C. & Timmis, J. (2019). Bits and bolts: The digital transformation and manufacturing. OECD Science, Technology and Industry Working Papers 2019/01, OECD Publishing, Paris.

Bajgar, M., Criscuolo, C. & Timmis, J. (2021). Intangibles and industry concentration: Supersize me. OECD Science, Technology and Industry Working Papers 2021/12, OECD Publishing, Paris.

Barbera, F., Hasso, T., & Schwarz, T. V. (2022). Family governance and firm performance: Exploring the intermediate effects of family functioning and competitive advantage. *Journal of Family Business Management*. https://doi.org/10.1108/JFBM-06-202

Baum, J. A. C., Rowley, T. J., Shipilov, A. V., & Chuang, Y.-T. (2005). Dancing with strangers: Aspiration performance and the search for underwriting syndicate partners. *Administrative Science Quarterly, 50*(4), 536–575. https://doi.org/10.5465/AMBPP.2004.13857657

Bennedsen, M., Perez-Gonzalez, F., & Wolfenzon, D. (2010). The governance of family firms. In K. Baker & R. Anderson (Eds.), *Corporate governance* (pp. 371–389). John Wiley & Sons.

Ben-Oz, C., & Greve, H. R. (2015). Short and long term performance feedback and absorptive capacity. *Journal of Management, 41*(7), 1827–1853. https://doi.org/10.1177/0149206312466148

Blagoeva, R. R., Mom, T. J. M., Jansen, J. J. P., & George, G. (2020). Problem-solving or self-enhancement? A power perspective on how CEOs affect R&D search in the face of inconsistent feedback. *Academy of Management Journal, 63*(2), 332–355. https://doi.org/10.5465/amj.2017.0999

Block, J., & Ulrich L. (2023). Are family owners and managers good stewards in global crises? Evidence from stock market reactions to COVID-19. *Journal of Family Business Strategy, 14*(1), 100534. https://doi.org/10.1016/j.jfbs.2022.100534

Block, J., Miller, D., Jaskiewicz, P., & Spiegel, F. (2013). Economic and technological importance of innovations in large family and founder firms: An analysis of patent data. *Family Business Review, 26*(2), 180–199. https://doi.org/10.1177/0894486513477454

Bloom, N., & Van Reenen, J. (2007). Measuring and explaining management practices across firms and countries. *The Quarterly Journal of Economics, 122*(4), 1351–1408. https://doi.org/10.1162/qjec.2007.122.4.1351

Buiten, M. C. (2021). Exploitative abuses in digital markets: Between competition law and data protection law. *Journal of Antitrust Enforcement, 9*(2), 270–288. https://doi.org/10.1093/jaenfo/jnaa041

Chen, W.-R. (2008). Determinants of firms' backward- and forward-looking R&D search behaviour. *Organization Science, 19*(4), 609–622. https://doi.org/10.1287/orsc.1070.0320

Chen, X., & Li, Q. (2021). Environmental regulation, subsidy and underperforming firms' R&D expenditure: Evidence from Chinese listed companies. *International Journal of Technology Management, 85*(2/3/4), 190–211. https://doi.org/10.1504/IJTM.2021.115265

Chen, J., Liu, L., & Wang, Y. (2021). Business model innovation and growth of manufacturing SMEs: A social exchange perspective. *Journal of Manufacturing Technology Management, 32*(2), 290–312. https://doi.org/10.1108/JMTM-03-2020-0089

Chen, W., Zhong, X., & Lv, D. D. (2022). Negative performance feedback, CEO tenure, and punctuated equilibrium innovation. *R and D Management, 52*(3), 564–576. https://doi.org/10.1111/radm.12501

Chesbrough, H. (2010). Business model innovation: Opportunities and barriers. *Long Range Planning, 43*(2–3), 354–363. https://doi.org/10.1016/j.lrp.2009.07.010

Chirico, F., & Bau, M. (2014). Is the family an "asset" or "liability" for firm performance? The Moderating Role of Environmental Dynamism. *Journal of Small Business Management, 52*(2), 210–225. https://doi.org/10.1111/jsbm.12095

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

Chung, D., & Shin, D. (2021). When do firms invest in R&D? Two types of performance feedback and organizational search in the Korean shipbuilding industry.

Asian Business and Management, 20(5), 583–561. https://doi.org/10.1057/s41291-019-00102-1

Ciapanna, E., Formai, S., Linarello, A., & Rovigatti, G. (2022). Measuring market power: Macro and micro evidence from Italy. Questioni Di Economia e Finanza (Occasional Papers) No. 672, Bank of Italy.

Coad, A., Holm, J. R., Krafft, J., & Quatraro, F. (2018). Firm age and performance. *Journal of Evolutionary Economics, 28*, 1–11. https://doi.org/10.1007/s00191-017-0532-6

Corrado, C., Haskel, J., Jona-Lasinio, C., & Iommi, M. (2022). Intangible capital and modern economies. *Journal of Economic Perspectives, 36*(3), 3–28. https://doi.org/10.1257/jep.36.3.3

Cucculelli, M., & Peruzzi, V. (2020). Post-crisis firm survival, business model changes, and learning: Evidence from the Italian manufacturing industry. *Small Business Economics, 54*, 459–474. https://doi.org/10.1007/s11187-018-0044-2

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

D'Aurizio, L., Oliviero, T., & Romano, L. (2015). Family firms, soft information and bank lending in a financial crisis. *Journal of Corporate Finance, 33*, 279–292. https://doi.org/10.1016/j.jcorpfin.2015.01.002

Daily, C. M., & Dollinger, M. J. (1993). Alternative methods for identifying family vs. non- family managed small businesses. *Journal of Small Business Management, 31*(2), 79–90.

Danes, S. M., Lee, J., Amarapurkar, S., Stafford, K., Haynes, G., & Brewton, K. E. (2009). Determinants of family business resilience after a natural disaster by gender of business owner. *Journal of Developmental Entrepreneurship, 14*, 333–354. https://doi.org/10.1142/S1084946709001351

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

Davis, J. H., Schoorman, F. D., & Donaldson, L. (1997). Toward a stewardship theory of management. *The Academy of Management Review, 22*(1), 20–47. https://doi.org/10.2307/259223

De Loecker, J., & Warzynski, F. (2012). Markups and firm-level export status. *American Economic Review, 102*(6), 2437–2471. https://doi.org/10.1257/aer.102.6.2437

De Massis, A., Ding, S., Kotlar, J., & Wu, Z. (2018). Family involvement and R&D expenses in the context of weak property rights protection: An examination of non-state-owned listed companies in China. *European Journal of Finance, 24*(16), 1506–1527.

El-Haddad, A., & Zaki, C. (2023). Storm survivors: Evidence from firms in times of pandemic. *The Journal of International Trade & Economic Development,* 1–34. https://doi.org/10.1080/09638199.2023.2169744

Estrin, S., Hanousek, J. & Shamshur A. (2022). Owner type and investment of private firms". CEPR Press Discussion Paper No. 17774. https://cepr.org/publications/dp17774. Accessed 22 June 2023

EUROSTAT (2022). Glossary: High-tech classification of manufacturing industries. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-tech_classification_of_manufacturing_industries. Accessed 22 June 2023

Fletcher, M., Harris, S., & Richey, R. G. (2021). Retrospective and prospective learning: Accelerating the internationalization process. *Journal of World Business, 56*(3), 101191. https://doi.org/10.1016/j.jwb.2021.101191

Foss, N. J., & Saebi, T. (2017). Fifteen years of research on business model innovation: How far have we come, and where should we go? *Journal of Management, 43*(1), 220–227. https://doi.org/10.1177/0149206316675927

Fries, A., Kammerlander, N., & Leitterstorf, M. (2021). Leadership styles and leadership behaviours in family firms: A systematic literature review. *Journal of Family Business Strategy, 12*(1), 100374. https://doi.org/10.1016/j.jfbs.2020.100374

Gaba, V., & Greve, H. R. (2019). Safe or profitable? The pursuit of conflicting goals. *Organization Science, 30*(4), 647–667. https://doi.org/10.1287/orsc.2018.1280

García-García, R., García-Canal, E., & Guillén, M. F. (2022). Walking on thin ice: CEOs' internationalization decisions in underperforming firms. *Long Range Planning, 55*(5), 102243. https://doi.org/10.1016/j.lrp.2022.102243

Gómez-Mejía, L. R., Larraza-Kintana, M., & Makri, M. (2003). The determinants of executive compensation in family-controlled public corporations. *Academy of Management Journal, 46*, 226–237. https://doi.org/10.2307/30040616

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

Gómez-Mejía, L. R., Cruz, C., Berrone, P., & De Castro, J. (2011). The bind that ties: Socioemotional wealth preservation in family firms. *Academy of Management Annals, 5*, 653–707. https://doi.org/10.1080/19416520.2011.593320

Greve, H. R. (1998). Performance, aspirations, and risky organizational change. *Administrative Science Quarterly, 43*, 58–86. https://doi.org/10.2307/2393591

Greve, H. R. (2003). *Organizational learning from performance feedback: A behavioural perspective on innovation and change*. Cambridge University Press.

Greve, H. R. (2008). A behavioural theory of firm growth: Sequential attention to size and performance goals. *Academy of Management Journal, 51*(3), 476–494. https://doi.org/10.5465/AMJ.2008.32625975

Greve, H. R. (2011). Positional rigidity: Low performance and resource acquisition in large and small firms. *Strategic Management Journal, 32*(1), 103–114. https://doi.org/10.1002/smj.875

Gupta, P., & Chauhan, S. (2023). Dynamics of corporate governance mechanisms – family firms' performance relationship- a meta-analytic review. *Journal of Business Research, 154*, 113299. https://doi.org/10.1016/j.jbusres.2022.113299

Han, S. (2022). The effect of performance feedback on strategic alliance formation and R&D intensity. *European Management Journal*. https://doi.org/10.1016/j.emj.2022.03.010

Hansen, C. & Block, J. (2020). Exploring the relation between family involvement and firms' financial performance: A replication and extension meta-analysis. *Journal of Business Venturing Insights*, e00158. https://doi.org/10.1016/j.jbvi.2020.e00158

He, L., Huang, L., & Yang, G. (2021). Invest in innovation or not? How managerial cognition and attention allocation shape corporate responses to performance shortfalls. *Management and Organization Review, 17*(4), 815–850. https://doi.org/10.1017/mor.2021.58

Heino, N., Tuominen, P., & Tuominen, T. (2019). The accounting performance of listed family firms vs. non-family firms: A systematic review of empirical studies. *International Journal of Entrepreneurial Venturing, 11*(2), 103–141. https://doi.org/10.1504/IJEV.2019.098758

Huynh, J., & Dang, V. D. (2021). Loan portfolio diversification and bank returns: Do business models and market power matter? *Cogent Economics & Finance, 9*(1), 1891709. https://doi.org/10.1080/23322039.2021.1891709

Islam, M. M., & Fatema, F. (2023). Do business strategies affect firms' survival during the COVID-19 pandemic? A global perspective. *Management Decision, 61*(3), 861–885. https://doi.org/10.1108/MD-11-2021-1456

Iwasaki, I., Kočenda, E., & Shida, Y. (2022). Institutions, financial development, and small business survival: Evidence from European emerging markets. *Small Business Economics, 58*, 1261–1283. https://doi.org/10.1007/s11187-021-00470-z

Jarsulic, M. (2019). Antitrust enforcement for the 21st century. *The Antitrust Bulletin, 64*(4), 514–530. https://doi.org/10.1177/0003603X19877008

Jiang, G. F., & Holburn, G. L. F. (2018). Organizational performance feedback effects and international expansion. *Journal of Business Research, 90*, 48–58. https://doi.org/10.1016/j.jbusres.2018.04.034

Jirásek, M. (2020). Curvilinearity in the performance feedback and R&D relationship. *Journal of Strategy and Management, 13*(1), 1–14. https://doi.org/10.1108/JSMA-09-2018-0098

Jirásek, M. (2021). Corporate boards' and firms' R&D responses to performance feedback. *Journal of Strategy and Management*. https://doi.org/10.1108/JSMA-06-2021-0132

Johnson, M.W., Christensen, C.M., & Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review*, *86*(12), 57–68. Available at: https://hbr.org/2008/12/reinventing-your-business-model. Last access: 07.09.2023.

Kaleka, A., & Morgan, N. A. (2019). How marketing capabilities and current performance drive strategic intentions in international markets. *Industrial Marketing Management, 78*, 108–121. https://doi.org/10.1016/j.indmarman.2017.02.001

Kiesling, L. (2014). Incumbent vertical market power, experimentation, and institutional design in the deregulating electricity industry. *The Independent Review, 19*(2), 239–264. https://doi.org/10.2139/ssrn.2091719

Klimek, L., & Funta, R. (2021). Data and E-commerce: An economic relationship. *Danube, 12*(1), 33–44. https://doi.org/10.2478/danb-2021-0003

Kraus, S., Clauss, T., Breier, M., Gast, J., Zardini, A., & Tiberius, V. (2020). The economics of COVID-19: Initial empirical evidence on how family firms in five European countries cope with the corona crisis. *International Journal of Entrepreneurial Behavior and Research, 26*(5), 1067–1092. https://doi.org/10.1108/IJEBR-04-2020-0214

Laffranchini, G., Hadjimarcou, J., & Kim, S. H. (2022). The first turnaround response of family firms in a crisis situation. *Journal of Family Business Strategy, 13*, 100434. https://doi.org/10.1016/j.jfbs.2021.100434

Lanzolla, G., & Markides, C. (2021). A business model view of strategy. *Journal of Management Studies, 58*(2), 540–553. https://doi.org/10.1111/joms.12580

Latifi, M.-A., Nikou, S., & Bouwman, H. (2021). Business model innovation and firm performance: Exploring causal mechanisms in SMEs. *Technovation, 107*, 102274. https://doi.org/10.1016/j.technovation.2021.102274

Le Breton-Miller, I., & Miller, D. (2009). Agency vs. stewardship in public family firms: A social embeddedness reconciliation. *Entrepreneurship Theory and Practice, 33*(6), 1169–1191. https://doi.org/10.1111/j.1540-6520.2009.00339

Le Breton-Miller, I., Miller, D., & Lester, R. H. (2011). Stewardship or agency? A social embeddedness reconciliation of conduct and performance in public family businesses. *Organization Science, 22*(3), 704–721. https://doi.org/10.1287/orsc.1100.0541

Le Breton-Miller, I., Miller, D., & Bares, F. (2015). Governance and entrepreneurship in family firms: Agency, behavioral agency and resource-based comparisons. *Journal of Family Business Strategy, 6*(1), 58–62. https://doi.org/10.1016/j.jfbs.2014.10.002

Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *The Review of Economic Studies, 70*(2), 317–341. https://doi.org/10.1111/1467-937X.00246

Li, L., Qian, G., Qian, Z., & Lu, I. R. R. (2018). Aspiration, foreignness liability and market potential: How do they relate to small firms' international entrepreneurial orientation? *International Marketing Review, 35*(6), 1009–1032. https://doi.org/10.1108/IMR-03-2017-0062

Lim, E. N. K., Lubatkin, M. H., & Wiseman, R. M. (2010). A family firm variant of the behavioral agency theory. *Strategic Entrepreneurship Journal, 4*, 197–211. https://doi.org/10.1002/sej.91

Lin, W.-T. (2014). How do managers decide on internationalization processes? The role of organizational slack and performance feedback. *Journal of World Business, 49*(3), 396–408. https://doi.org/10.1016/j.jwb.2013.08.001

Lu, L.-H., & Fang, S.-C. (2013). Problematic search, slack search and institutional logic in corporate R&D strategy: An empirical analysis of Taiwanese electronics firms. *Journal of Management and Organization, 19*(6), 659–678. https://doi.org/10.1017/jmo.2014.11

Lumpkin, G. T., & Dess, G. G. (2001). Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and industry life cycle.

Journal of Business Venturing, 16(5), 429–451. https://doi.org/10.1016/S0883-9026(00)00048-3

Lv, D. D., Chen, W., Zhu, H., & Lan, H. (2019). How does inconsistent negative performance feedback affect the R&D investments of firms? A study of publicly listed firms. *Journal of Business Research, 102*, 151–162. https://doi.org/10.1016/j.jbusres.2019.04.045

Madadian, O., & Van den Broeke, M. (2022). R&D investments in response to performance feedback: Moderating effects of firm risk profile and business strategy. *Applied Economics*. https://doi.org/10.1080/00036846.2022.2094879

Marques, B. & Alves, C. (2021). Business model diversity and banking sector resilience. FEP Working Papers 623, Universidade do Porto, Faculdade de Economia do Porto.

Martínez-Noya, A., & García-Canal, E. (2021). Innovation performance feedback and technological alliance portfolio diversity: The moderating role of firms' R&D intensity. *Research Policy, 50*(9), 104321. https://doi.org/10.1016/j.respol.2021.104321

McCormick, M., & Fernhaber, S. A. (2018). Are growth expectations being met? Implications for the internationalization of micro-sized ventures. *Small Business Economics, 50*(3), 591–605. https://doi.org/10.1007/s11187-017-9909-z

Melo Filho, C. R., Salgado, L. H., Sato, R., & Oliveira, A. V. M. (2014). Modeling the effects of wage premiums on airline competition under asymmetric economies of density: A case study from Brazil. *Journal of Air Transport Management, 36*, 59–68. https://doi.org/10.1016/j.jairtraman.2013.12.010

Migliori, S., De Massis, A., Maturo, F., & Paolone, F. (2020). How does family management affect innovation investment propensity? The key role of innovation impulses. *Journal of Business Research, 113*, 243–256. https://doi.org/10.1016/j.jbusres.2020.01.03

Miller, D., & Le Breton-Miller, I. (2005). *Managing for the long run: Lessons in competitive advantage from great family businesses*. Harvard Business School Press.

Miller, D., Le Breton-Miller, I., & Scholnick, B. (2008). Stewardship vs. stagnation: An empirical comparison of small family and non-family businesses. *Journal of Management Studies, 45*(1), 51–78. https://doi.org/10.1111/j.1467-6486.2007.00718.x

Mondolo, J. (2022). Product and labour market imperfections in the Italian manufacturing sector: A firm-level analysis. *Economia Politica-Journal of Institutional and Analytical Economics, 39*, 813–838. https://doi.org/10.1007/s40888-022-00280-w

Ng, D. W. L., Duarte Alonso, A., Bressan, A., Vu, O. T. K., Tran, T. D., & Atay, E. (2022). Businesses and their community in times of COVID-19: A stakeholder theory approach. *European Business Review, 34*(6), 798–818. https://doi.org/10.1108/EBR-03-2022-0060

Olley, S., & Pakes, A. (1996). The dynamics of productivity in the telecommunications equipment industry. *Econometrica, 64*, 1263–1297. https://doi.org/10.2307/2171831

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. John Wiley and Sons Inc.

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying business models: Origins, present, and future of the concept. *Communications of the Association for Information Systems, 16*(1), 1–25. https://doi.org/10.17705/1CAIS.01601

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

Petrin, A., & Levinsohn, J. (2012). Measuring aggregate productivity growth using plant-level data. *RAND Journal of Economics, 43*(4), 705–725. https://doi.org/10.1111/1756-2171.12005

Ploeg, M., Knoben, J., & Vermeulen, P. (2022). We are in it together: Communitarianism and the performance-innovation relationship. *Research Policy, 51*(5), 104507. https://doi.org/10.1016/j.respol.2022.104507

Qi, Y., & Wu, J. (2022). Performance feedback, succession process and innovative activities of family firms: Evidence from China. *Asian Business and Management*. https://doi.org/10.1057/s41291-022-00192-4

Ramdani, B., Binsaif, A., & Boukrami, E. (2019). Business model innovation: A review and research agenda. *New England Journal of Entrepreneurship, 22*, 89–108. https://doi.org/10.1108/NEJE-06-2019-0030

Ref, O., Feldman, N. E., Iyer, D. N., & Shapira, Z. (2021). Entry into new foreign markets: performance feedback and opportunity costs. *Journal of World Business, 56*(6), 101258. https://doi.org/10.1016/j.jwb.2021.101258

Rhee, L., Ocasio, W., & Kim, T.-H. (2019). Performance feedback in hierarchical business groups: The cross-level effects of cognitive accessibility on R & D search behaviour. *Organization Science, 30*(1), 51–69. https://doi.org/10.1287/orsc.2018.1237

Rowley, T. W., Shipilov, A. V., & Greve, H. R. (2017). Board reform versus profits: The impact of ratings on the adoption of governance practices. *Strategic Management Journal, 38*(4), 815–833. https://doi.org/10.1002/smj.2545

Russo, F., & Stasi, M. L. (2016). Defining the relevant market in the sharing economy. *Internet Policy Review, 5*(2), 1–13. https://doi.org/10.14763/2016.2.418

Saemundsson, R., Candi, M., & Sigurjonsson, T. O. (2022). The influence of performance feedback and top management team orientation on decisions about R&D in technology-based firms. *Technovation, 113*, 102420. https://doi.org/10.1016/j.technovation.2021.102420

Salvato, C., Chirico, F., & Sharma, P. (2010). Understanding exit from the founder's business in family firms. *Advances in Entrepreneurship, Firm Emergence and Growth, 12*, 31–85. https://doi.org/10.1108/S1074-7540(2010)0000012005

Salvato, C., Sargiacomo, M., Amore, M. D., & Minichilli, A. (2020). Natural disasters as a source of entrepreneurial opportunity: Family business resilience after an earthquake. *Strategic Entrepreneurship Journal, 14*, 594–615. https://doi.org/10.1002/sej.1368

Santulli, R., Gallucci, C., Torchia, M., & Calabrò, A. (2022). Family managers' propensity towards mergers and acquisitions: The role of performance feedback. *Journal of Small Business and Enterprise Development, 29*(2), 293–310. https://doi.org/10.1108/JSBED-01-2019-0033

Saqib, N., & Satar, M. S. (2021). Exploring business model innovation for competitive advantage: A lesson from an emerging market. *International Journal of Innovation*

Science, 13(4), 477–491. https://doi.org/10.1108/IJIS-05-2020-0072

Schulze, W. S., Lubatkin, M. H., & Dino, R. N. (2003). Exploring the agency consequences of ownership dispersion among inside directors at family firms. *Academy of Management Journal, 46*(2), 179–194. https://doi.org/10.5465/30040613

Schweizer, L. (2005). Concept and evolution of business models. *Journal of General Management, 31*(2), 37–56. https://doi.org/10.1177/030630700503100203

Shipilov, A. V., Li, S. X., & Greve, H. R. (2011). The prince and the pauper: Search and brokerage in the initiation of status-heterophilous ties. *Organization Science, 22*(6), 1418–1434. https://doi.org/10.2139/ssrn.1609591

Siebels, J. F., & Knyphausen-Aufseβ, D. (2012). A review of theory in family business research: The implications for corporate governance. *International Journal of Management Reviews, 14*(3), 280–304. https://doi.org/10.1111/j.1468-2370.2011.00317.x

SobrepereiProfitos, X., Keil, T., & Kuusela, P. (2022). The two blades of the scissors: Performance feedback and intrinsic attributes in organizational risk taking. *Administrative Science Quarterly, 67*(4), 1012–1048. https://doi.org/10.1177/00018392221117996

Soluk, J., Kammerlander, N., & De Massis, A. (2021). Exogenous shocks and the adaptive capacity of family firms: Exploring behavioral changes and digital technologies in the COVID-19 pandemic. *R&D Management, 51*(4), 364–380. https://doi.org/10.1111/radm.12471

Sudrajad, O. Y., & Hübner, G. (2019). Empirical evidence on bank market power, business models, stability and performance in the emerging economies. *Eurasian Business Review, 9*, 213–245. https://doi.org/10.1007/s40821-018-0112-1

Sun, Y., & Qiu, Z. (2022). Positive performance feedback and innovation search: New ideas for sustainable business development. *Sustainability (switzerland), 14*(4), 2086. https://doi.org/10.3390/su14042086

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning, 43*(2–3), 172–194. https://doi.org/10.1016/j.lrp.2009.07.003

Vissa, B., Greve, H. R., & Chen, W. (2010). Business group affiliation and firm search behaviour in India: Responsiveness and focus of attention. *Organization Science, 21*(3), 696–712. https://doi.org/10.1287/orsc.1090.0475

Waldner, F., Poetz, M. K., Grimpe, C., & Eurich, M. (2015). Antecedents and consequences of business model innovation: The role of industry structure. *Advances in Strategic Management, 33*, 347–386. https://doi.org/10.1108/S0742-332220150000033009

Wan, L., Li, R., & Chen, Y. (2022). Negative performance feedback and corporate venture capital: The moderating effect of CEO overconfidence. *Applied Economics, 54*(16), 1829–1843. https://doi.org/10.1080/00036846.2021.1982133

Wang, Y., Wang, X. & Xu, W. (2021). How does negative performance feedback affect a firm's openness in its innovation search behaviour? The moderating role of organisational slack. *Technology Analysis and Strategic Management*. https://doi.org/10.1080/09537325.2021.1976405

Wannakrairoj, W., & Velu, C. (2021). Productivity growth and business model innovation. *Economics Letters, 199*, 109679. https://doi.org/10.1016/j.econlet.2020.109679

Wennberg, K., & Holmquist, C. (2008). Problemistic search and international entrepreneurship. *European Management Journal, 26*(6), 441–454. https://doi.org/10.1016/j.emj.2008.09.007

Wooldridge, J. (2009). On estimating firm-level production functions using proxy variables. *Economics Letters, 104*(3), 112–114. https://doi.org/10.1016/j.econlet.2009.04.026

Wunker, S. (2012). Better growth decisions: Early mover, fast follower or late follower? *Strategy & Leadership, 40*(2), 43–48. https://doi.org/10.1108/10878571211209341

Xie, E., Huang, Y., Stevens, C. E., & Lebedev, S. (2019). Performance feedback and outward foreign direct investment by emerging economy firms. *Journal of World Business, 54*(6), 101014. https://doi.org/10.1016/j.jwb.2019.101014

Zahra, S. A., Hayton, J. C., Neubaum, D. O., Dibrell, C., & Craig, J. (2008). Culture of family commitment and strategic flexibility: The moderating effect of stewardship. *Entrepreneurship Theory and Practice, 32*(6), 1035–1054. https://doi.org/10.1111/j.1540-6520.2008.00271.x

Zellweger, T. M., Kellermanns, F. W., Chrisman, J. J., & Chua, J. H. (2012). Family control and family firm valuation by family CEOs: The importance of intentions for transgenerational control. *Organization Science, 23*, 851–868. https://doi.org/10.1287/orsc.1110.0665

Zhong, X., Chen, W., & Ren, G. (2022). The impact of innovation aspiration shortfall and CEO origin on emerging economy firms' international expansion: Evidence from China. *International Marketing Review, 39*(6), 1309–1330. https://doi.org/10.1108/IMR-12-2021-0365

Zott, C., & Amit, R. (2007). Business model design and the performance of entrepreneurial firms. *Organization Science, 18*(2), 181–199. https://doi.org/10.1287/orsc.1060.0232

Zott, C., Amit, R., & Massa, L. (2011). The business model: Recent developments and future research. *Journal of Management, 37*(4), 1019–1042. https://doi.org/10.1177/0149206311406265