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Building a resilient organization through a pre-shock strategic emphasis on innovation

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Abstract

Why are some firms more resilient when systemic shocks like the Global Financial Crisis (GFC) or COVID-19 pandemic set in? We approach this question by arguing that a firm's pre-shock strategic emphasis on innovation can mitigate the consequences of such shocks by facilitating stability and flexibility, major components of organizational resilience, as the shock sets in. We test our arguments empirically by analyzing data from 2003 to 2011 on as many as 994 firms from the S&P 1500 to identify the causes of their resilience during the 2008 GFC. Our findings indicate that pre-shock product introductions and, to some extent, top management's focus on innovation can facilitate stability and flexibility when a shock occurs, while R&D intensity and patents, other dimensions of a strategic emphasis on innovation, do so only when firm profitability before the shock is low. In this way, we direct innovation research's attention to the additional performance benefits of innovation activities when shocks occur and reveal which dimensions of a strategic emphasis on innovation buffer the negative consequences of a shock, thus providing insights into how innovation helps firms be resilient. Further, our theorizing and empirical findings unveil an intriguing paradox: While existing research tends to find positive associations between innovation and profitability in "regular" times, strong pre-shock profitability impairs innovation's ability to unfold its effects fully at shock onset.

KEYWORDS

new product introductions, organizational resilience in times of crisis, patents, R&D intensity, top management focus on innovation

1 | INTRODUCTION

The COVID-19 pandemic is the most recent example of a systemic shock with a global reach, yet far from the first one. In only the past 50 years, economies have dealt with many such shocks, including the OPEC Oil Price Shock (1973), the International Debt Crisis (1982), Black Monday (1987), the Asian Crisis (1997), the dot-com bubble (2000), the 9/11 attacks (2001), the Global Financial Crisis (GFC, 2008), and the COVID-19 pandemic. While such systemic shocks always threaten negative effects on many firms, some firms are better able to sustain their businesses and rebound from them than others. According to the theory of organizational resilience (Gittell et al., 2006; Sutcliffe & Vogus, 2003), a firm's pre-shock features can determine how well it endures and

recovers from such shocks. The literature identifies empirically a set of pre-shock features, especially its corporate social responsibility (DesJardine et al., 2019), its corporate governance structure (Buyl et al., 2019), and its CEO's characteristics (Patel & Cooper, 2014; Sajko et al., 2021), that help it endure shocks and bounce back from them.

Unknown, however, is whether a pre-shock strategic emphasis on innovation, a major success factor in "regular" times (Rubera & Kirca, 2012), can foster organizational resilience during and after a shock. Sparing monetary resources and pursuing more down-to-earth activities may appear better preparations for possible shocks than investing in R&D and innovation (Archibugi et al., 2013). However, a pre-shock strategic emphasis on innovation may equip firms with such resources as ideas, technologies, stakeholder relationships, and innovation-friendly values, all of which might be helpful in mitigating the negative consequences of a shock.

To address this discussion, we investigate several dimensions of a firm's pre-shock strategic emphasis on innovation. We relate to organizational resilience the resources that originate from innovation input (measured as R&D intensity), innovation output (measured as patents and product introductions), and top management's innovation focus (Griliches, 1998; Matzler et al., 2015; Rosenbusch et al., 2011). To capture organizational resilience, we follow DesJardine et al. (2019) and Sajko et al. (2021) in differentiating between stability, which manifests in reduced severity of losses, and flexibility, which manifests in faster recovery to the pre-shock state.

While we expect generally positive associations, we embed our investigations in a contingency perspective by arguing that a firm's pre-shock profitability plays a major role in the effects of a pre-shock emphasis on innovation on the firm's resilience when a shock sets in. In line with the behavioral theory of the firm (Gavetti et al., 2012), Haleblian and Rajagopalan (2005) argue that strong firm performance increases persistence in a firm's behaviors and how it uses resources, while weak firm performance increases its openness to new approaches (Yu et al., 2019). Based on this notion and that leveraging pre-shock innovation-related resources requires a willingness to change, restructure, and shuffle innovation resources to respond to the shock and the dramatic change of conditions it entails (Vogus & Sutcliffe, 2007), we theorize that the resources a pre-shock strategic emphasis on innovation provides are particularly effective in creating organizational resilience when pre-shock firm profitability is not strong. We test our arguments by analyzing data from 2003 to 2011 on as many as 994 firms from the S&P 1500 to identify the causes of their resilience (or lack thereof) during the 2008 GFC that started on September 17, 2008, following Bank of America's acquisition of Merrill Lynch and Lehman Brothers' bankruptcy filing, both on September 15, 2008, and the U.S. Federal Reserve's bailout of American International Group (AIG) on September 16, 2008.

Practitioner points

- Innovation can mitigate the negative consequences of crises.
- A strategic emphasis on innovation, especially the associated skills, processes and experiences, can serve as a kind of "insurance" against the next systemic shock. Executives who hesitate to dedicate resources and budgets to innovation should keep this additional benefit in mind.
- Success can lead to underestimating innovation's potential. Firms with strong pre-shock performance should be aware of this potential "persistence trap" and find means to activate these innovation resources when the inevitable shock occurs.

We contribute to research in three ways. First, while research has investigated innovation's performance implications in "regular" times (Rosenbusch et al., 2011; Rubera & Kirca, 2012), research on innovation's role in absorbing the effects of shock is absent. We investigate this role of innovation using an organizational resilience lens (Ortiz-de-Mandojana & Bansal, 2016), which directs our attention to innovation's potential to foster stability and flexibility when a shock sets in.

Second, we highlight an intriguing paradox in innovation's performance consequences in "regular" times and in times of crisis.[1] While existing research and our study find some positive associations between a strategic emphasis on innovation and profitability in "regular" times (Rubera & Kirca, 2012), our theorizing based on the behavioral theory of the firm (e.g., Gavetti et al., 2012) argues (and our empirical findings demonstrate) that strong pre-shock profitability, for example, by increasing strategic persistence, can impair innovation's ability to unfold its performance effects fully when a crisis sets in and conditions change dramatically.

Third, we inform the literature on crisis management that the pre-shock level of firm profitability is a contingency factor in the effectiveness of antecedents that may

[1]We are grateful to an anonymous reviewer for directing our attention to this paradox, which was implied in our arguments and empirical findings.

mitigate the consequences of a shock (Yu et al., 2019). Based on Haleblian and Rajagopalan (2005), we establish theoretically and demonstrate empirically that the resilience-related effect of the pre-shock strategic emphasis on innovation during a systemic crisis is strongest when the firm also faces a firm-level crisis in terms of its individual performance, thus revealing that systemic shocks and firm performance interact.

2 | CONCEPTUAL BACKGROUND AND HYPOTHESES

2.1 | The theory of organizational resilience

Resilience refers to a system's ability to endure even in times of crisis and adversity and to recover after an external systemic shock (van der Vegt et al., 2015; Vogus & Sutcliffe, 2007). In management research, shocks often mean decreased availability of capital and decreased market demand for many organizations. Organizational resilience enables organizations to respond better to such adverse situations and recover more quickly from sudden downturns (Sutcliffe & Vogus, 2003).

Organizational resilience can be conceptualized along two components: stability and flexibility (Ortiz-de-Mandojana & Bansal, 2016; Patel & Cooper, 2014). Stability refers to a firm's immediate reaction to an external shock, where organizations are considered stable if they can keep core functions and processes running during the shock (Weick et al., 1999). Flexibility addresses the post-shock path back to the pre-shock state, where organizations are considered flexible if they implement crisis-related changes quickly enough to adapt to the new situation before damage is done (DesJardine et al., 2019).

Even when organizational resilience is disaggregated into stability and flexibility, it remains a latent construct that cannot be measured directly (Brand & Jax, 2007; Gunderson & Pritchard, 2002). Following DesJardine et al. (2019) and Sajko et al. (2021), we measure a firm's organizational resilience as the reaction of its stock price to a shock. Stock prices reflect investors' evaluation of businesses and their potential and incorporate all new information, including innovation-related information, so these prices reflect firms' overall situation (Hanssens et al., 2009; Sharma & Lacey, 2004). While controlling for many other factors in measuring resilience is necessary, the literature considers "stock prices [to be] among the best measures available to assess resilience in general crises" (DesJardine et al., 2019, p. 1457). The percentage drop in stock price, also referred to as severity of loss, proxies for the stability component, while the number of days it takes a firm's stock price to recover to its pre-shock level, also referred to as time to recovery, proxies for the flexibility component.

Organizational resilience theory argues that an organization's pre-shock features are critical to how it performs once a systemic shock sets in (Sutcliffe & Vogus, 2003). However, van der Vegt et al. (2015) call for more quantitative research to explain what shapes firms' ability to "bounce back" to their original state when a crisis sets in. Some recent research addresses this call by investigating firms' pre-shock features, but four studies from the GFC context are particularly useful to our purpose. DesJardine et al. (2019) analyze how social and environmental practices were related to firms' stability and flexibility during the GFC and find that strategic practices were more effective than tactical practices. Also in the context of the GFC, Sajko et al. (2021) find that firms were less resilient when they were led by greedy CEOs, defined as those who engage in myopic behaviors and neglect corporate social responsibility. Focusing on banks during the GFC, Buyl et al. (2019) find that precrisis CEO narcissism led to a slower recovery. Since this association is mediated by the risk level of bank policies precrisis, the authors see the precrisis depletion of the banks' internal resources as a reason for these findings. Patel and Cooper (2014) show that CEO narcissism was negatively related to stability but positively to flexibility after a shock. While these four studies suggest that a firm's pre-shock features can absorb to some degree a systemic shock's negative consequences for a firm, Linnenluecke's (2017) review reveals that the effects of a firm's pre-shock resources and capabilities have not yet been addressed.

2.2 | Strategic emphasis on innovation and its dimensions

A firm's strategic emphasis results from its decisions about how to compete and how to allocate resources internally (Jaworski & Kohli, 1993; Mizik & Jacobson, 2003). A strategic emphasis on innovation reflects the firm's decision to compete based on innovation and to allocate resources to innovation. Firms with a strong emphasis on innovation usually have the resources and capabilities to adopt new ideas and develop new products (Rosenbusch et al., 2011) and tend to outperform other firms in "regular" times (Sorescu & Spanjol, 2008), especially on metrics that capture innovations' business potential, such as firm value, but also (albeit to a lesser degree) on profitability-related metrics (e.g., Rubera & Kirca, 2012). It is useful to depict the dimensions of strategic emphasis on innovation comprehensively using the process by which innovation inputs (especially R&D intensity) translate into

innovation outputs (especially patents and product introductions), supported by top management's innovation focus (Griliches, 1998; Matzler et al., 2015; Wakasugi & Koyata, 1997).

As an innovation input, R&D intensity captures the resources that a firm allocates to R&D and innovation activities (Sciascia et al., 2015). While R&D intensity does not necessarily translate into innovation outputs, it captures the resources available to the firm to develop new ideas and concepts and familiarize itself with the most recent technologies and scientific progress (DeCarolis & Deeds, 1999), so high R&D intensity adds to a firm's stock of innovation-related knowledge (Artz et al., 2010). Innovation outputs can be reflected in patents and new product introductions. Patents reflect the firm's ability to combine knowledge in a unique, non-obvious way and its willingness to protect its knowledge (Encaoua et al., 2006), while high-quality patents, as reflected, for example, in a high number of forward citations, indicate that the firm has particularly valuable and unique knowledge and technologies. The literature indicates that patents, especially those of high quality, increase the firm's reputation among stakeholders like employees and customers (Sommer et al., 2017). For their part, new product introductions, which refer to the commercialization of ideas into marketable products (Wakasugi & Koyata, 1997), translate into increased customer satisfaction and brand equity and improve employer branding, which attracts talent (Dotzel et al., 2013; Pauwels et al., 2004). Innovation inputs and outputs are embedded in the top management's focus on innovation. When top management has a strong innovation focus, it champions openness to change and experimentation (Garms & Engelen, 2019; Musteen et al., 2010; You et al., 2020). While these dimensions of a strategic emphasis on innovation tend to correlate, individual firms can score differently on these dimensions (Wagner & Wakeman, 2016).

2.3 | Pre-crisis strategic emphasis on innovation and organizational resilience

The theory of organizational resilience proposes that resources that are developed before a shock are needed to facilitate stability and flexibility when a shock occurs (Buyl et al., 2019). Following this notion, we link the resources provided by a pre-shock strategic emphasis on innovation[2] to stability and flexibility as components of organizational resilience. A high degree of stability suggests that firms can maintain their core functions and processes, which reduces the severity of losses when a shock sets in (Sutcliffe & Vogus, 2003). DesJardine et al. (2019) indicate that robust and stable stakeholder relationships, among other factors, facilitate such stability.

High *R&D intensity* before a crisis equips the firm with a pool of ideas and knowledge about, for example, recent technologies and scientific progress (Cui & Xiao, 2019). Even if the ideas and knowledge are not used in products in the precrisis phase, they can help to accommodate shock conditions when a shock occurs, such as by helping customers reduce costs with innovative ideas immediately, thereby keeping existing customers, maintaining the business, and reducing the severity of loss (Roberts, 1991; Shane, 2000). When a firm's pre-shock R&D intensity is low, it must invest to build the ideas and knowledge needed to react to the crisis, thus compromising the stability component of organizational resilience.

We expect that a strong pre-shock stock of *patents*, especially high-quality patents, will absorb the negative effects of a shock, as customers and employees will be likely to remain loyal, leading to stable sales even at the onset of a crisis (Andreassen & Lanseng, 2010). Further, the more patents a firm has, the more opportunities it has to sell or license them to gain immediate cash flows that can be used to mitigate loss and the negative effects of a crisis (Arora et al., 2001) and to increase stability.

Product introductions that are made pre-shock are likely to create for customers an image of an innovative company whose products serve their needs better than its competitors do, increasing customer satisfaction (Rubera & Kirca, 2017), binding customers to the firm when the shock sets in (Stock, 2011), and reducing losses, thus fostering stability. When precrisis product introductions are few or absent, a firm is likely to offer ordinary, even outdated products that customers, who are also hit by the shock and need to streamline their own expenses, might replace with other products after the shock's onset,

[2]To determine whether a strategic emphasis on innovation in a given year is "pre-shock" is only possible after the onset of a shock. Shocks are often unpredictable (Wenzel et al., 2021). For example, while some experts predicted that a virus pandemic was possible at some point, no one could know the exact time and magnitude of the COVID-19-pandemic. The examples in the introductory paragraph of this manuscript are of eight large, systemic crises in the 50 years since the beginning of the 1970s. Assuming that the 5 years before a crisis are "pre-shock" years (Salvato et al., 2020), we conclude that many years were "pre-shock" and that an executive can realistically expect to face about two of such crises within the next decade.

The literature typically considers the 5 years or so preceding a shock as "pre-shock" (Salvato et al., 2020; Wenzel et al., 2021). We also use the 5-year window prior to shock onset to measure the pre-shock strategic emphasis on innovation, but we weigh the scores of the years more immediately preceding the shock more heavily than we do the least recent years (Salvato et al., 2020). We provide robustness checks that use alternative time windows to capture the pre-shock period. See Section 3 for more details.

increasing the firm's vulnerability and losses and decreasing its stability.

Finally, top management that has a pronounced *innovation focus* is likely to inject confidence throughout the firm that it is able and willing to deal with uncertainty (Dyer et al., 2009). Uncertainty is seen as an opportunity, rather than a threat, ensuring that the crisis' onset does not hamstring the entire organization (Tellis et al., 2009). Quick corrective measures to accommodate the crisis enable it to react rapidly with creative ideas to keep customers, increasing stability (Devece et al., 2016). Firms whose top managers do not have an innovation focus are more likely to be paralyzed and destabilized at the onset of a crisis. Therefore, we propose:[3]

> **Hypothesis 1a.** A pre-shock strategic emphasis on innovation is positively associated with organizational stability once a systemic shock sets in.

Flexibility, the second component of organizational resilience, manifests in shortening the time for a firm to return to its state before the shock (Brand & Jax, 2007; Patel & Cooper, 2014). Positive stakeholder relationships are, again, major drivers of this type of organizational resilience (DesJardine et al., 2019). Available resources (e.g., knowledge, technologies) at a shock's onset help the firm adapt to the new situation and speed recovery.

When a firm has invested in *R&D* before a shock, it is likely to have extant ideas and ongoing R&D projects (Cui & Xiao, 2019; Ferrier, 2001) that can be recombined in innovative ways to deal with the new situation, enabling solutions that are tailored to the new situation and that speed recovery. When a firm has little prior knowledge about, for example, recent technologies and scientific progress and few ideas, it has a limited basis for such novel recombinations and few ideas about how to shuffle products and market offerings. Therefore, longer development cycles for new ideas are required, which curbs flexibility and recovery efforts.

The more *patents* a firm has before a shock, the more unique knowledge and technology it has on which it can build, the greater its experience with pursuing knowledge combinations when a shock sets in, the shorter the time until it introduces the new offerings that will speed its recovery (Arora & Ceccagnoli, 2006; Artz et al., 2010). Further, high-quality patents that have been acquired pre-shock enhance a firm's reputation and facilitate the quest for partners (Hsu & Ziedonis, 2013) that can help to accelerate the development of new products or services. When a firm has few or no pre-shock patents, it needs time to develop the new knowledge that will help it recover and regain its previous performance levels, slowing recovery.

The more *product introductions* a firm has pursued pre-shock, the more experience it has with customer preferences, their reactions to new products, and distribution partners, all of which facilitate the speedy development and introduction of new products (Artz et al., 2010; Kalia & Ahuja, 2002) that are adapted to shock conditions, enabling quick recovery. When a firm has introduced only a few products before the shock's onset, it has little current knowledge about and experience with customer reactions and few established processes and partnerships with which to bring to the market new products that are tailored to the crisis conditions. The resulting long development cycles limit its flexibility.

Finally, top management teams that have an *innovation focus* promote experimentation and openness to new solutions (Kuratko et al., 2011) that enable their firms to develop new solutions that are tailored to the new situation and speed recovery (Dyer et al., 2009). Such openness enables firms to pursue cooperation with external partners and to use their resources to deal with the new conditions jointly and flexibly. Further, such top management teams' attention to innovative solutions increases the chances of finding new products that address the conditions of the shock (Ortiz-de-Mandojana & Bansal, 2016), increasing the capability to react quickly and flexibly. Overall, then, we expect:

> **Hypothesis 1b.** A pre-shock strategic emphasis on innovation is positively associated with organizational flexibility once a systemic shock sets in.

2.4 | The moderating role of a firm's pre-shock profitability

To add precision to our research model, we investigate the role of pre-shock profitability as a major indicator of the firm's financial situation before a shock sets in (Yu et al., 2019). Existing research on crisis management shows that pre-shock profitability is often directly and positively related to organizational stability and flexibility after a systemic shock sets in (e.g., DesJardine et al., 2019; Gittell et al., 2006). Firms that have strong pre-shock profitability tend to be healthy businesses that can react effectively when a crisis occurs. Such firms tend to have the

[3]We state overarching hypotheses that relate the pre-shock emphasis on strategic innovation to organizational resilience's components but test later the associations between the various dimensions of this strategic emphasis (e.g., R&R intensity, patents) individually to unveil the nuances of these associations and to determine which facets of such a strategic emphasis drive the outcome variables.

financial means to keep existing resources or even acquire new resources to help them react to the shock, facilitating stability and flexibility at the shock's onset. This notion, empirically backed by existing studies, suggests that pre-shock profitability can be a positive and direct driver of our dependent variables.[4]

However, the question arises concerning whether pre-shock innovation and pre-shock profitability interact. Implicit in our argumentation about how the dimensions of a strategic emphasis on innovation translate into resilience at the onset of a shock is innovative firms' ability and willingness to recombine, shuffle, and use the innovation-related resources they built before the shock to accommodate the new conditions, mitigate its consequences, and recover quickly. While one might argue that firms can leverage their pre-shock innovations best when they are performing well (e.g., because of efficient processes), such firms may not always be willing or able to employ their innovation-related resources and capabilities in new ways once the shock sets in, which may reduce these resources' value in facilitating organizational resilience. This notion is in line with the behavioral theory of the firm, which suggests that past performance influences whether the firm is able to change strategically and use resources in new ways (Audia et al., 2000; Gavetti et al., 2012; Yu et al., 2019). Specifically, weak performance increases a firm's willingness to recombine and reshuffle its resources to accommodate the new conditions that are triggered by a crisis, facilitating a strategic emphasis on innovation's effect on resilience once a shock sets in.

This effect occurs for two reasons. First, past profitability influences whether a firm fully recognizes the shock and its severity. While the repercussions of such major shocks as the GFC are evident in retrospect (Bundy & Pfarrer, 2015), individual firms might have struggled to understand the crisis's severity at its onset. Many experts were surprised by the GFC, so it is reasonable to assume that many firms were also surprised by the timing and magnitude of its onset (DesJardine et al., 2019). Haleblian and Rajagopalan (2005) argue that firms sometimes see crises, especially systemic crises like recessions and other economic crises that affect entire industries or countries, as likely to be transitory and not relevant to themselves, a notion that applies particularly when pre-shock profitability was strong. Strong past profitability can result in decreased information-seeking, which might lead to a firm's ignoring early alerts and the new environmental conditions and might hamstring the resources provided by the pre-shock strategic emphasis on innovation in accommodating the changed conditions.

Second, the behavioral theory of the firm suggests that firms use their past performance and feedback about it to adjust their strategic approaches (Gavetti et al., 2012), including decisions about changes in their use of resources and capabilities. A firm that has enjoyed years of strong profitability before a shock can face pronounced resistance to strategic change when a shock occurs and could need time to understand the new conditions before it switches to crisis mode (Rajagopalan & Spreitzer, 1997; Zajac & Kraatz, 1993). Such a firm may be satisfied with its situation and conclude that its pre-shock approaches are still effective. As Miller and Chen (1994) argued "success can make managers so complacent, so content with the status quo that they resist change" (p. 3), reducing the effect of the resources gained from a pre-shock strategic emphasis on innovation.

Specifically, we expect that strong pre-shock *R&D intensity* translates more strongly into stability at the onset of a shock when a firm was performing poorly before the shock than if it had been performing well. In this case, the firm is likely to be more willing to apply the ideas generated by strong R&D intensity pre-shock and to introduce new products to accommodate the new situation, thus facilitating stability. When a firm's pre-shock profitability is strong, it is less likely to be willing to tap into such ideas and knowledge to deal with the new conditions, which interferes with the corrective action needed to ensure stability at the onset of a shock.

Patents translate into more stability only when the knowledge and technologies described in these patents are combined to create new ideas that are actually used in the marketplace (Artz et al., 2010; Srinivasan et al., 2008). When precrisis profitability is already low, the willingness to give up technologies that have been used heavily or to scan the patent portfolio for unused knowledge is greater (Haleblian & Rajagopalan, 2005; Yu et al., 2019), while such shifts in technology trajectories are less likely when the firm is riding high when the shock sets in.

Pre-shock *product introductions* may increase customer satisfaction, but active management may be required to leverage the increase fully (Stock, 2011). When a firm's pre-shock profitability is low, the firm is likely to have been on alert before the crisis' onset and to have reached out to customers to deepen relationships, thus increasing the loss-limiting effect of product introductions. However, when the firm is financially successful before a shock, it is less likely to have worked to deepen customer relationships, so competitors may have an opportunity to win the firm's customers over by

[4]While we do not present a hypothesis for pre-shock profitability's direct effect on performance at a crisis's onset, we capture the effect of pre-shock profitability on organizational resilience by means of a control in the regression analyses and find significant and positive direct effects. For more details, see Tables 3 and 4 in "Section 4."

making offers that reflect the new conditions, thus limiting the potential of the firm's product introductions to reduce the severity of losses and ensure stability when a crisis occurs.

We argued that *top management's focus on innovation* increases a firm's stability by, for example, injecting values like openness to new ideas into its communication and behaviors, which serve as reference points for employees' behaviors and decisions (Gumusluoglu & Ilsev, 2009; Yadav et al., 2007). We expect that such effects are particularly strong when a firm's pre-shock profitability is low and a shock's onset brings completely new conditions. In this case, the firm is uncertain about its prospects and needs direction, so middle managers and employees act decisively on what top management suggests (Kuratko et al., 2011). In addition, in such cases, the necessity to adapt (e.g., by turning to brainstorming for ideas to address the shock with corrective measures) is greater, increasing the effect of top management's focus on innovation and increasing stability. Therefore, we propose:

> **Hypothesis 2a.** The positive association between a pre-shock strategic emphasis on innovation and organizational stability is stronger when the firm's profitability before the shock is low.

Pre-shock *R&D intensity* provides insights into technology trends and a pool of ideas to pursue when a shock occurs (Artz et al., 2010; DeCarolis & Deeds, 1999), but such intangible resources translate into flexibility only when they are used to accommodate the new situation the shock brings about. Deployment of combinations of pre-shock ideas and technology insights is more likely when a firm's pre-shock profitability is low than when it is high as the duration and magnitude of the combined firm-level and systemic crises are likely to be significant, which increases the firm's willingness to change and adapt to the shock quickly and, thus, the chances of a speedy recovery.

A stock of (high-quality) *patents* enhances a firm's reputation and its access to partners with which to pursue joint projects and react flexibly to a shock's onset. However, even a good reputation requires that the firm reaches out to potential partners and is open to new cooperation (Wassmer, 2010). When a firm's pre-shock profitability is low, leveraging the firm's reputation and engaging in such activities are likely to be more important than when the firm's pre-shock profitability is high. In addition, strong pre-shock firm profitability may mask the consequences of a shock and lead to persistence in the kinds of behaviors (Lant & Mezias, 1992) that reduce the likelihood that the firm will react flexibly to new conditions by using existing patents' potential to speed recovery.

A high number of precrisis *product introductions* can increase flexibility because of the connections built with customers and distribution partners pre-crisis (Bhattacharya & Sen, 2003). A firm whose profitability before the crisis is low is likely to be willing to tap into these networks when a shock occurs to generate the new insights that will speed recovery, even if doing so means it must give up proprietary product features.

For the effect on the flexibility of *top management's focus on innovation* to unfold, middle management and employees must fully embrace values like experimentation and openness to change (Kuratko et al., 2011). When the firm is not riding high pre-shock, these groups are likely to have accepted the necessity to engage in innovation-related behaviors and to have already done so. Therefore, poorly performing firms may be able to count on such values as drivers of firm-level behavior at the onset of a shock, speeding recovery, while such effects are reduced when profitability was not a factor before the shock. Overall, then:

> **Hypothesis 2b.** The positive association between a pre-shock strategic emphasis on innovation and organizational flexibility is stronger when the pre-shock firm profitability is low.

We summarize our research model in Figure 1.

3 | METHODOLOGY

3.1 | Sample

The GFC is an appropriate setting for testing our hypotheses as it was unprecedented in its magnitude, had a broad impact across industries, and happened unexpectedly. In line with prior work, we define September 17, 2008, as the starting date of the GFC, as that date followed both Bank of America's acquisition of Merrill Lynch and Lehman Brother's bankruptcy filings on September 15, 2008, and the U.S. Federal Reserve's bailout of AIG on September 16, 2008 (DesJardine et al., 2019). Investors withdrew $144 billion from U.S. money market funds on the next day, freezing the short-term lending market that corporations need to fund their daily operations (Gullapalli & Anand, 2008).

We constructed a cross-sectional sample of public U.S. corporations listed on the S&P 1500 by identifying the 1497 companies that were part of the S&P 1500 Composite Index as of September 16, 2008, 1 day before the GFC's onset. Then, we added information from eight data

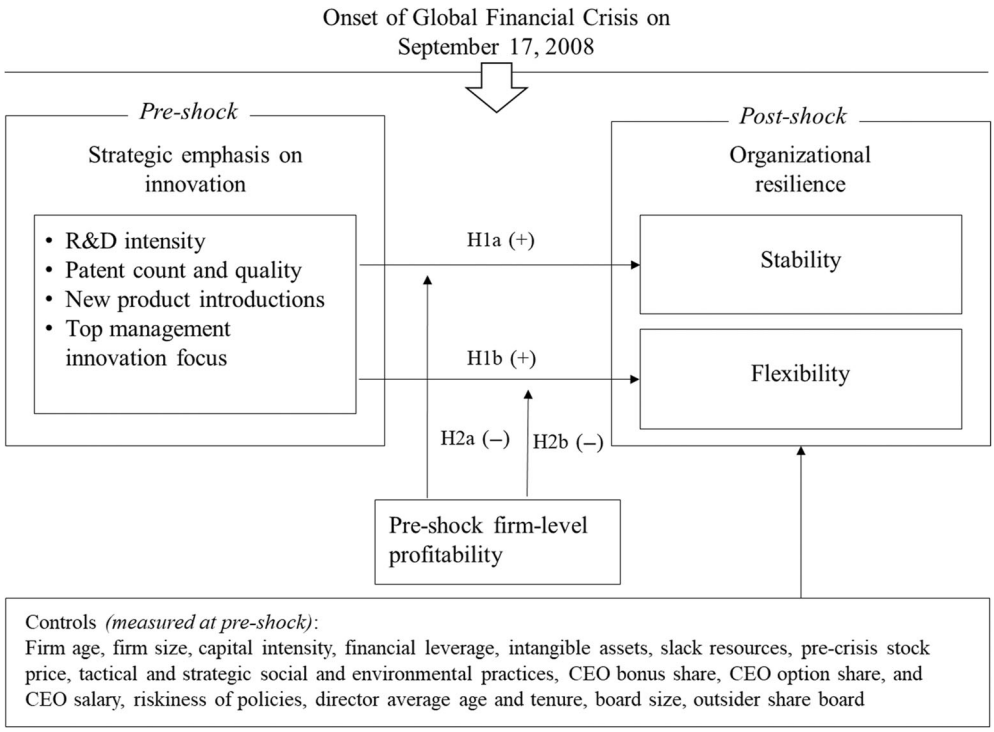

FIGURE 1 Overview of research model.

sources to construct the required dependent, independent, and control variables. First, we added the entire Compustat database to our sample to obtain information on control variables and the firms' R&D expenses. Then we added daily stock price information from the Center of Research in Security Prices (CRSP) and found one security per company for 1343 of the firms and up to four securities for the remaining 154 companies. As companies' primary motivation for introducing additional share classes is to equip them with particular voting and dividend characteristics and these characteristics influence share price and stock performance, we worked with trading-volume-weighted stock prices to blend differences in stock prices and relative performance over time. Our stock price-based measures share the same characteristics as those calculated by DesJardine et al. (2019) and Sajko et al. (2021). Next, we obtained patent data from the United States Patent and Trademark Office (USPTO) and included application, filing, and citation information. To ensure high-quality mapping, we linked Compustat and USPTO data with a publicly available crosswalk created and maintained by Kogan et al. (2017), verified 10% of the matches manually, and ran a statistical test to identify differences in means. In the next step, we used firms' public annual reports to measure strategy-related constructs using text analysis (McKenny et al., 2018) and added data from RavenPack News Analytics, which captures press releases and news articles from business newswires like *The Wall Street Journal* and *Dow Jones Newswires* (Guo et al., 2019). RavenPack's patented algorithm classifies news articles using a taxonomy of actions that overcomes manual coding challenges (Hill et al., 2019). These were available for a subset of 424 S&P 500 firms in our sample. Finally, we added information on top management team level, board-level, and firm-level control variables from Execucomp, Boardex, and KLD.[5]

We dropped seven firms because of inconsistencies between data sources and dropped all firms with missing

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data on the variables in our models, resulting in a sample of 1017 firms. Missing data on our independent variables further reduced our sample to 994 firms for top management focus on innovation, 586 firms for patent count, 573 firms for patent quality, 487 firms for R&D intensity, and 424 firms for new product introductions. We ran our models with observation windows ranging from 1 to 5 years for the pre-shock period (2003–2007) and 1 to 3 years for the post-shock period (2008–2011).

3.2 | Measures

3.2.1 | Dependent variables

Stability

Following DesJardine et al. (2019) and Sajko et al. (2021), we measured stability by computing the severity of loss as the absolute percentage change in each company's stock price between the closing price prior to the onset of the GFC (as of September 16, 2008) and the lowest point the stock reached in the following 12-month period (until September 16, 2009). We adopted the 1-year observation window established in related studies (e.g., Sajko et al., 2021) to reduce the likelihood that adverse events other than the GFC triggered a stock price minimum.

Flexibility

We followed DesJardine et al. (2019) and Sajko et al. (2021) in measuring flexibility (the time to recovery) as the number of days before a company's stock regained its precrisis level, that is, its closing price as of September 16, 2008. We limited the time for the stock price recovery to the first 3 years following the crisis' onset.

3.2.2 | Independent variables

We determined the firms' pre-shock strategic emphasis on innovation over several years before the shock, with the most recent scores—those for the years immediately preceding the shock—weighed more heavily than those for more distant years. We applied the perpetual inventory formula with a constant depreciation rate (δ); this method is regularly employed to accumulate innovation-related data (e.g., Sandner & Block, 2011). Following Griliches (1981), we used a depreciation rate of 15%, as shown in Equation (1):

$$p_t^{\text{stock}} = p_t^{\text{flow}} + (1-\delta) \times p_{t-1}^{\text{stock}}. \quad (1)$$

We measured the independent variables over the immediate 5-year precrisis period (Salvato et al., 2020) to reflect that the transformation of innovation efforts into knowledge and skills as an ongoing process (Simeth & Cincera, 2015). Depending on data availability, we reran our models with 1- and 3-year observation windows to test for robustness.

R&D intensity

We operationalized R&D intensity by accumulating yearly R&D expenditure according to Equation (1) and applied a $\log(1+x)$ transformation.

Patents

We measured patent activity by a count, as well as a quality measure (Savage et al., 2020). With regard to patent count, we accumulated yearly patent count figures according to Equation (1) and applied a $\log(1+x)$ transformation. As the patenting process from application to publication may last months or years, we determined the application date to be relevant for constructing yearly count figures. With regard to patent quality, we built on yearly forward citation counts according to Equation (1) and applied a $\log(1+x)$ transformation. Researchers use forward citations with varying intents, but all have in common that they relate to the quality and impact of innovation outcomes (e.g., Kotha et al., 2011). When counting forward citations, we excluded self-citations but considered all forward citations that appeared within 12 years of the application filing date and assigned the count to the patent's application year.

Product introductions

We measure product innovations using RavenPack News Analytics, which classifies corporate news into categories. RavenPack was first used in the finance literature and is now increasingly used in management research (e.g., Guo et al., 2019). The data are more accurate than manual coding, as it avoids missing sources and counting the same news repeatedly (e.g., Hill et al., 2019). The product introductions category has been used and validated in the marketing literature (Varma et al., 2023; see especially Warren & Sorescu, 2017).

Top management's focus on innovation

We built on a long tradition of research that identifies top management's priorities by analyzing top managers' writings (Short et al., 2010). A range of studies shows that top managers are heavily involved in crafting their firms' annual reports and that the words in these reports reflect top managers' focus in their daily decisions (e.g., Devinney & Kabanoff, 1999). We used the firms' annual reports and applied the dictionary Eklund and Mannor (2021) propose for product innovation strategies (with such

keywords and word stems as innov*, R&D, and invent*).[6] This dictionary was developed following established approaches to computer-aided text analysis, as suggested by Short et al. (2010), including discussing the terms with a panel of experts and applying them to transcripts of analysts' calls to gage the terms' validity.

3.2.3 | Moderating variable

We captured the firms' pre-shock profitability by measuring their profitability as the ratio of earnings before interest, tax, depreciation, and amortization (EBITDA) to the book value of total assets in the 5 years before the GFC shock's onset. The literature indicates that profitability is the major metric along which firms evaluate their short-term performance (Chen & Hambrick, 2012). In particular, several years of low or negative profitability are a clear indication of firm-level issues that put decision-makers on alert (Yu et al., 2019). We took several years into account to avoid outliers that were due to events not immediately related to the firms' health.

3.2.4 | Control variables

To understand the contribution of a strategic emphasis on innovation to organizational resilience, we adopted the controls firm age, firm size, capital intensity, financial leverage, intangible assets, slack resources, and precrisis stock price from DesJardine et al. (2019). We controlled for *firm age*, the difference between 2008 and the year in which Compustat first covered the company, as older firms have experienced crises, so they are likely to have acquired the skills and knowledge to react effectively to adverse events. *Firm size*, as the natural logarithm of assets, acknowledges that smaller businesses are hit particularly hard during downturns. We controlled for *capital intensity*, the ratio of capital expenditure to the book value of total assets, as Gittell et al. (2006) find that capital-intensive airlines performed worse after the 9/11 attacks than those with less capital employed. We controlled for *financial leverage*, measured as the ratio of long-term debt to the book value of total assets, as less leveraged firms obtain a smaller portion of their financing needs from debt, so if investors prefer safer investments during economic crises, highly leveraged firms are hit harder and recover later. We controlled for *intangible assets*, measured as the natural logarithm of market value per share to book value per share, as it captures that premium investors are willing to pay for goodwill, brand recognition, and corporate reputation (Fombrun et al., 2000). We controlled for *slack resources* as the ratio of long-term debt to market value of equity, which affects the available (monetary) resources with which to react when a shock sets in. Finally, we controlled for *pre-crisis stock price* as the closing stock price as of September 16, 2008, which accounts for absolute price levels.

We also used as controls several variables that existing studies treat as main effects that explain stability and flexibility in shocks, especially in the GFC context. Inspired by DesJardine et al. (2019), we controlled for *strategic social and environmental practices* (SSEP), measured as the sum of strengths in the domains of environment, diversity, employee relations, human rights, product quality and safety, and corporate governance, based on KLD STATS. We also controlled for *tactical social and environmental practices* (TSEP), measured as the sum of strengths in the domain of community development, based on KLD STATS. Following Sajko et al. (2021), we controlled for *CEO bonus share*, *CEO option share*, and *CEO salary share*. Following Buyl et al.'s (2019) finding that the *riskiness of policies* before the shock is an important antecedent to organizational resilience, we controlled for this risk using Eklund and Mannor's (2021) text-based measure "financial and risk management strategies" and applied this measure to the firms' annual reports. We also controlled for the corporate-governance-related variables (Buyl et al., 2019) *directors' average age* and *tenure*, *board size*, and *share of outsiders on the board* (Terbeck et al., 2021).

We defined *industry dummies* as the firms' two-digit Standard Industrial Classification codes. These dummies absorb all effects that are specific to an industry and consider that investors may shift their focus to more stable businesses (e.g., utilities) in challenging times. *Year–month dummies* are composed of the year and month in which a company's stock price reached its minimum value. We included time dummies in each model. Table 1 summarizes all of the measures used in our study.

4 | RESULTS

4.1 | Descriptive statistics

Table 2 provides descriptive statistics and the correlation coefficients for each of the variables shown in Table 1. Stock prices dropped an average of 54% from their precrisis levels in the year following the GFC's onset on September 17, 2008, and took an average of 568 days to

[6]The final dictionary for "product innovation strategies" consists of 18 terms: accelerated product dev*, artificial intelligenc*, bleeding edge, design thinking, develop*, experim*, idea*, innov*, invent*, nanotech*, pilot, R&D, reverse engineer*, revolut*, science, scientific*, technol*, test* (see the Online Supplement in Eklund & Mannor, 2021).

TABLE 1 Overview of measures.

Variable	Descriptions	Source
Dependent variables		
Organizational stability	Severity of loss as an absolute percentage loss in stock price in the 12 months following the start of the GFC: |[(minimum stock price between September 17, 2008, and September 16, 2009)/(closing stock price on September 16, 2008)] − 1|. The variable is then multiplied by −1 so low values indicate high severity of loss and high values indicate low severity of loss.	CRSP
Organizational flexibility	Time to recovery, measured as the number of days until the stock price reached the pre-GFC level (i.e., the closing price on September 16, 2008).	CRSP
Independent variables		
R&D intensity	Capitalization of yearly R&D expenses based on a declining-balance formula with constant depreciation; log(1 + x) transformation is applied.	Compustat
Patent count	Capitalization of yearly patent count based on a declining-balance formula with constant depreciation; log(1 + x) transformation is applied.	USPTO
Patent quality	Capitalization of yearly forward citation count based on a declining-balance formula with constant depreciation; log(1 + x) transformation is applied.	USPTO
New product introductions	Capitalization of the yearly number of new product introductions based on a declining-balance formula with constant depreciation.	Ravenpack
Top management focus on innovation	Capitalization based on a declining-balance formula with constant depreciation of the yearly word count of innovation-related keywords and word stems (e.g., innov*, R&D, invent*) in text in annual reports, relative to the total text in annual reports, based on Eklund and Mannor's (2021) measure for "product innovation strategies."	Annual reports
Control variables		
Firm age	Number of years between 2008 and the year Compustat first covered the firm.	Compustat
Firm size	Natural logarithm of total assets.	Compustat
Pre-shock firm profitability	Ratio of earnings before interest, tax, depreciation, and amortization (EBITDA) to book value of total assets.	Compustat
Capital intensity	Ratio of capital expenditure to book value of total assets.	Compustat
Financial leverage	Ratio of long-term debt to book value of total assets.	Compustat
Intangible assets	Natural logarithm of the ratio of market value per share to book value per share.	Compustat
Slack resources	Ratio of long-term debt to market value of equity.	Compustat
Precrisis stock price	Closing stock price on September 16, 2008.	CRSP
SSEP	Strengths in the domains of environment, diversity, employee relations, human rights, product quality and safety, and corporate governance.	KLD Stats
TSEP	Strengths in the domain of community development.	KLD Stats
CEO's bonus share	Ratio of CEO bonus to total compensation.[a]	Execucomp
CEO's option share	Ratio of CEO stock option value to total compensation.[a]	Execucomp
CEO's salary share	Ratio of CEO salary to total compensation.[a]	Execucomp
Riskiness of policies	Word count of risk-related keywords and word stems (e.g., risk*, hedge*) in text in annual reports, relative to the total text in annual reports, based on Eklund and Mannor's (2021) measure for "financial and risk management strategies."	Annual reports
Board size	Number of board directors.	Boardex
Board age	Average age of board members.	Boardex
Board tenure	Average tenure of board members.	Boardex
Outside director share	Proportion of nonexecutive directors on the board.	Boardex
Industry dummy	Dummy variable that represents the industry division based on a 2-digit SIC code.	Compustat
Year–month dummy	Dummy variable that represents the year and month in which stock price reached its minimum.	–

Abbreviations: CRSP, Center of Research in Security Prices; GFC, Global Financial Crisis; SIC, Standard Industrial Classification; SSEP, strategic social and environmental practices; TSEP, tactical social and environmental practices; USPTO, United States Patent and Trademark Office.

[a]Since Execucomp changed how it calculates several variables in 2006, we adjusted pre-2006 values, which are in line with the literature (e.g., Walker, 2011).

recover. Roughly 35% of stocks in the full sample of 994 firms (351 firms) had recovered within a year, 67% (663 firms) had recovered within 24 months, and 80% (800 firms) had recovered within 36 months. The remaining 20% of the stocks (194 firms) did not recover within our 3-year observation period. Particularly high bivariate correlations between the dimensions of a strategic emphasis on innovation (i.e., 0.681, 0.755, and 0.942; Table 2) may indicate multicollinearity concerns, so we refrained from using them simultaneously in one model. The correlations between the dimensions of strategic emphasis on innovation and pre-shock profitability (our moderator) range between −0.132 for top management's innovation focus and 0.099 for patent quality. These correlations are low to moderate for variables that are combined in interaction terms (Dawson, 2014). In line with Rubera and Kirca (2012), strategic emphasis on innovation's correlations with our pre-shock stock price control are higher (up to 0.184), which was expected since the pre-shock price (as opposed to pre-shock profitability) covers innovation's business potential.

4.2 | Models

We applied ordinary least squares regressions to test the relationship between the pre-shock strategic emphasis on innovation and stability (Table 3) and specified robust standard errors for all our calculations. A positive coefficient indicates a less severe drop in a stock price and, hence, higher stability. We specified a Cox proportional hazard model to evaluate the impact on flexibility, measured as time to recovery, of the dimensions of a strategic emphasis on innovation (Table 4). In our analysis of time to recovery, a positive coefficient indicates a greater chance of recovery and, therefore, greater flexibility.

4.3 | Controls and direct effects

Before we turn to testing our hypotheses, we first describe the effects of selected controls. As Table 3 indicates, capital intensity is negatively related to stability, which is in line with Sajko et al. (2021) and DesJardine et al. (2019). Table 4 shows that firm size is negatively related to flexibility at a crisis's onset, while TSEP are positively related to flexibility, in line with DesJardine et al. (2019). To test our hypotheses, we included the dimensions of strategic emphasis on innovation first without interactions and then using a regression with interaction terms between the respective dimension and pre-shock firm profitability.[7] As Table 3 indicates, the number of product introductions (0.025, $p < 0.010$; model 8) and top management's focus on innovation (0.021, $p < 0.001$; model 10) are significantly and positively related to stability. Table 3 also shows that R&D intensity is positively and significantly related to stability. However, as our robustness checks show (Table 6), these associations are not robust, so H1a is not supported for R&D intensity. The other two innovation dimensions are not significantly related to stability ($p > 0.050$; models 4 and 6). Therefore, H1a is supported only for product introductions and top management's focus on innovation.

We specified a Cox proportional hazard model to evaluate the impact on flexibility, measured as time to recovery, of the dimensions of a strategic emphasis on innovation (Table 4). As Table 4 indicates, product introductions (0.269, $p < 0.001$; model 8) are significantly and positively related to flexibility, while the other dimensions are not ($p > 0.050$; models 2, 4, 6, and 10). Thus, H1b is supported for the product introductions dimension of a strategic emphasis on innovation.

4.4 | The moderating role of pre-shock firm profitability

Next, we examine the moderating effects. The regressions with stability as the dependent variable (Table 3) indicate negative and significant regression coefficients for the interactions of R&D intensity (−0.016, $p < 0.050$; model 2) and top management's focus on innovation (−0.011, $p < 0.010$; model 10) with pre-shock firm profitability. The slopes for various scores of pre-shock firm profitability in Figure 2 indicate particularly strong positive effects when pre-shock firm profitability is low, whereas the positive associations weaken and even disappear with increasing pre-shock profitability, a result that is in line with H2a. We found no significant interactions with pre-shock firm profitability for the two patent-related variables or the number of product introductions ($p > 0.050$; models 4, 6,

[7]Following Sharma et al.'s (1981) differentiation between pure and quasi-moderators, we derive a quasi-moderation as we expect both elements of the interaction term—the dimensions of innovation emphasis (as hypothesized in H1a and H1b) and pre-shock profitability (informed by prior literature, without formal hypothesis in our study)—to be related to the dependent variable. We find empirically that profitability is related to the dependent variable in all models, which suggests that it is a quasi-moderator. Therefore, we follow Saemundsson and Candi (2014) and Meier and Schier (2021) in interpreting the regression coefficients of the direct effects (i.e., between the dimensions of strategic emphasis on innovation) and performance at a crisis's onset using regression models with interaction terms. Conclusions would remain constant if the regression coefficients of the direct effects from the regression models were interpreted without interaction terms.

TABLE 2 *n*, means, standard deviations, and bivariate correlations.

Variable	*n*	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Stability	994	−0.540	0.189																									
2. Flexibility	994	567.680	337.130	−0.365*																								
3. Recovered	994	0.804	0.400	0.228*	−0.772*																							
4. R&D intensity	487	5.376	1.701	0.226*	−0.049	−0.008																						
5. Patent count	586	3.314	2.076	0.042	−0.036	0.047	0.755*																					
6. Patent quality	573	5.310	2.445	0.037	−0.012	0.018	0.681*	0.942*																				
7. New product introductions	424	30.545	73.800	0.080	−0.094	0.027	0.527*	0.478*	0.443*																			
8. Top management focus on innovation	994	0.011	0.008	0.072*	−0.085*	0.017	0.142*	0.252*	0.260*	0.245*																		
9. Firm age	994	30.012	16.890	0.109*	0.128*	−0.040	0.262*	0.158*	0.081	−0.017	−0.284*																	
10. Firm size	994	7.531	1.527	0.113*	0.095*	−0.043	0.740*	0.413*	0.324*	0.354*	−0.239*	0.503*																
11. Pre-shock firm profitability	994	0.146	0.075	0.130*	−0.007*	0.082*	0.088	0.096*	0.099*	−0.051	−0.132*	−0.065*	−0.018															
12. Capital intensity	994	0.053	0.049	−0.062	0.002	−0.010	−0.051	−0.072	−0.080	−0.109*	−0.156*	−0.007*	0.044	0.340*														
13. Financial leverage	994	0.168	0.135	−0.052	0.110*	−0.122*	0.077	−0.118*	−0.148*	−0.182*	−0.287*	0.246*	0.356*	−0.161*	0.049													
14. Intangible assets	994	1.041	0.601	0.163*	−0.100*	0.055	0.209*	0.164*	0.168*	0.038	0.158*	−0.111*	−0.044	0.457*	0.028	−0.005												
15. Slack resources	994	0.342	3.497	0.029	0.003	0.009	0.059	−0.088*	−0.106*	−0.036	−0.063*	0.039	0.025	−0.020	−0.019	0.052	−0.054											
16. Precrisis stock price	994	33.926	28.937	0.192*	0.092*	−0.031	0.184*	0.118*	0.099*	−0.033	−0.033	0.158*	0.242*	0.257*	0.025	0.028	0.165*	0.001										
17. SSEP	994	1.434	1.910	0.131*	0.004	−0.015	0.651*	0.494*	0.428*	0.475*	0.033	0.324*	0.556*	0.093*	−0.033	−0.015	0.144*	−0.020	0.122*									
18. TSEP	994	0.155	0.476	0.010*	−0.015	0.014	0.484*	0.373*	0.319*	0.428*	0.008	0.264*	0.462*	0.072*	−0.031	0.013	0.095*	0.001	0.086*	0.639*								
19. CEO bonus share	994	0.145	0.107	−0.048	0.075*	−0.054	0.057	−0.018	−0.054	0.018	−0.135*	0.099*	0.147*	0.122*	0.010	0.063*	−0.042	−0.020	0.061	−0.010	0.028							
20. CEO option share	994	0.264	0.304	0.074*	−0.047	0.021	0.191*	0.106*	0.125*	0.082	0.227*	−0.104*	0.034	0.094*	−0.061	−0.112*	0.180*	0.034	0.127*	0.085*	0.050	−0.114*						
21. CEO salary share	994	0.279	0.172	−0.053	−0.032	−0.023	−0.453	−0.272*	−0.230*	−0.056	−0.045	−0.182*	−0.498*	−0.046	0.007	−0.189*	−0.151*	−0.039	−0.157*	−0.252*	−0.213*	−0.114*	−0.126*					
22. Riskiness of policies	994	0.018	0.005	−0.064*	0.045	−0.028	−0.119*	−0.111*	−0.111*	−0.107*	−0.290*	0.149*	0.041	0.058	0.095*	0.097*	−0.098*	0.015	−0.024	−0.046	−0.012	0.025	−0.075*	0.115*				
23. Outsider director share	994	0.815	0.087	0.022	0.062	−0.020	0.126*	0.104*	0.080*	−0.014	−0.023	0.265*	0.228*	−0.116*	−0.059	0.206*	−0.005	0.016	0.123*	0.087*	0.096*	−0.094*	0.022	−0.272*	−0.006			
24. Board size	994	9.952	2.589	0.010*	0.130*	−0.073*	0.445*	0.214*	0.152*	0.138*	−0.245*	0.500*	0.671*	−0.046	−0.015	0.255*	−0.046	0.022	0.161*	0.446*	0.398*	0.095*	−0.026	−0.314*	0.000	0.249*		
25. Board age	994	59.965	3.700	0.079*	0.054	0.002	−0.017	0.040	- 0.006	−0.074	−0.096*	0.326*	0.187*	−0.034	−0.032	0.072*	−0.115*	−0.064*	0.131*	0.031	0.049	0.138*	−0.141*	0.001	0.008	0.104*	0.176*	
26. Board tenure	994	9.343	3.680	0.028	−0.006	0.028	−0.118*	−0.074	−0.097*	−0.068	−0.022	0.138*	−0.099*	0.068*	0.013	−0.087*	−0.036	−0.055	0.000	−0.069*	−0.041	0.144*	−0.061	0.212*	0.047	−0.269*	−0.094*	0.400*

Note: *n* for variables 4–7 deviates from 994 as data availability is restricted, see sample description in Section 3.

Abbreviations: SSEP, strategic social and environmental practices; TSEP, tactical social and environmental practices.

*$p < 0.05$.

TABLE 3 Regressions results with post-shock organizational stability as dependent variable (based on ordinary least squares model).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Intercept	0.003 (0.054)	0.011 (0.055)	−0.002 (0.062)	−0.001 (0.062)	−0.006 (0.061)	−0.004 (0.062)	−0.146* (0.065)	−0.146* (0.065)	0.044 (0.048)	0.046 (0.047)
Main effects										
R&D intensity	0.027* (0.014)	0.031* (0.013)								
Patent count			−0.002 (0.010)	−0.002 (0.010)						
Patent quality					−0.004 (0.010)	−0.004 (0.010)				
New product introductions							0.025** (0.009)	0.025** (0.009)		
Top management focus on innovation									0.021*** (0.006)	0.021*** (0.006)
Pre-shock firm profitability (PFP)	0.028** (0.010)	0.029** (0.009)	0.027** (0.009)	0.027** (0.009)	0.027** (0.009)	0.027** (0.009)	0.031* (0.013)	0.031* (0.013)	0.032*** (0.007)	0.040*** (0.076)
Interaction effects										
R&D intensity × PFP		−0.016* (0.007)								
Patent count × PFP				−0.001 (0.007)						
Patent quality × PFP						−0.003 (0.007)				
New product introductions × PFP								−0.004 (0.008)		
Top management focus on innovation × PFP										−0.011** (0.003)
Controls										
Firm age	−0.007 (0.010)	−0.008 (0.009)	−0.006 (0.009)	−0.006 (0.009)	−0.009 (0.009)	−0.008 (0.009)	−0.006 (0.009)	−0.006 (0.009)	−0.001 (0.007)	−0.000 (0.001)
Firm size	0.003 (0.010)	0.001 (0.018)	0.017 (0.014)	0.017 (0.014)	0.014 (0.013)	0.014 (0.013)	0.007 (0.013)	0.073 (0.013)	0.026** (0.009)	0.029** (0.009)
Capital intensity	−0.022** (0.008)	−0.024** (0.008)	−0.021* (0.009)	−0.021* (0.009)	−0.022* (0.009)	−0.022* (0.009)	−0.021* (0.010)	−0.022* (0.010)	−0.013* (0.007)	−0.014* (0.007)
Financial leverage	−0.007 (0.012)	−0.007 (0.012)	−0.001 (0.010)	−0.001 (0.010)	−0.001 (0.010)	−0.001 (0.010)	−0.003 (0.012)	−0.004 (0.012)	−0.022** (0.007)	−0.021** (0.007)

(Continues)

TABLE 3 (Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Intangible assets	−0.003 (0.008)	−0.004 (0.008)	−0.001 (0.008)	−0.001 (0.008)	−0.001 (0.008)	−0.001 (0.008)	−0.008 (0.012)	−0.008 (0.012)	0.011 (0.007)	0.007 (0.007)
Slack resources	−0.032* (0.016)	−0.034* (0.015)	−0.030* (0.015)	−0.030* (0.015)	−0.029* (0.015)	−0.029* (0.014)	−0.027* (0.013)	−0.027* (0.013)	0.006** (0.002)	0.006** (0.002)
Precrisis stock price	0.022 (0.012)	0.021 (0.012)	0.021 (0.011)	0.021 (0.011)	0.021 (0.011)	0.021 (0.011)	0.020 (0.014)	0.020 (0.014)	0.022 (0.011)	0.021 (0.011)
SSEP	−0.008 (0.011)	−0.007 (0.011)	0.004 (0.010)	0.004 (0.010)	0.007 (0.010)	0.007 (0.010)	−0.005 (0.012)	−0.005 (0.012)	−0.001 (0.007)	−0.008 (0.007)
TSEP	0.010 (0.008)	0.011 (0.01)	0.007 (0.008)	0.007 (0.008)	0.006 (0.008)	0.006 (0.008)	−0.004 (0.010)	−0.004 (0.011)	0.002 (0.006)	0.002 (0.006)
CEO bonus share	−0.004 (0.008)	−0.005 (0.008)	−0.003 (0.007)	−0.002 (0.007)	−0.001 (0.007)	−0.001 (0.007)	−0.009 (0.008)	−0.008 (0.008)	−0.005 (0.005)	−0.005 (0.005)
CEO option share	0.009 (0.007)	0.008 (0.007)	0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	−0.000 (0.008)	−0.004 (0.008)	0.002 (0.005)	0.001 (0.005)
CEO salary share	−0.006 (0.007)	−0.004 (0.007)	−0.008 (0.007)	−0.008 (0.007)	−0.009 (0.008)	−0.009 (0.008)	−0.006 (0.009)	−0.006 (0.009)	0.003 (0.006)	0.003 (0.006)
Riskiness of policies	−0.006 (0.007)	−0.006 (0.007)	−0.014* (0.01)	−0.014* (0.008)	−0.015 (0.008)	−0.015 (0.008)	−0.006 (0.009)	−0.006 (0.009)	−0.005 (0.005)	−0.006 (0.004)
Outsider director share	−0.024** (0.007)	−0.024** (0.007)	−0.023*** (0.01)	−0.023*** (0.007)	−0.02** (0.007)	−0.022** (0.007)	−0.002 (0.008)	−0.003 (0.008)	−0.008 (0.005)	−0.008 (0.006)
Board size	0.009 (0.009)	0.012 (0.009)	0.011 (0.009)	0.011 (0.009)	0.010 (0.009)	0.010 (0.009)	0.014 (0.009)	0.014 (0.009)	0.007 (0.006)	0.006 (0.006)
Board age	0.008 (0.008)	0.008 (0.008)	0.008 (0.007)	0.008 (0.007)	0.008 (0.007)	0.007 (0.007)	0.004 (0.008)	0.003 (0.008)	0.012* (0.006)	0.012* (0.006)
Board tenure	0.008 (0.008)	0.009 (0.008)	0.003 (0.007)	0.003 (0.007)	0.005 (0.007)	0.005 (0.007)	0.012 (0.008)	0.012 (0.008)	0.006 (0.006)	0.005 (0.057)
Industry dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Year–month dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Observations	487	487	586	586	573	573	424	424	994	994
Adjusted R^2	0.438	0.443	0.445	0.444	0.444	0.444	0.413	0.411	0.457	0.461
F statistic	6.924***	6.945***	6.792***	6.696***	6.648***	6.560***	4.499***	4.439***	10.289***	10.339***

Note: ***$p < 0.001$. **$p < 0.01$. *$p < 0.05$. All numerical variables were standardized before running the models.

Abbreviations: SSEP, strategic social and environmental practices; TSEP, tactical social and environmental practices.

TABLE 4 Regressions results with post-shock organizational flexibility as dependent variable (based on Cox model).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Main effects										
R&D intensity	0.032 (0.057)	0.042 (0.057)								
Patent count			0.096 (0.086)	0.109 (0.085)						
Patent quality					0.094 (0.052)	0.020 (0.053)				
New product introductions							0.261*** (0.074)	0.269*** (0.08)		
Top management focus on innovation									0.028 (0.052)	0.036 (0.052)
Pre-shock firm profitability (PFP)	0.151** (0.058)	0.145* (0.059)	0.193* (0.085)	0.172* (0.083)	0.173** (0.056)	0.150** (0.057)	−0.048 (0.138)	−0.039 (0.150)	0.094 (0.056)	0.117* (0.057)
Interaction effects										
R&D intensity × PFP		−0.157* (0.065)								
Patent count × PFP				−0.200* (0.081)						
Patent quality × PFP						−0.157** (0.061)				
New product introductions × PFP								−0.026 (0.073)		
Top management focus on innovation × PFP										−0.056 (0.041)
Controls										
Firm age	−0.073 (0.057)	−0.081 (0.057)	−0.084 (0.077)	−0.087 (0.078)	−0.107* (0.053)	−0.103 (0.054)	−0.088 (0.084)	−0.085 (0.085)	−0.034 (0.056)	−0.031 (0.056)
Firm size	−0.032 (0.055)	−0.025 (0.053)	−0.140 (0.134)	−0.124 (0.134)	−0.128** (0.048)	−0.134** (0.048)	−0.399*** (0.115)	−0.391*** (0.118)	−0.031 (0.083)	−0.017 (0.084)
Capital intensity	−0.044 (0.051)	−0.069 (0.051)	−0.034 (0.075)	−0.060 (0.076)	−0.074 (0.057)	−0.096 (0.058)	−0.093 (0.010)	−0.973 (0.101)	−0.019 (0.060)	−0.018 (0.060)
Financial leverage	0.041 (0.053)	0.030 (0.053)	0.019 (0.074)	0.017 (0.074)	0.018 (0.055)	0.012 (0.056)	−0.345** (0.133)	−0.346** (0.133)	−0.076 (0.059)	−0.076 (0.059)
Intangible assets	0.070 (0.052)	0.073 (0.054)	0.017 (0.085)	0.045 (0.815)	0.007 (0.059)	0.034 (0.061)	0.053 (0.111)	0.054 (0.112)	0.101 (0.055)	0.085 (0.058)

(Continues)

TABLE 4 (Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Slack resources	0.066 (0.042)	0.042 (0.035)	0.090 (0.050)	0.072 (0.043)	0.066 (0.044)	0.058 (0.039)	0.128 (0.204)	0.132 (0.202)	0.101*** (0.027)	0.100*** (0.028)
Precrisis stock price	−0.237*** (0.070)	−0.244*** (0.069)	−0.207* (0.090)	−0.216* (0.089)	−0.184** (0.064)	−0.195** (0.064)	−0.020 (0.069)	−0.022 (0.069)	−0.146 (0.102)	−0.142 (0.102)
SSEP	−0.045 (0.059)	−0.026 (0.058)	−0.023 (0.088)	−0.022 (0.089)	0.022 (0.045)	0.027 (0.050)	0.134 (0.099)	0.126 (0.103)	0.000 (0.062)	−0.005 (0.063)
TSEP	0.137* (0.057)	0.140* (0.059)	0.170* (0.073)	0.187* (0.074)	0.173*** (0.046)	0.180*** (0.050)	0.125 (0.084)	0.121 (0.087)	0.087 (0.050)	0.091 (0.050)
CEO bonus share	−0.021 (0.057)	−0.025 (0.057)	−0.050 (0.064)	−0.048 (0.067)	−0.033 (0.057)	−0.031 (0.057)	−0.125 (0.092)	−0.124 (0.091)	−0.056 (0.050)	−0.059 (0.050)
CEO option share	−0.057 (0.102)	−0.068 (0.102)	−0.126 (0.094)	−0.126 (0.095)	−0.125 (0.093)	−0.126 (0.094)	−0.111 (0.076)	−0.113 (0.076)	−0.029 (0.065)	−0.028 (0.064)
CEO salary share	−0.091 (0.072)	−0.073 (0.071)	−0.073 (0.97)	−0.070 (0.096)	−0.105 (0.067)	−0.114 (0.067)	0.065 (0.089)	0.069 (0.090)	−0.049 (0.060)	−0.053 (0.061)
Riskiness of policies	−0.008 (0.042)	−0.023 (0.042)	−0.094 (0.063)	−0.113 (0.064)	−0.094* (0.048)	−0.104* (0.048)	0.042 (0.072)	0.044 (0.073)	0.024 (0.042)	0.020 (0.043)
Outsider director share	−0.164** (0.051)	−0.168** (0.051)	−0.043 (0.071)	−0.048 (0.071)	−0.048 (0.052)	−0.056 (0.052)	0.055 (0.076)	0.052 (0.078)	−0.029 (0.047)	−0.024 (0.047)
Board size	−0.088 (0.062)	−0.060 (0.061)	−0.025 (0.076)	−0.025 (0.077)	−0.029 (0.053)	−0.019 (0.053)	−0.213** (0.077)	−0.214** (0.082)	−0.116* (0.057)	−0.120* (0.057)
Board age	0.029 (0.050)	0.028 (0.054)	−0.051 (0.069)	−0.054 (0.069)	−0.025 (0.054)	−0.021 (0.054)	0.117 (0.078)	0.113 (0.080)	0.081 (0.050)	0.085 (0.050)
Board tenure	0.023 (0.053)	0.023 (0.054)	0.072 (0.064)	0.089 (0.064)	0.083 (0.051)	0.094 (0.051)	−0.034 (0.070)	−0.036 (0.070)	−0.016 (0.048)	−0.016 (0.048)
Industry dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Year–month dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Observations	487	487	586	586	573	573	424	424	994	994
Pseudo R^2	0.423	0.429	0.328	0.338	0.343	0.349	0.483	0.483	0.298	0.300
LR test	267.540***	272.879***	232.880***	241.470***	240.850***	245.710***	279.680***	279.820***	351.150***	354.040***
Score (log rank) test	1053.440***	1057.740***	1301.370***	1308.560***	1264.320***	1269.020***	355.940***	356.010***	415.330***	418.860***

Note: ***$p < 0.001$. **$p < 0.01$. *$p < 0.05$. All numerical variables were standardized before running the models.

Abbreviations: LR test, likelihood ratio test; SSEP, strategic social and environmental practices; TSEP, tactical social and environmental practices.

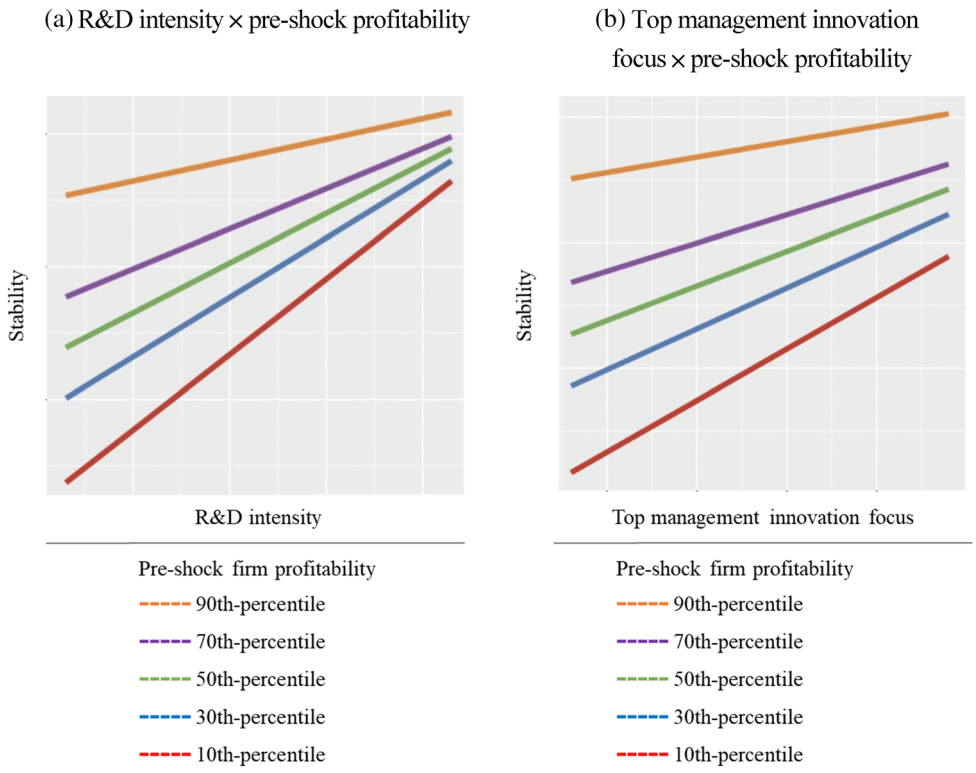

FIGURE 2 Interaction effects with stability as dependent variable.

and 8). While strong pre-shock profitability hamstrings innovation's ability to increase stability, the slopes in Figure 2 also show that firms that have strong pre-shock profitability always perform better overall.

The regressions with flexibility as the dependent variable (Table 4) show that the interactions of pre-shock firm profitability with R&D intensity (−0.157, $p < 0.050$; model 2), patent count (−0.200; $p < 0.050$; model 4), and patent quality (−0.157, $p < 0.010$; model 6) are all negative and significant. The slope analysis in Figure 3 indicates that the effects of these three dimensions of a strategic emphasis on innovation are positively related to flexibility only when pre-shock firm profitability is low, while these positive associations reduce and even disappear with increasing pre-shock profitability, in line with H2b. For firms that have very high levels of pre-shock profitability (those in the 90th percentile), the associations of R&D intensity, patent count, and patent quality with flexibility even become negative, a finding to which we return in our discussion section. Again, the slopes show that firms that have strong pre-shock profitability tend to perform better overall.

Table 5 summarizes the findings for both components of organizational resilience and the dimensions of the strategic emphasis on innovation.

4.5 | Robustness checks

Although we used a rich set of controls, omitted variable concerns may remain (Antonakis et al., 2014). To address this threat, we used the "robustness of inference to replacement" (Busenbark et al., 2022; Frank et al., 2013) and quantified for all regressions that had significant hypotheses-related effects, the endogeneity-related bias that would be necessary to invalidate our inference. We found that, to invalidate new product introductions' positive association with post-crisis stability, 27.90% of the related estimate would have to be due to endogeneity-related bias. Table 6 presents these values for all significant effects. The second-lowest value is 18.08%, a value that existing research considers robust (e.g., Busenbark et al., 2017). However, the relationship between R&D intensity and stability could be invalidated if only 2.28% of the estimate were due to bias, so we find insufficient support for H1a for this independent variable.

Instead of differentiating between TSEP and SSEP, we also ran our regressions with an aggregate corporate social responsibility measure that is based on the measure Sajko et al. (2021) suggest, and our findings remained stable. The same held true when we replaced the independent variable *top management's innovation focus* with other innovation-related measures like *resource and capability development*

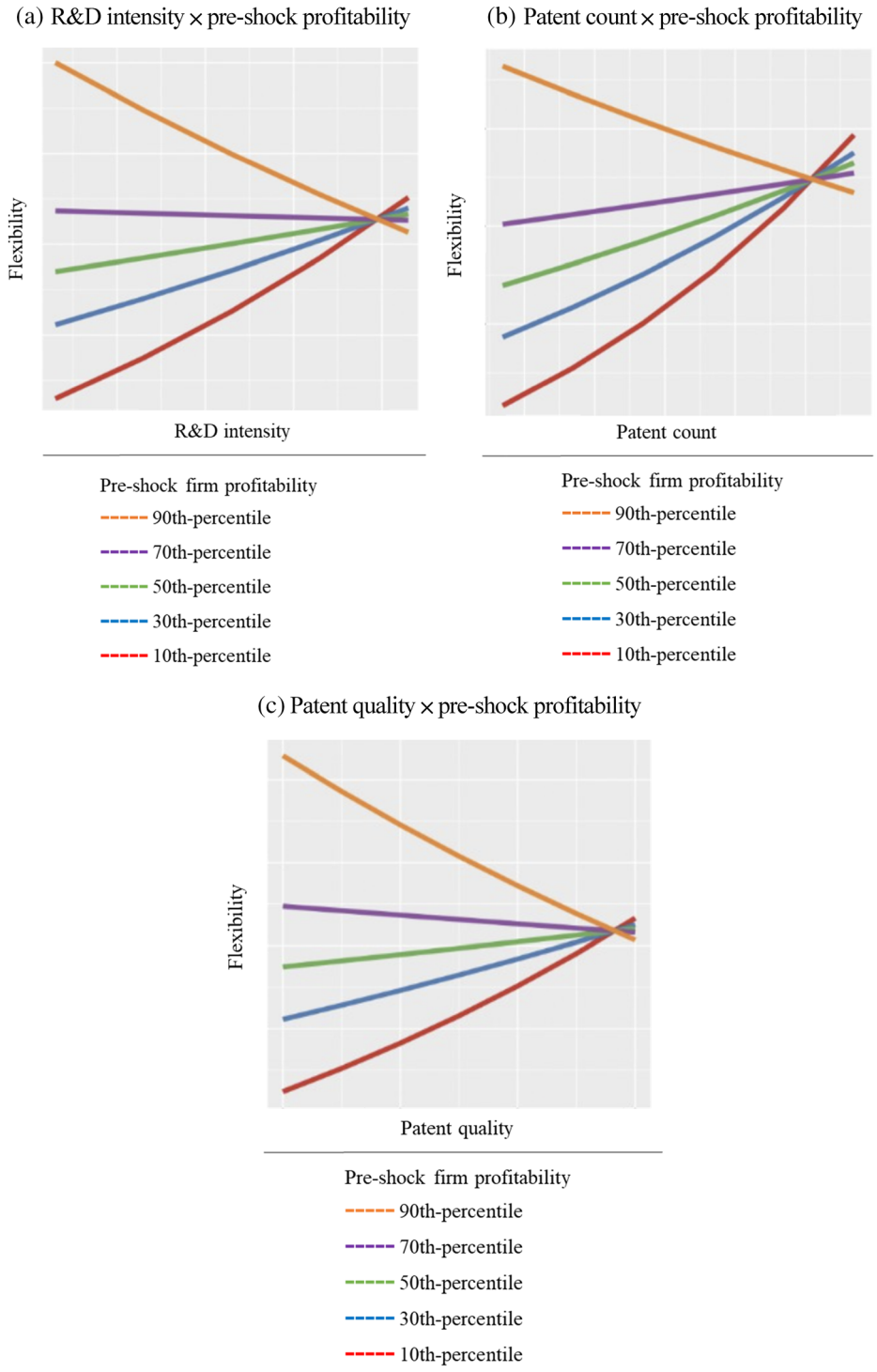

FIGURE 3 Interaction effects with flexibility as dependent variable.

and *business model innovation* as offered by Eklund and Mannor (2021). Again, results remained stable.

While we used established measures for patent count and patent quality, an alternative measure for innovation output is the quotient of patent quality and patent count, that is, the average quality of each patent. However, this variable is related to neither flexibility nor stability at a crisis's onset in our data, which suggests that it is the pre-shock volume of innovation output, rather than the ability to produce (potentially few) high-quality outputs, that is important to the ability to react to a new shock.

Finally, as we included a high number of control variables, we used variance inflation factors (VIFs) and Kalnins' (2018) criteria to understand potential

multicollinearity concerns. First, we calculated VIFs for all relevant models and found that VIFs remained below 10 (with VIFs ranging between 1.074 and 7.588), indicating that multicollinearity is not likely to be an issue. Still, we also considered for each of our key independent variables in relation to all other variables the three criteria Kalnins (2018) provides: (1) correlations between two independent variables are equal to or higher than 0.300, (2) the beta coefficients of the variables are of the same sign if they correlate negatively or of opposite signs if they correlate positively, and (3) the correlation of one of the independent variables with the dependent variable is of the opposite sign compared to the beta coefficient. We identified two controls that might cause multicollinearity concerns: SSEP and TSEP. When we removed them, the results remained consistent.

TABLE 5 Overview of hypotheses-related findings.

Dimensions of pre-shock emphasis on innovation	Stability H1a and H2a	Flexibility H1b and H2b
R&D intensity	Positive only when pre-shock firm profitability is low	Positive only when pre-shock firm profitability is low
Patent count	No effect	Positive only when pre-shock firm profitability is low
Patent quality	No effect	Positive only when pre-shock firm profitability is low
New product introductions	Positive direct effect regardless of pre-shock firm profitability	Positive direct effect regardless of pre-shock firm profitability
Top management innovation focus	Positive direct effect across levels of pre-shock firm profitability, effects stronger when pre-shock firm profitability is low	No effect

5 | DISCUSSION

Why are some firms more resilient than others when a systemic shock sets in? The present research addresses this question by linking firms' pre-shock strategic emphasis on innovation with organizational resilience after the onset of a shock. We found that various dimensions of a pre-shock strategic emphasis on innovation facilitated organizational resilience when the shock set in. However, direct associations were present only between new product introductions and both flexibility and stability, and between top management's innovation focus and stability, while the other dimensions translated into stability and flexibility only when the pre-shock firm profitability was low.

5.1 | Research-related implications

Our findings contribute to research in three major ways. First, we add to the literature on innovation's performance implications, which currently focuses primarily on innovation's (mostly positive) associations with various metrics of firm performance (e.g., profitability and firm value) in a variety of contexts (Rubera & Kirca, 2012; Sood & Tellis, 2009), but typically in non-shock times. The organizational resilience lens directs our attention to innovation outcomes that the literature does not address by relating a firm's strategic emphasis on innovation along various dimensions to stability and flexibility when a systemic shock—in our case, the

TABLE 6 Bias necessary for hypotheses-related inference to be invalid.

	Stability H1a and H2a		Flexibility H1b and H2b	
Main dependent variable	Direct effect	Interaction term with profitability	Direct effect	Interaction term with profitability
R&D intensity	2.28%	18.08%	n/a	18.89%
Patent count	n/a	n/a	n/a	20.13%
Patent quality	n/a	n/a	n/a	24.13%
New product introductions	27.90%	n/a	44.05%	n/a
Top management innovation focus	41.45%	37.44%	n/a	n/a

Note: Evaluation is based on a significance level of $\alpha = 0.05$; n/a = not significant in main regressions (Tables 3 and 4) and therefore not part of this analysis. Direct effects are evaluated based on models including only direct effects.

GFC—sets in. That is, innovation is not only a source of competitive advantage in normal times but also protects the corporate against unexpected systemic shocks.

By comparing the various dimensions of a strategic emphasis on innovation, we learn that the pre-shock number of product introductions is the only universal driver of stability and flexibility, regardless of firms' pre-shock firm profitability. Product introductions stand out against the other dimensions of a strategic emphasis on innovation by creating connections to distribution partners and customers and improving the firm's reputation based on products commercialized in the market. In contrast, patent activities, for example, relate to internal innovation resources and knowledge creation and protection, not necessarily to activities that are directed to partners and customers. Unlike most of the other innovation variables we covered, pre-shock product introductions provide experience and skills in market introductions and opportunities to learn from and interact with customers. These activities and the relationships built with stakeholders appear to be major innovation-related drivers of stability and flexibility at the shock's onset.

The moderating analysis adds to these insights that most other dimensions of strategic emphasis on innovation only translate into stability and flexibility when pre-shock firm-level profitability levels were rather low. These findings suggest that these dimensions, that is, R&D intensity and patent count and quality, create resources that do not automatically help the firm in shock onsets, but that specific conditions for their deployment are necessary (Vogus & Sutcliffe, 2007). As our arguments and findings demonstrate, such an "activation" can be the result of a low pre-shock firm-level profitability.

Second, using arguments from the behavioral theory of the firm (Gavetti et al., 2012; Yu et al., 2019), we contribute to the literature on innovation's performance outcomes by identifying an intriguing paradox related to innovation's consequences in "regular" times and in times of crisis. The paradox manifests in the observation that some dimensions of a strategic emphasis on innovation can be positively related to profitability in "regular" times, which is suggested by some positive correlations (Table 2) and corroborated by existing literature (e.g., Rubera & Kirca, 2012). This increased profitability then reduces the effects of some innovation dimensions on organizational stability and flexibility once a shock sets in. Thus, innovation can create its own limitations when conditions shift dramatically from "regular" times to the onset of a crisis. While these findings may seem counter-intuitive at first, the behavioral theory of the firm argues that strong past profitability creates an unwillingness to use (innovation) resources in new ways (Gavetti et al., 2012; Rajagopalan & Spreitzer, 1997) that may be necessary at the onset of dramatically new conditions.

This paradox can unfold particularly in firms that have strong pre-shock R&D intensity, high patent counts and patent quality, and exceptionally strong pre-shock profitability (firms in the 90th percentile). In these cases, strong pre-shock innovation can even have a negative effect on flexibility when a crisis occurs (Figure 3). A firm's positive pre-shock financial situation, combined with strong innovation investment and patent performance, might make the firm complacent and convinced that it is too outstanding to be affected by changing conditions. This conviction and the unwillingness to shuffle innovation-related resources expose the firm to the full negative consequences of a crisis.

Even so, this paradox should be interpreted with several boundaries in mind: Not all dimensions of a strategic emphasis on innovation are consistently positively related to profitability either in our data, as the correlation table suggests, or in the broader literature (Rosenbusch et al., 2011). When the association between innovation and profitability is absent or weak in "regular" times, the paradox is weak or disappears. Further, firms that have strong pre-shock profitability (along with others that benefit from pre-shock innovation) still perform better at the beginning of a crisis than firms that have low pre-shock profitability do, as indicated by the strong direct associations between pre-shock profitability and performance in a crisis (Figures 2 and 3). Only a performing firm's innovation potential is not fully leveraged when a crisis sets in, as the net effect of pre-shock profitability remains positive. Further, we find the paradox in our data only for R&D intensity and the patent-related variables, a finding that resonates with our theoretical understanding that the onset of a crisis requires revising how existing resources are deployed. R&D intensity and the patent-related variables are not helpful per se; they must be adapted to the new situation the shock triggers. When a firm is not willing to use these resources differently to accommodate the crisis, as could be the case for a strongly performing firm, its innovation-related resources have little value. We do not find such a paradoxical effect in our data for new product introductions, perhaps because such introductions before a shock create an image of innovativeness among stakeholders that remains after the shock sets in, even without the firm's making any adaptations.

Third, we contribute to the crisis management literature by revealing interactions between firm performance and a systemic shock that jointly determine the consequences of a crisis for a firm. Thus, our research integrates studies of crisis that focus only on firm-level crises (e.g., O'Brien & David, 2014) or systemic shock (e.g., Patel & Cooper, 2014). It follows that systemic crises touch firms differently based on the firms' pre-shock profitability. The "total level" of a crisis determines the

most effective deployment of the resources that were created before a systemic shock. The interplay of systemic and firm-level crises is a major threat to firms that have strong firm profitability before the onset of a systemic shock as these firms appear to have problems tapping into existing (innovation) resources and deploying them as the GFC shock came on, which suggests a hurdle they must overcome to switch to crisis mode.

5.2 | Limitations and avenues for future research

Like all studies, our research comes with several limitations that provide avenues for future research. First, we investigate empirically pre-shock innovation's role in a shock in the context of the GFC. While we believe that many of our arguments and findings are transferable, future studies could verify our findings' generalizability by comparing innovation's role across other shocks to identify differences and commonalities. As such, the COVID-19 pandemic differed from the GFC crisis by coming in cycles, with the winters' being the most severe phases in some countries and the summers' being more relaxed. Future research might investigate how such cycles within a crisis affect innovation's potential to mitigate the negative consequences of a crisis.

Second, our findings are derived empirically in the context of large, publicly listed companies. While our sample covers a large part of the U.S. economy, findings may change in the context of small and medium-sized firms. Smaller firms might be more flexible when a shock comes along and use their innovation resources better than larger firms do (Aldrich & Auster, 1986). On the other hand, these firms tend to have fewer financial and innovation-related resources, which might require different approaches when a shock sets in.

Third, based on Haleblian and Rajagopalan's (2005) concept of strategic persistence, we focused on one major contingency variable, pre-shock firm profitability. Future studies could take alternative views on our direct associations by, for example, analyzing whether the type of CEO (e.g., in terms of personality) determines firms' ability to activate innovation resources when a shock sets in. For example, a CEO whose personality is characterized by strong openness to change or future orientation (Yadav et al., 2007) might increase pre-shock innovation's effect on organizational resilience by providing the resources to activate the firm's innovation resources and by contributing ideas.

Finally, we shed additional light on the role of pre-shock firm profitability by demonstrating that strong profitability reduces the positive effect of innovation on organizational resilience, indicating that pre-shock firm performance has a complex influence on how well a firm sustains a crisis. While our focus is on explaining innovation's role, future research could build on our findings to unpack the underlying processes. For example, could executives' overconfidence that arises from past successes lead to persistence, or do certain corporate cultures emerge in times of strong performance that increase persistence and reduce the likelihood of undertaking new directions?

5.3 | Managerial implications

We listed eight large systemic shocks in the last 50 years. Assuming that executives spend about 25 years of their careers in executive positions, they are likely to experience about four of such shocks, so they must know how to deal with their potentially negative effects. For these executives, our study offers three important messages.

5.3.1 | Innovation softens shocks

Firms tend to reduce R&D budgets when a systemic crisis sets in (Archibugi et al., 2013), which suggests that executives believe that innovation is not helpful in a crisis. While we did not analyze R&D budgets when crises have already set in, we put in context this wisdom as innovation plays an important role in mitigating the negative consequences of crises.

5.3.2 | A strategic emphasis on innovation provides "insurance"

Executives are certainly aware that a strategic emphasis on innovation is important in "regular" times, but our findings inform them about the major additional benefit of innovation as a way to offset the negative consequences of shocks. Executives should take these potential benefits into account when they calculate the pros and cons of investing in innovation activities. Given the high incidence of systemic shocks, many years are pre-shock years, so a strategic emphasis on innovation, especially the associated skills, processes, and experiences, can serve as a kind of "insurance" against the next systemic shock. Executives who hesitate to dedicate resources and budgets to innovation during "regular" times should keep this additional economic benefit in mind.

5.3.3 | Success can lead to underestimating innovation's potential

While positive pre-shock profitability has certain positive effects when shocks set in, our findings indicate that,

during the GFC shock, resources like the knowledge, ideas, and technologies that resulted from pre-shock R&D or that were codified and protected in patents were not fully exploited. Our findings suggest that only firms that had low pre-shock profitability fully activated such resources to recover from the shock. Therefore, firms that are riding high should be aware of this potential "persistence trap" and find means to activate these innovation resources when the inevitable shock occurs. As such, engaging external support to investigate the full potential of existing R&D investments and patents in dealing with crises might be useful.

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