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Employees' entrepreneurial orientation in response to exogenous crises: the contingent role of entrepreneurial exposure

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Abstract
Employees' entrepreneurial orientation represents a powerful bottom–up force for building organizations that are more resilient to exogenous crises. However, limited empirical knowledge exists regarding how exogenous crises may affect employees' entrepreneurial orientation in the first place. To address this gap, we draw on threat-rigidity theory and exploit the COVID-19 pandemic as a valuable test bed. Using a survey administered to employees of a system integrator firm pre- and post-COVID-19, we find that the crisis negatively impacted employees' entrepreneurial orientation. However, entrepreneurial exposure mitigates this effect, ultimately enhancing employees' entrepreneurial orientation in response to exogenous crises. Our findings deepen the understanding of employees' entrepreneurial orientation dynamics and the role of entrepreneurial exposure in established firms.

Keywords Exogenous crisis · Entrepreneurial exposure · Entrepreneurial orientation · Corporate entrepreneurship · Threat-rigidity theory

JEL Classification L26 · M14 · O33

1 Introduction

The relationship between entrepreneurship and exogenous crises, such as the 2007 financial crisis or the more recent COVID-19 pandemic, has drawn increasing interest in the entrepreneurship field (Audretsch & Moog, 2022; Bishop, 2019; Kuckertz et al., 2020; Vasi et al., 2024; Williams & Shepherd, 2016; Williams et al., 2017). Most research on the topic has focused on the impact of crises on new venture creation (Xu et al., 2021); however,

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entrepreneurship also manifests within established firms at various levels (Burgelman, 1983; Shane & Venkatamaran, 2000), beginning with individual employees (Covin et al., 2020). In particular, employees with entrepreneurial orientation—a construct that indicates proactive, innovative, and risk-taking dispositions and behaviors (Covin & Slevin, 1989; Covin & Wales, 2019; Van Doorn et al., 2013)—serve as a crucial bottom–up force driving entrepreneurship within corporate settings (Covin et al., 2020; Rigtering et al., 2024). Recent research has highlighted the importance of fostering an entrepreneurial orientation among employees at all levels, beyond top leadership roles, as it is essential for enhancing organizational adaptability and responsiveness (Clark et al., 2024). Particularly in times of crisis, the absence of entrepreneurial behaviors and dispositions across organizational levels can undermine resilience and hinder the ability to navigate and thrive amid challenges (Cherbib, 2024; Kuratko et al., 2023).

However, the literature on crises raises concerns about employees' abilities to maintain an entrepreneurial orientation in the face of adversity (Mazzei et al., 2024). Like all individuals, employees tend to exhibit rigidity when confronted with exogenous crises—a tendency marked by conservatism, resistance to change, and suppression of innovation and creativity (Connelly & Shi, 2022; Staw et al., 1981). This rigidity could ultimately suppress employees' entrepreneurial orientation, even though exogenous crises may present opportunities for creativity and innovation (Jeong et al., 2023; Osiyevskyy & Dewald, 2018). Unfortunately, there is limited understanding of how crises affect employees' entrepreneurial orientation.

To address this gap, we pose the following research question: "How do exogenous crises affect employees' entrepreneurial orientation?" To address this question, it is essential to consider the individual as a boundary condition, given that responses to exogenous crises are often more complex than previously theorized (Mazzei et al., 2024) and are shaped by an individual's background (Williams & Shepherd, 2016). Specifically, we examine entrepreneurial exposure as a key contingency in the crisis–entrepreneurial orientation relationship. Entrepreneurial exposure reflects an individual's background with some form of proximity to entrepreneurial activities, such as direct experience or indirect involvement (Peterman & Kennedy, 2003). This background is particularly relevant as a boundary condition, since entrepreneurial exposure influences how individuals respond to stressful situations (Uy et al., 2013), such as exogenous crises (Espinoza-Benavides & Guerrero, 2024).

To address our research question, we have developed two hypotheses grounded in the threat-rigidity theory (Staw et al., 1981). This theory, rooted in psychological and sociological studies, suggests that individuals often struggle to adapt seamlessly to complex situations like exogenous crises (Mazzei et al., 2024), due to the inherent limitations of human rationality (Simon, 1991). In such circumstances, individuals tend to fall into rigidity, reverting to learned and habitual courses of action as a protective mechanism (Halinski et al., 2024; Wood & McKinley, 2017). Based on threat-rigidity theory, we first hypothesize that exogenous crises diminish employees' entrepreneurial orientation, as crisis-induced rigidity constrains innovativeness, proactiveness, and risk-taking. Second, since the courses of action influenced by rigidity are shaped by an individual's background (Mazzei et al., 2024), we propose that prior entrepreneurial exposure may mitigate the negative impact of exogenous crises on employees' entrepreneurial orientation. Threats tend to drive individuals to prioritize courses of action they are familiar with (Hodgkinson & Wright, 2002). Since employees with entrepreneurial exposure are familiar with entrepreneurial approaches (Hamilton, 2011; Pittino et al., 2018), they are more likely to follow an entrepreneurial path in response to crises. Because of this familiarity, we hypothesize that employees with entrepreneurial exposure in their background will exhibit higher

entrepreneurial orientation in response to exogenous crises compared to their counterparts without such exposure.

We test our hypotheses by focusing on the impact of the COVID-19 pandemic on employees of a multinational system integrator firm. The firm provides advanced technology solutions in a very competitive environment, which requires the ability to rapidly sense new market demands, opportunities, and challenges and to adapt to emerging technologies to better serve its customers. This environment naturally demands innovativeness, proactiveness, and risk-taking dispositions and behaviors at all levels, including the backbone of the organization—that is, the employees. As exogenous crises can amplify or suppress the entrepreneurial orientation required in this context, the selected firm offered a valuable setting for testing our hypotheses. Moreover, the COVID-19 pandemic, with its widespread impact on the economy and society, has been widely recognized as a significant threat (Wu et al., 2022), making it a relevant circumstance for generating insights into how individuals and organizations respond to exogenous crises (Vasi et al., 2024). We administered two questionnaires to the firm's employees, one before and one after the COVID-19 pandemic. Using propensity score matching, we identified 296 individuals who responded to the first questionnaire and matched them with the 296 most similar individuals who responded to the second questionnaire. This approach allowed us to estimate the effect of the crisis on individual changes in entrepreneurial orientation in response to the pandemic.

By showing how COVID-19 affected employees' entrepreneurial orientation, we provide three main contributions to existing research. First, we extend the research on entrepreneurship and crises by illustrating how exogenous crises affect employees' entrepreneurial orientation. Second, our study advances the emerging research based on threat-rigidity theory by offering a more nuanced understanding of how the boundary conditions shape individual responses to threats such as crises (Mazzei et al., 2024). Finally, our research complements existing studies on the importance of employees with entrepreneurial exposure in organizations (Braunerhjelm & Lappi, 2023; Rieger et al., 2023) by highlighting entrepreneurial exposure as a critical factor influencing changes in employees' entrepreneurial orientation in response to exogenous crises.

2 Literature review

2.1 Entrepreneurship and exogenous crises

The COVID-19 pandemic presented entrepreneurs with significant challenges, including adapting to new government measures, fluctuating consumer demand, shifting investor priorities, resource mobilization difficulties, and heightened uncertainty in future planning (Anwar et al., 2023; Xu et al., 2021). These unprecedented circumstances have reignited and expanded the existing research on the intersection of entrepreneurship and exogenous crises; and have provided valuable insights for both theory and practice (Kuckertz & Brändle, 2022; Vasi et al., 2024). Beyond documenting the impact of exogenous crises on ventures and entrepreneurs (e.g., Williams & Shepherd, 2016), scholars have produced invaluable knowledge on how these actors can effectively respond to crisis-related challenges, spanning different levels of analysis. For example, at the regional level, studies have highlighted how a robust entrepreneurial culture can significantly enhance crisis response efforts (Bishop, 2019; Bishop & Shilcof, 2017). At the individual level, research has examined the factors that shape entrepreneurs' responses, particularly their emotions, cognition,

and background. Concerning emotions, Shepherd and Williams (2020) argue that entrepreneurs' abilities to transition from negative to positive emotions are crucial for fostering creativity and innovation during adverse events. Regarding cognition, research suggests that entrepreneurs' cognitive schemas and prior experiences strongly influence how they perceive and respond to threats (Ahmed et al., 2022). For instance, some entrepreneurs identify opportunities even amid exogenous crises like the COVID-19 pandemic and leverage these perceptions to drive innovative solutions. Indeed, opportunity perception is widely acknowledged as a key driver of high-quality entrepreneurship during crises (Giotopoulos et al., 2017). Finally, regarding background, Williams and Shepherd (2016) emphasize the pivotal role of human capital, which can either hinder or enhance entrepreneurs' abilities to respond effectively to crises, depending on their specific experiences and educational background. This research underscores the importance of understanding how individuals respond to exogenous crises by being entrepreneurial in the context of venture creation (Emami et al., 2022). The same individual response may apply to the context of established organizations (Kuratko et al., 2023; Williams et al., 2017), yet little is known about how employees' entrepreneurial behaviours and dispositions change in response to exogenous crises. Understanding these dynamics is particularly important since crises impact all organizational levels (Mazzei et al., 2024), and employees' entrepreneurial behaviors and dispositions are crucial for overcoming inertia and preventing business decline or stagnation during such periods (Corbett et al., 2013; Kreiser et al., 2020; Niemann et al., 2022; Pearce et al., 1997). Since exogenous crises—such as financial downturns, natural disasters, wars, and infectious disease outbreaks (e.g., the COVID-19 pandemic)—are likely to recur, understanding their impact on individual entrepreneurial dispositions and behaviors is crucial for equipping organizations with a workforce that is both resilient and adaptable (Covin et al., 2020; Xu et al., 2021).

2.2 Employees' entrepreneurial orientation

Employees' entrepreneurial dispositions and behaviors are captured by the entrepreneurial orientation construct (Clark et al., 2024), which can be described as "a tendency held by individual employees of the organization toward innovative, proactive, and risk-taking behaviors in the workplace" (Covin et al., 2020, p. 2). This entrepreneurial orientation construct was originally introduced at the firm level to indicate the phenomenon of organizations *being entrepreneurial* (Covin & Slevin, 1989; Miller, 1983), such as displaying innovativeness, proactiveness, and risk-taking. Scholars have recently recognized the importance of capturing entrepreneurial orientation at the individual level (Bolton & Lane, 2012; Wales et al., 2023), with a focus on employees at every hierarcichal level, not just top managers (Clark et al., 2024). This shift emphasizes employees' agency in "thinking" and "behaving" entrepreneurially, thus positioning individual entrepreneurial orientation as a meaningful construct that reflects personal dispositions and behaviors independently of top management's influence. Employees endowed with entrepreneurial orientation can go beyond the tasks of their roles and implement entrepreneurial behavior to improve workplace performance and drive corporate entrepreneurship (Niemann et al., 2022; Ritala et al., 2021). For example, employees can develop creative solutions to improve processes or introduce new products, demonstrate proactiveness by anticipating market trends, and take calculated risks to implement transformative changes during routine operations. During crises, entrepreneurial orientation becomes equally crucial (Zighan et al., 2022). For instance, employees with entrepreneurial orientation can help the organization by

proposing innovative ways to collaborate, proactively identifying alternative supply chains, and taking the risk of experimenting with new work practices.

Notably, entrepreneurial orientation may vary among employees. Research on corporate entrepreneurship, for instance, highlights gender as a key factor influencing these differences. One stream of research, based on the feminist social theory, suggests that women employees are less predisposed to entrepreneurship due to individual attributes, such as psychological and personal traits (Adachi and Hishada, 2017) as well as their human and social capital (Turro et al., 2020). Other studies, building on the feminist liberal theory, suggest that the gender gap is due to discrimination in organizational and national (Ruiz et al., 2023b) settings (Urbano et al., 2022). For example, at the organizational level discrimination arises from glass-ceiling effects, balancing work and family responsibilities, and the different degrees of autonomy (Lumpkin et al., 2009; Ruiz et al., 2023a; Turro et al., 2020). At the national level, culture (Attah-Boakye et al., 2020; Marlow, 2020), such as a risk-taking culture (Ruiz et al., 2023a) and an individualistic culture (Turro et al., 2020), hinders women employees' participation in entrepreneurship, whereas a widespread gender equality culture (Ruiz et al., 2023b) could limit the gender gap in entrepreneurship among employees. Exogenous crises may exacerbate this gender gap among employees, as traits such as self-efficacy and resilience—stereotypically associated with masculinity (Kogut and Mejri, 2022)—become crucial during to navigate crises.

Regardless of gender, employees' entrepreneurial orientation remains critical for helping established organizations to overcome exogenous crises. However, the impact of exogenous crises on employees' entrepreneurial orientation remains empirically unexplored and theoretically puzzling. On the one hand, exogenous crises can create opportunities for individual employees to engage in new initiatives, proactively adapt, and take calculated risks to change how they approach their daily tasks (Osiyevskyy & Dewald, 2018). On the other hand, exogenous crises often impose constraints (Mazzei et al., 2024), such as heightened organizational control and resource limitations, which can inhibit employees' abilities to take advantage of such opportunities. This tension underscores the urgency of investigating the impact of exogenous crises on employees' entrepreneurial orientation.

2.3 Entrepreneurial exposure

In addressing the puzzle of the crisis–entrepreneurial orientation relationship in employees, it is important to consider individuals' background, as suggested in prior research. Williams and Shepherd (2016) highlight the dual role of background as a double-edged sword in navigating crisis-induced challenges. This perspective aligns with studies that frame exogenous crises as threats and highlights the importance of exploring individual-level boundary conditions to explain the varied ways in which individuals respond to crises (Mazzei et al., 2024).

Among the various background factors that could significantly shape individuals' responses to exogenous crises, entrepreneurial exposure—defined as prior experience or indirect involvement with entrepreneurial activities (Peterman & Kennedy, 2003)—stands out. What sets entrepreneurial exposure apart is the familiarity that it provides through challenges inherent to entrepreneurship (Hahn et al., 2022; Hamilton, 2011), such as navigating complex and uncertain situations (Duchek, 2018). Research has highlighted that this exposure to the distinctive challenges of entrepreneurship plays a significant role in shaping how individuals respond to stressful situations (Uy et al., 2013), including crises

(Espinoza-Benavides & Guerrero, 2024). A prominent form of entrepreneurial exposure, particularly among a qualified workforce (Cervello et al., 2022; Sieger et al., 2024), involves growing up in an entrepreneurial family (Hahn et al., 2020; Mathias et al., 2015; Pittino et al., 2018). Such exposure serves as a formative experience (Chlosta et al., 2012; Hamilton, 2011) and offers individuals role models, vicarious learning, and insights into business challenges through observation and personal understanding (Criaco et al., 2017; Hahn et al., 2022; Mathias et al., 2015).

3 Theory and hypotheses

3.1 Threat-rigidity theory and crises

Threat-rigidity theory provides a strong foundation for understanding how crises affect organizations and individuals. Originally proposed by Staw et al. (1981), in this theory, a threat is defined as an "environmental event that has impending negative or harmful consequences for an entity" (p. 582). Exogenous crises, such as the COVID-19 pandemic, represent a notable form of threat, as they disrupt normal operations and impose significant risks on organizations (Wu et al., 2022). Their disruptive nature triggers pervasive behavioral responses across all organizational levels, not solely among top managers (Mazzei et al., 2024).

In response to threats, individuals and organizations often exhibit rigidity—a protective behavioral response driven by human-bounded rationality that limits individuals' abilities to adapt to complex situations (Simon, 1991). This rigidity is characterized by retreating into familiar and established courses of action rather than exploring new approaches. In particular, at the individual level, rigidity arises from natural human tendencies to respond to the stress of change and uncertainty by defaulting to simplified decision-making based on learned information and habitual behaviors (Weick, 1990). Thus, rigidity manifests as reduced *cognitive* flexibility (Hodgkinson & Wright, 2002), in which decisions are guided by background knowledge and past experiences rather than effortfully incorporating new information when faced with external threats (Mazzei et al., 2024). *Behaviorally*, rigidity is characterized by a reliance on familiar courses of action and a reluctance to deviate from established practices, even when novel or unconventional responses are required (Griffin et al., 1995).

Although these protective mechanisms may offer short-term stability in response to an exogenous crisis, they often hinder innovation and creativity (Halinski et al., 2024; Mazzei et al., 2024; Wood & McKinley, 2017). This rigidity becomes particularly dysfunctional when dealing with unprecedented or complex challenges that require flexible thinking and novel solutions (Griffin et al., 1995; Hodgkinson & Wright, 2002; Staw et al., 1981). Drawing on threat-rigidity theory, the following sections explore how crisis-induced rigidity may influence employees' entrepreneurial orientation and how these responses are shaped by entrepreneurial exposure.

3.2 Employees' entrepreneurial orientation and exogenous crises

Building on threat-rigidity theory, we hypothesize that exogenous crises induce rigidity, which significantly undermines employees' entrepreneurial orientation for the following two main reasons.

First, crisis-induced rigidity constrains employees' *cognitive* flexibility (Hodgkinson & Wright, 2002). As a result, employees tend to rely heavily on existing knowledge rather than exploring new ideas, thus limiting their capacity to develop innovative solutions or proactively anticipate emerging opportunities (Wood & McKinley, 2017). Heightened fear and anxiety, as seen in response to exogenous crises, such as the COVID-19 pandemic (Doanh et al., 2021), further narrow focus and erode confidence, discouraging employees from experimenting with new approaches or taking calculated risks (Dijkstra et al., 2022; Hodgkinson & Wright, 2002). Social distancing and remote work intensified these challenges by restricting informal collaboration and spontaneous idea-sharing, both of which are critical for fostering creativity, proactive engagement, and bold decision-making (Covin et al., 2020).

Second, rigidity also manifests *behaviorally* as a retreat to familiar courses of action (Hodgkinson & Wright, 2002), which reduces employees' tendency to proactively seek new ideas and take the risk of implementing them. Under increased organizational control and resource preservation efforts, employees often avoid initiatives that deviate from well-established practices or are perceived as uncertain or costly, thereby further constraining their capacity to innovate, take initiative, or engage in risky endeavors (Saebi et al., 2017; Shimizu, 2007). Anxiety and stress, such as the health-related concerns experienced in response to the COVID-19 pandemic (Doanh et al., 2021), can intensify this retreat, as employees prioritize immediate safety and preservation over forward-thinking and entrepreneurial behaviors, including seeking new opportunities, proposing creative solutions, and engaging in risk-taking (Dijkstra et al., 2022; Jeong et al., 2023).

In sum, the rigidity that often emerges from exogenous crises constrains employees' entrepreneurial orientation, particularly across the dimensions of innovativeness, proactiveness, and risk-taking. Based on these arguments, we propose the following hypothesis:

H1 A negative relationship exists between exogenous crises and employees' entrepreneurial orientation.

3.3 The role of entrepreneurial exposure as a boundary condition

As posited by threat-rigidity theory, employees respond to threats by focusing on areas they believe they can control and relying on established and well-learned courses of action shaped by their backgrounds (Chattopadhyay et al., 2001; Staw et al., 1981). While this tendency generally leads to a reduction in entrepreneurial orientation, as hypothesized above, there may be cases where background, rather than being a constraint, serves as an asset that employees leverage to navigate challenging conditions. Indeed, an individual's background functions as a "double-edged sword" in the context of a threat (Williams & Shepherd, 2016, p. 366). On the one hand, it anchors individuals to well-learned courses of action and familiar information, often at the expense of exploring new information or innovative solutions (Hodgkinson & Wright, 2002). On the other hand, when one's background includes entrepreneurial exposure, it can provide the individual with appropriate courses of action that can help them cope with the stress and uncertainty (Braunerhjelm & Lappi, 2023; Uy et al., 2013) that characterize exogenous crises (Espinoza-Benavides & Guerrero, 2024).

In light of this, we hypothesize that entrepreneurial exposure serves as a boundary condition that mitigates the adverse impact of exogenous crises on employees' entrepreneurial orientation. Entrepreneurial exposure, such as being raised in a family of

entrepreneurs, provides opportunities for vicarious learning and role modeling (Criaco et al., 2017). Through this exposure, individuals observe and internalize how entrepreneurial parents or mentors rapidly adapt to unexpected events, handle stressful situations that threaten personal and financial stability, and transform challenges into opportunities by taking calculated risks and devising innovative solutions (Hahn et al., 2022; Hamilton, 2011). In times of crisis, employees with entrepreneurial exposure are likely to activate these familiar courses of action (Mazzei et al., 2024) observed in entrepreneurial models, thus enabling them to respond with innovativeness, proactiveness, and risk-taking. For example, employees with entrepreneurial exposure may draw on their familiarity with flexible responses to unexpected events, allowing them to adapt quickly to disruptions in work practices, such as finding new ways to collaborate in response to social distancing and remote work during the COVID-19 pandemic. Similarly, in the face of crisis-induced anxiety and stress, such as the health-related concerns observed in response to the COVID-19 pandemic, which amplified uncertainty and fear, these employees are more likely to respond with openness to new approaches by proactively seeking innovative solutions to navigate personal threats and taking the risks necessary to implement them.

In contrast, employees without entrepreneurial exposure lack familiarity with entrepreneurial role models and have had fewer opportunities to observe entrepreneurial responses to stressful conditions and unexpected disruptions. Consequently, when they revert to established courses of action in response to exogenous crises, as suggested by threat-rigidity theory, they are more likely to exhibit overly cautious behaviors and narrow thinking. For example, these employees may struggle to adapt to disruptions in ways of working (e.g., remote work) or avoid taking the risks necessary to experiment with novel approaches, particularly when pressured by the anxiety and stress that often accompany exogenous crises.

These arguments highlight the crucial role of entrepreneurial exposure in shaping different responses to exogenous crises. When a crisis occurs, employees with entrepreneurial exposure respond with higher levels of innovativeness, proactiveness, and risk-taking compared to their counterparts without such exposure. Thus, while entrepreneurial exposure mitigates the negative effects of exogenous crises on entrepreneurial orientation, it also amplifies the differences in entrepreneurial orientation between employees with and without entrepreneurial exposure during times of crisis. Accordingly, we propose the following hypothesis:

H2 Employees with entrepreneurial exposure exhibit higher entrepreneurial orientation in response to exogenous crises compared to employees without entrepreneurial exposure.

Our conceptual framework is represented in Fig. 1.

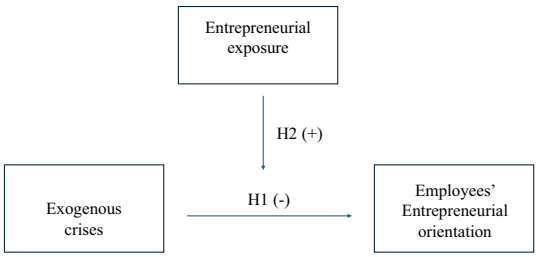

Fig. 1 Conceptual framework

4 Methodology

4.1 Sample and data collection

To test the hypotheses, data were collected using two separate questionnaires administered via computer-assisted web interviewing. The first questionnaire was administered in September 2019, during the pre-COVID pandemic period, whereas the second one was conducted between May and June 2021, approximately a year after the COVID-19 outbreak was officially declared a global pandemic. Both questionnaires were distributed to employees of the same system integrator firm, a multinational software firm headquartered in northern Italy. This firm specializes in providing vertical solutions for its clients through a range of software solutions and consulting services. Their expertise spans areas such as digital marketing, e-commerce, mobile applications, web design, remote monitoring and control systems, and digital public services. The firm is not listed, has 20 years of market experience, employs nearly 2000 people, and generates annual revenue exceeding 200 million dollars.

To ensure data confidentiality, the questionnaires were anonymous, and employees answered on a voluntary basis. In the first survey wave, employees willing to participate in the survey were required to answer all questions, including those regarding personal data (e.g., age, gender, education). In the second wave, these questions were optional due to the firm's updated policy restrictions. To ensure consistency, we excluded incomplete cases in which demographic data were missing. This helped maintain a comparable dataset across both waves.

For both time periods, the questionnaires were administered to a total of about 1,500 employees from the Italian division of the firm, with the aim of reducing heterogeneity within the sample. The response rate was 20% for the first questionnaire (with a total of 299 responses) and 25% for the second (with a total of 369 responses). Both questionnaires met Comrey and Lee's (1992) sample size thresholds for assessing the adequacy of the data collected. We further checked for nonresponse bias in both waves of the survey, as explained in Sect. 5.1.

The first questionnaire aimed to support the firm in assessing different skills (e.g., digital skills, soft skills), including the level of employees' entrepreneurial orientation. For the purposes of this research, the derived dataset represents the pre-COVID-19 sample and was used to measure employees' level of entrepreneurial orientation before the COVID-19 pandemic. The second questionnaire, which was a follow-up, allowed for assessing employees' conditions in a rapidly evolving context that had changed substantially since the first questionnaire due to the effect of the pandemic. This second dataset was used to measure the level of entrepreneurial orientation of employees affected by the pandemic conditions.

4.2 Definition of variables

4.2.1 Dependent variable

The two questionnaires were used to measure the dependent variable, *entrepreneurial orientation*, on the basis of the scale developed by Bolton and Lane (2012), the first authors to validate a scale for measuring entrepreneurial orientation at the individual level. To

measure entrepreneurial orientation, the questionnaire included 10 items assessing the three dimensions of entrepreneurial orientation on a 5-point Likert scale, distributed as follows:

- Risk-taking: three items
- Innovativeness: four items
- Proactiveness: three items

The questions included in the questionnaires are reported in the Appendix.

Before building our dependent variable (*entrepreneurial orientation*), the validity and reliability of the 10-item scale were checked. To determine validity, we conducted a confirmatory factor analysis, which revealed that the 10-item scale loaded onto a single factor. This result supports the one-dimensionality of the scale and indicates that the items collectively measure a single underlying construct, thus supporting the scale's validity. To check the scale's reliability, we computed Cronbach's alpha and composite reliability across the 10 items, which yielded values of 0.863 and 0.865, respectively. Both metrics exceeded the commonly recommended thresholds of 0.7 for Cronbach's alpha (Nunnally, 1978) and 0.7 for composite reliability (Hair et al., 2020), indicating the scale's strong reliability.

Finally, we computed the dependent variable, *entrepreneurial orientation*. A refined method based on least squares regressions (Thurstone, 1935) was used to calculate the factor score, which represents the dependent variable (*entrepreneurial orientation*) derived from the 10 measured items (predictor variables) weighted by their regression coefficients. Using this approach, the independent variables in the regression equation were the standardized observed values of the items associated with the estimated factor. These predictor variables were weighted by the regression coefficients, which were obtained by multiplying the inverse of the observed variable correlation matrix by the matrix of factor loadings. The resulting factor score served as the dependent variable in the regression equation. The predicted values generated through confirmatory factor analysis were then adopted to represent the latent construct of entrepreneurial orientation.

4.2.2 Independent variable

The main explanatory variable was the *COVID-19* dummy variable, which was equal to 1 for those observations collected from the second questionnaire (*COVID-19* = 1) and 0 otherwise.

The other independent variable used as a boundary condition was *entrepreneurial exposure*, which was equal to 1 if the respondents indicated that their parents owned or founded a business. This variable aimed to capture a widely recognized form of entrepreneurial exposure—namely, exposure to an entrepreneurial family (Hahn et al., 2020). This kind of exposure is recognized as a formative experience that offers individuals insight into business challenges through vicarious learning and personal understanding (Hamilton, 2011; Mathias et al., 2015).

4.2.3 Control variables

Several controls at the individual level were collected, including personal information (e.g., gender, age, and level of study) and job information (e.g., tenure and role within the firm). Specifically, *gender* was a dummy variable equal to 1 if the individual was male. *Age* was a

continuous variable indicating the difference between the year when the questionnaire was administrated and the respondent's date of birth. *Level of study* was proxied by an ordinal variable identifying the following levels of study: *postgraduate degree* (either doctorate or MBA; value 0); *high school diploma* (value 1), *bachelor's degree* (value 2), *master's degree* (value 3), *less than high school level* (value 4), and *other level of study* (value 5). *Tenure* was a continuous variable indicating the number of years that the individual had been working in the firm. We defined the role within the firm as an ordinal variable identifying the following job positions: *nonmanagerial employee* (value 0), *middle manager* (value 1), *manager* (value 2), and *other job position* (value 3).

4.3 Matching procedure

To assess the extent to which entrepreneurial orientation changed due to the COVID-19 pandemic, the datasets derived from the two questionnaires were first matched, as in prior research investigating the impact of exogenous crises (e.g., Douch et al., 2023). Although the questionnaires were administered within the same firm, adequately anonymized respondents may have differed across the questionnaires, making it impossible to track intra-individual changes in entrepreneurial orientation among individuals who participated in both questionnaires due to the COVID-19 pandemic. To address this issue, we relied on propensity score matching (Rosenbaum & Rubin, 1983), which allows for matching a subset of individuals from the treated group (i.e., post-COVID-19 respondents) with a subset of individuals in the control group (i.e., pre-COVID-19 respondents). Specifically, this involves pairing (matching) individuals from the treated group with individuals from the control group to ensure that each selected pair consists of two individuals who are as similar as possible in their baseline characteristics. This results in a final subset of individuals who are balanced in terms of these baseline characteristics, allowing for a more accurate comparison between the groups (DuGoff et al., 2014; Stuart, 2010; Stuart & Rubin, 2008).

Since finding exact matches on all covariates is often challenging in real-world applications, propensity score matching relies on a distance measure to pair individuals from treated and control groups. Specifically, the propensity score is defined as "the probability that an individual received the treatment, based on his or her observed characteristics" (DuGoff et al., 2014, p. 287). It enables matching by summarizing the covariates into a single scalar value, often referred to as a balancing score, which allows for matching treated and control groups on this summary measure (Stuart & Rubin, 2008), improving comparability between the two groups, reducing bias in effect estimations, and enhancing the validity of causal inferences (Austin, 2011; DuGoff et al., 2014).

Operationally, the covariates used to perform the matching were *gender, year of birth,*[1] *tenure, role, level of study,* and *entrepreneurial exposure.* The nearest-neighbor method was adopted with the option of "no replacement," which ensured that each individual was matched to only one pair. Finally, the "common support" criterion was applied to define the range of propensity scores in which individuals from both the treatment and control groups overlapped (Garrido et al., 2014; Stuart, 2010). Individuals from the treated group who fell outside this range (i.e., were "off support") could not be included in the analysis, as there were no comparable individuals in the control group with similar propensity scores. This

[1] We adopted the year of birth instead of age because it was time invariant and did not change from the first to second questionnaire, which were administrated in two different years.

exclusion ensured that the treatment effects were assessed only within the range for which valid comparisons could be made (Garrido et al., 2014).

4.4 Empirical model

To test our hypotheses, we performed a multiple hierarchical ordinary least squares regression analysis (Cohen et al., 2013). This methodology differs from conventional multiple-regression analysis, as the independent variables are added in blocks. Accordingly, the baseline model included only the dependent variable and the control variables. Then, the *COVID-19* dummy variable was entered to assess its relationship with the dependent variable. Finally, *entrepreneurial exposure* was included as a contingent variable.

To assess its potential role as a contingency in the relationship between exogenous crises and employees' entrepreneurial orientation, we first had to determine whether the two datasets from the two questionnaires could be pooled together. To do so, we conducted a Chow test. The Chow test evaluates whether the coefficients estimated for one group of data are equal to those estimated for another to identify potential structural breaks in the data—in this case, between pre-COVID-19 and post-COVID-19. Based on the results of the Chow test, as detailed in Sect. 5.3, we found evidence of a structural break and consequently kept the pre- and post-COVID-19 samples separate. This meant that we had to test the effect of *entrepreneurial exposure* before and after COVID-19 independently.

5 Results

5.1 Reliability, validity, and common method bias

We implemented multiple steps to ensure the reliability and validity of our sample and measurement model. First, to address early response bias, we tested for nonresponse bias by comparing early and late respondents within each wave. We performed several t-tests for the means of the control variables to compare early and late respondents in both the pre-COVID-19 and post-COVID-19 surveys. The difference in the means of all variables was far from being statistically significant.[2]

To address potential common method bias, we first performed a Harman's one-factor test (Podsakoff et al., 2003). A principal component analysis that included all variables in our model identified seven factors with eigenvalues greater than 1. The first factor accounted for only 26.8% of the total variance, well below the 50% threshold, typically indicative of a common method bias issue. Additionally, following the statistical approach of Kock and Lynn (2012), we generated a new variable with random values and created a model in which all constructs pointed to this random variable. We then ran the model and compared the inner model's variance inflation factors (VIFs). All VIFs ranged from 1.6 to 1.9, well below the threshold of 3, indicating that our data did not exhibit any concerning signs of common method bias (Kock, 2015; Kock & Lynn, 2012).

[2] T-tests are available upon request.

5.2 Matching procedures

The initial dataset consisted of 668 individuals, with 299 respondents from the pre-COVID-19 survey and 369 respondents from the post-COVID-19 survey. Propensity score matching led to a final sample of 296 individuals before COVID-19 and 296 individuals after the COVID-19 pandemic.

We implemented multiple steps to ensure the quality of the matching results. First, we assessed the adequacy of the common support criterion used in our analysis. This criterion is fundamental for selecting covariates for propensity score matching between the treatment and control groups. This ensures that there are sufficient and reasonable cases in the control group to serve as comparable counterparts for the treatment group. Common support was evaluated using a propensity score histogram, which illustrates the distribution of propensity scores across two groups. If the distributions of propensity scores are similar, common support is verified (Garrido et al., 2014). Figure 2 presents the propensity score histogram by treatment status and shows a good overlap in the propensity score distributions between the two groups, thereby validating the use of the common support criterion.

Second, we assessed the standardized percentage bias for each covariate before and after matching. Standardized percentage bias is defined as the difference in sample means between the treated and control groups, expressed as a percentage of the square root of the average of the sample variances in the two groups (Rosenbaum & Rubin, 1983). When the quality of the matching is satisfactory, the matching process decreases the imbalance in the samples. Figure 3 provides a graphical summary of the covariate imbalance using a dot chart that shows the standardized percentage bias for each covariate before and after matching.

As can be seen in Fig. 3, for all covariates, there was a reduction in the bias after matching, which is particularly relevant in the case of *entrepreneurial exposure* and *year of birth*. This means that the matching procedure ensured that the two groups were characterized by a similar level of *entrepreneurial exposure* and by almost the same *year of birth.*

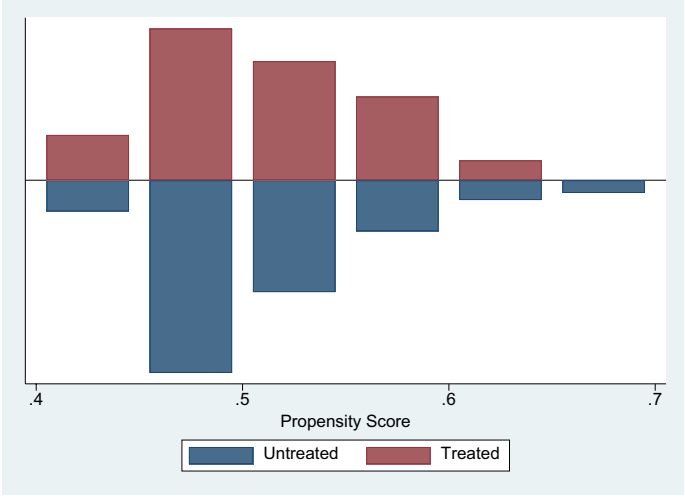

Fig. 2 Propensity score histogram by treatment status

Fig. 3 Standardized percentage bias across the covariates for the unmatched and matched groups

Table 1 T-test on the mean of the covariates before and after matching

	Treated	Control	Difference	*p*-value
Before matching				
Gender	0.6429	0.6689	−0.0260	0.4837
Year of birth	1974.1280	1972.7360	1.3920	0.0704
Level of study	1.7650	1.7759	−0.0109	0.8842
Tenure	11.6635	12.2943	−0.6309	0.3860
Role	0.4851	0.4548	0.0302	0.6136
Entrepreneurial exposure	0.2280	0.1505	0.0775	0.0118
After matching				
Gender	0.6554	0.6655	−0.0101	0.7950
Year of birth	1973.3000	1972.9000	0.4000	0.5800
Level of study	0.4628	0.4595	0.0034	0.7820
Tenure	1.7534	1.7703	−0.0169	0.9560
Role	12.0880	12.3010	−0.2130	0.8310
Entrepreneurial exposure	0.1689	0.1520	0.0169	0.5760

Third, in addition to graphical representation, numerical diagnostics were employed to more rigorously assess the matching quality and ensure that the sample obtained could be used for subsequent regression analyses. Therefore, a t-test (a statistical test used to compare the means of two groups) was performed. In Table 1, the t-test results show the differences in the mean values of the covariates between the treated and control groups. The comparison was made both before and after matching.

A statistically nonsignificant difference between the means indicated that the treated and control groups exhibited similar characteristics and that the matching quality was satisfactory. All variables showed nonsignificant differences after matching. In addition, *entrepreneurial exposure* and *year of birth*, which had statistically significant differences (respectively, $p < 0.05$ and $p > 0.01$) before matching, exhibited statistically nonsignificant differences in the averages between the treated and control groups (respectively, $p = 0.576$ and $p = 0.580$) after matching.

5.3 Descriptive evidence

The final sample consisted of 592 observations for which we had complete information. Table 2 reports the descriptive statistics and correlations of the variables. The participants exhibited e*ntrepreneurial orientation* equal to 0.0375, which represents the mean of the predicted values achieved from the confirmatory factor analysis, as explained in Sect. 4.2.1. In our sample, 15.5% of employees had *entrepreneurial exposure*, which is in line with broader published reports indicating that, on average, approximately 20% of graduates have been similarly exposed to entrepreneurial backgrounds (e.g., 22.4% in Chiarello et al., 2019; 19.7% in Cervello et al., 2022). Moreover, 66% of the individuals in our sample were male, with an average age of almost 47 years. Concerning job position, two-thirds of the individuals were nonmanagerial employees, 24% were middle managers, 6% were top managers, and less than 4% were in other job positions. For study title, 53% had high school diplomas, 14% had bachelor's degrees, 30% had master's degrees, 1.7% had higher degrees (e.g., PhD or MBA), 0.8% had lower-level degrees, and 0.5% had other types of degrees. The sample was balanced before and after the COVID-19 pandemic, with 50% of the observations before and 50% after the crisis.

5.4 Main estimations

Table 3 shows the regression analyses. Model 1 included only the control variables. In Model 2, the independent variable *COVID-19* was added to test H1. In Models 3 and 4, the variable *entrepreneurial exposure* was added (first without *COVID-19*, then including it). In Models 5 and 6, to assess the contingent role of *entrepreneurial exposure* in shaping changes in *entrepreneurial orientation* in response to exogenous crises (i.e., H2), the sample was split into pre-COVID-19 (Model 5) and post-COVID-19 (Model 6) groups. The effect of *entrepreneurial exposure* on *entrepreneurial orientation* was then estimated separately for each group. We followed this approach based on the results of the Chow test, which indicated a structural break in the data between the pre- and post-COVID-19 period.

The results of the Chow test were obtained by fitting a model that included a separate intercept for the post-COVID-19 period and an interaction term between *COVID-19* and *entrepreneurial exposure*. This model allowed us to test the effects of *COVID-19* on both the intercept and the slope of *entrepreneurial exposure*. The overall test performed a joint hypothesis test to assess whether the coefficients for the pre- and post-COVID-19 periods were equal. The Chow test yielded a significant result, with a *p*-value of 0.0288, an F test equal to 3.57, indicating that the coefficients differed between the two periods. This finding implies a recommendation to analyze the effect of *entrepreneurial exposure* on *entrepreneurial orientation* separately for each period (Chow, 1960).

Table 2 Descriptive statistics and correlation matrix

	Obs	Mean	Std. Dev	Entrepreneurial orientation	Gender	Age	Role	Level of study	Tenure	COVID-19	Entrepreneurial exposure
Entrepreneurial orientation	592	0.0375	2.1239	1.0000							
Gender	592	0.6605	0.4739	0.1433*	1.0000						
Age	592	46.8767	9.2962	−0.0065	0.0531	1.0000					
Role	592	0.4611	0.7485	0.1162*	0.0844*	0.3012*	1.0000				
Level of study	592	1.7618	0.9624	0.0035	−0.0886*	−0.0837*	0.0940*	1.0000			
Tenure	592	12.1944	9.3243	−0.1126*	−0.0882*	0.4091*	0.0459	−0.1666*	1.0000		
COVID-19	592	0.5000	0.50042	−0.0882*	−0.0107	0.0849*	0.0023	−0.0088	−0.0114	1.0000	
Entrepreneurial exposure	592	0.15540	0.3625	0.1031*	−0.0666	0.1158*	−0.0098	0.0044	−0.0368	0.0093	1.000

* $p < .05$

Table 3 Main analysis

	(1) Entrepreneurial orientation	(2) Entrepreneurial orientation	(3) Entrepreneurial orientation	(4) Entrepreneurial orientation	(5) Entrepreneurial orientation	(6) Entrepreneurial orientation
Gender	0.536***	0.533***	0.593***	0.589***	0.379	0.853***
	(0.192)	(0.191)	(0.191)	(0.191)	(0.241)	(0.305)
Age	−0.00320	0.000242	−0.00826	−0.00479	−0.00970	−0.0130
	(0.0115)	(0.0115)	(0.0115)	(0.0116)	(0.0152)	(0.0184)
Nonmanagerial employee	−1.019**	−1.023**	−1.077***	−1.078***	−1.341**	−0.941
	(0.409)	(0.406)	(0.406)	(0.405)	(0.551)	(0.605)
Middle manager	−0.601	−0.631	−0.660	−0.686*	−0.830	−0.574
	(0.417)	(0.414)	(0.414)	(0.412)	(0.541)	(0.637)
Other roles	−0.625	−0.626	−0.648	−0.648	−0.472	−0.863
	(0.619)	(0.615)	(0.614)	(0.611)	(0.846)	(0.900)
Post graduate	1.571**	1.552**	1.502**	1.485**	0.882	2.163*
	(0.705)	(0.700)	(0.699)	(0.696)	(0.811)	(1.232)
High school diploma	−0.0172	−0.00307	−0.0179	−0.000271	−0.177	0.271
	(0.213)	(0.212)	(0.212)	(0.211)	(0.268)	(0.335)
Bachelor's degree	0.0810	0.0945	0.0971	0.113	0.133	0.0274
	(0.301)	(0.299)	(0.299)	(0.297)	(0.377)	(0.475)
Less than high school level	−0.992	−0.754	−1.053	−0.825		−0.729
	(0.982)	(0.979)	(0.974)	(0.973)		(1.097)
Other level of study	−1.354	−1.560	−1.495	−1.694	−1.773	
	(1.263)	(1.257)	(1.253)	(1.250)	(1.130)	
Tenure	−0.0211*	−0.0231**	−0.0170	−0.0191*	−0.0124	−0.0243
	(0.0108)	(0.0107)	(0.0108)	(0.0107)	(0.0139)	(0.0167)
COVID-19		−0.435**		−0.425**		
		(0.179)		(0.178)		
Entrepreneurial exposure			0.666***	0.657***	0.339	0.946**
			(0.248)	(0.247)	(0.313)	(0.399)
Constant	0.971	1.043	1.069	1.134*	1.799*	0.679
	(0.695)	(0.691)	(0.690)	(0.688)	(0.929)	(1.062)
Observations	592	592	592	592	296	296
R-squared	0.056	0.067	0.068	0.078	0.069	0.085

Results of the ordinary least squares regressions performed on the matched sample. Model 1 contains only control variables, Model 2 adds the independent variable *COVID-19*, Model 3 adds the variable *Entrepreneurial exposure,* and Model 4 includes both variables. Finally, Models 5 and 6 split the sample before and after COVID-19 (*COVID-19* = 0 in Model 5 and *COVID-19* = 1 in Model 6) to investigate the contingent effect of *Entrepreneurial exposure*

Standard errors in parentheses; *** $p < .01$, ** $p < .05$, * $p < .10$

Let us now discuss the results displayed in Table 3. To interpret the resulting coefficients, we looked at the statistically significant relationships and evaluated the magnitude of the effect in terms of change in the standard deviation (SD) of the dependent variable. The SD for *entrepreneurial orientation*, as exhibited in Table 2, was equal to 2.12. In

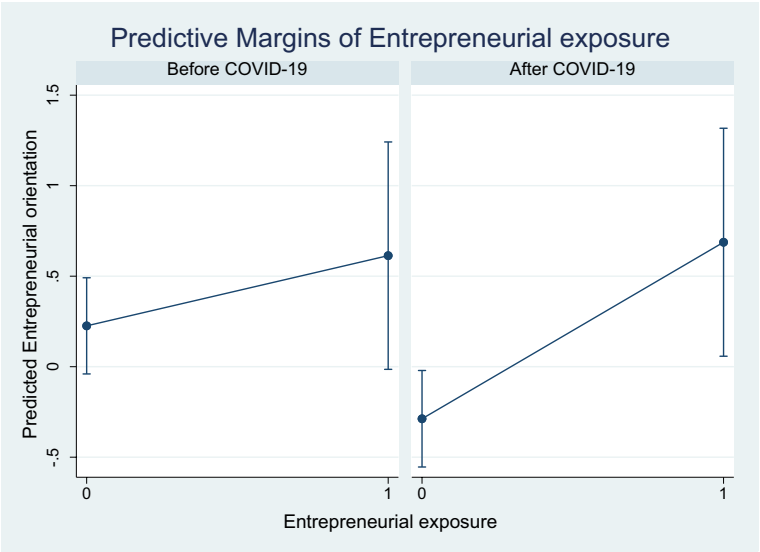

Fig. 4 Margin plots of the effects of entrepreneurial exposure before and after the COVID-19 pandemic

Model 1, *entrepreneurial orientation* was affected by different controls. In particular, being a male increased *entrepreneurial orientation* by 0.26 SD ($p < 0.001$). A high level of study (namely, a postgraduate level of study)[3] was positively related to *entrepreneurial orientation* ($p < 0.05$) and increased the *entrepreneurial orientation* by 0.734 SD. In contrast, occupying nonapical roles, such as nonmanagerial employees, decreased *entrepreneurial orientation* ($p < 0.05$) by 0.522 SD compared to managers.[4]

In Model 2, the coefficient of *COVID-19* was negative and statistically significant, suggesting that an exogenous crisis reduces employees' entrepreneurial orientation, thereby supporting H1. In particular, after COVID-19, *entrepreneurial orientation* decreased by 0.128 SD ($p < 0.001$). Models 3 and 4, which included the independent variable *entrepreneurial exposure* (first without the *COVID-19* variable and then with it), showed that the effect of *entrepreneurial exposure* was positive and statistically significant. Exposure to entrepreneurship led to an increase of 0.334 SD and 0.349 SD in employees' *entrepreneurial orientation* in Model 3 and Model 4, respectively.

Models 5 and 6 separately show the effect of *entrepreneurial exposure* before and after the COVID-19 pandemic, respectively. Before COVID-19, *entrepreneurial exposure*, although exhibiting a positive coefficient, had no statistically significant effect on *entrepreneurial orientation* (see Model 5). After COVID-19, exposure to entrepreneurship had a statistically significant effect ($p < 0.001$) and increased e*ntrepreneurial orientation* by 0.414 SD. H2 is thereby supported.

To visually interpret these results, Fig. 4 displays the effect of *entrepreneurial exposure* on *entrepreneurial orientation*, distinguishing between the periods before and after the COVID-19 pandemic. The upward-sloping line indicates a positive relationship between *entrepreneurial exposure* and *entrepreneurial orientation* both pre- and

[3] The reference case was *master's degree*.

[4] The reference case was *manager.*

Table 4 Robustness tests

	(1) Entrepreneurial orientation	(2) Entrepreneurial orientation	(3) Entrepreneurial orientation	(4) Entrepreneurial orientation	(5) Entrepreneurial orientation	(6) Entrepreneurial orientation
Gender	0.532***	0.524***	0.611***	0.607***	0.348	0.910***
	(0.187)	(0.186)	(0.186)	(0.185)	(0.241)	(0.284)
Age	−0.0126	−0.0112	−0.0136	−0.0123	−0.0193	−0.0158
	(0.0109)	(0.0109)	(0.0108)	(0.0108)	(0.0147)	(0.0162)
Nonmanagerial employee	−1.094***	−1.113***	−1.109***	−1.131***	−1.518***	−0.893
	(0.399)	(0.396)	(0.395)	(0.393)	(0.547)	(0.570)
Middle manager	−0.568	−0.596	−0.630	−0.655	−0.883	−0.491
	(0.408)	(0.405)	(0.403)	(0.402)	(0.541)	(0.599)
Other roles	−0.747	−0.752	−0.780	−0.793	−0.557	−1.081
	(0.611)	(0.607)	(0.604)	(0.602)	(0.847)	(0.861)
Post graduate	1.544**	1.521**	1.503**	1.475**	0.895	2.116*
	(0.700)	(0.696)	(0.692)	(0.690)	(0.813)	(1.193)
High school diploma	0.00345	0.00803	0.0149	0.0304	−0.112	0.284
	(0.208)	(0.206)	(0.205)	(0.204)	(0.265)	(0.316)
Bachelor's degree	0.0394	0.0448	0.0716	0.0840	0.171	−0.0574
	(0.291)	(0.289)	(0.288)	(0.287)	(0.376)	(0.435)
Less than high school level	−1.020	−0.844	−1.057	−0.872		−0.778
	(0.976)	(0.973)	(0.965)	(0.965)		(1.063)
Other level of study	−1.341	−1.499	−1.477	−1.663	−1.701	
	(1.256)	(1.251)	(1.242)	(1.241)	(1.132)	
Tenure	−0.0206*	−0.0221**	−0.0161	−0.0178*	−0.00903	−0.0259
	(0.0107)	(0.0106)	(0.0106)	(0.0106)	(0.0138)	(0.0162)
COVID-19		−0.324*		−0.371**		
		(0.175)		(0.174)		
Entrepreneurial exposure			0.720***	0.762***	0.358	1.023***
			(0.225)	(0.225)	(0.313)	(0.326)
Constant	1.464**	1.597**	1.286**	1.435**	2.290**	0.754
	(0.659)	(0.659)	(0.654)	(0.656)	(0.906)	(0.953)
Observations	613	613	612	612	299	313
R-squared	0.060	0.067	0.076	0.084	0.074	0.105

Results of the ordinary least squares regressions on the whole sample without the propensity score matching. Model 1 contains only control variables, Model 2 adds the independent variable *COVID-19*, Model 3 adds the variable *Entrepreneurial exposure,* and Model 4 includes both the variables. Finally, Models 5 and 6 split the sample before and after COVID-19 (*COVID-19* = 0 in Model 5 and *COVID-19* = 1 in Model 6) to investigate the contingent effect of *Entrepreneurial exposure*

Standard errors in parentheses; *** $p < .01$, ** $p < .05$, * $p < .10$

post-COVID-19. However, before COVID-19, the confidence intervals for *entrepreneurial orientation* overlapped when *entrepreneurial exposure* was either 0 or 1. This suggests that, prior to the pandemic, employees with prior entrepreneurial exposure exhibited higher levels of entrepreneurial orientation, but the difference was not statistically significant. In

contrast, post-COVID-19, the confidence interval for *entrepreneurial orientation* when *entrepreneurial exposure* was equal to 1 lay entirely above the confidence interval when it was equal to 0. This indicates that, in response to the pandemic, employees with prior entrepreneurial exposure began to display significantly higher levels of entrepreneurial orientation.

5.5 Robustness checks

As a robustness test, we ran the regressions again without employing propensity score matching. The results are shown in Table 4 Model 1 contained control variables only; Model 2 included the main independent variable, *COVID-19*; Model 3 added the variable *entrepreneurial exposure*; and Model 4 added both *COVID-19* and *entrepreneurial exposure*. Models 5 and 6 split the sample before and after COVID-19, respectively, to investigate the role of *entrepreneurial exposure*. The results were robust also under this specification and were aligned with our main estimations.

5.6 Additional results and alternative explanations

While the results of Models 5 and 6 in Table 3 focus on the role of entrepreneurial exposure as a contingency in the crisis–entrepreneurial orientation relationship (and predicted by H2), these models also shed light on other variables that may influence changes in employees' entrepreneurial orientation in response to an exogenous crisis. Examining the role of these variables allows us to further enrich the discussion of employees' responses to exogenous crises by considering complementary or alternative theoretical explanations that could account for the observed results.

First, let us consider the role of gender. Before COVID-19 (Model 5), there was no statistically significant effect of being male on *entrepreneurial orientation*. This finding aligns with studies based on feminist liberal theory, which suggest that male and female employees exhibit similar predispositions toward entrepreneurship (Ruiz et al., 2023a, 2023b). However, after COVID-19 (Model 6), the coefficient of *gender* became positive and significant, indicating that being male increased *entrepreneurial orientation* by 0.26 SD in response to the crisis. These findings suggest that male employees displayed higher entrepreneurial orientation compared to female employees in response to exogenous crises. This finding supports our arguments based on threat-rigidity theory and is consistent with the literature on gender and entrepreneurship (Adachi and Hishada, 2017; Turro et al., 2020), which suggests that crises may exacerbate the gender gap in entrepreneurship among employees (Bartik et al., 2020; Kogut and Mejri, 2022; Sörensson and Ghannad, 2024; Yousef et al., 2024). Specifically, a well-documented pattern in the literature argues that men are more likely to engage in courses of action characterized by boldness and extroversion—traits commonly associated with entrepreneurial behavior (Adachi and Hishada, 2017; Turro et al., 2020). During exogenous crises, male employees are therefore more inclined to revert to these familiar entrepreneurial approaches, as predicted by threat-rigidity theory, resulting in an enhanced entrepreneurial orientation compared to their female counterparts.

Second, let us consider the effect of employee role on entrepreneurial orientation. In Models 5 and 6, the effect of role changed notably from pre- to post-COVID-19. Before COVID-19 (Model 5), being a nonmanagerial employee, as opposed to a manager, was associated with a 1.34 SD decrease in entrepreneurial orientation. However, this effect

became statistically nonsignificant after COVID-19 (Model 6). Hence, the COVID-19 pandemic narrowed the gap in entrepreneurial orientation between managers and nonmanagerial employees. These findings suggest that entrepreneurial orientation may evolve differently across hierarchical levels, particularly in response to an exogenous crisis. This is consistent with recent literature on individual entrepreneurial orientation, which emphasizes the value of studying entrepreneurial orientation as a characteristic not confined to top management but pervasive throughout the organization (Clark et al., 2024).

Finally, no statistically significant difference was found in the effect of tenure on entrepreneurial orientation before and after the COVID-19 pandemic. This suggests that tenure does not shield employees from the adverse effects of exogenous crises on entrepreneurial orientation. This finding suggests that the observed impact of the crisis on entrepreneurial orientation might not be explained solely by distinctive features of the COVID-19 pandemic, such as social distancing. Isolation during the pandemic disrupted constructive dialogue and idea-sharing among employees, potentially reducing proactiveness and innovation. If this was the primary mechanism driving the negative relationship between crisis and entrepreneurial orientation—rather than threat-induced rigidity, as posited by threat-rigidity theory—we would expect employees with longer tenure, who typically have more established and resilient relationships within the firm, to be less affected. However, the lack of a tenure effect suggests otherwise, reinforcing the role of threat-induced rigidity as a key mechanism. Ruling out this alternative explanation is essential for generalizing our findings to other types of exogenous crises that do not necessarily involve quarantines or social distancing measures. This enhances the robustness and applicability of our conclusions across various crisis contexts.

6 Discussion

We began by noting that, although researchers have recognized exogenous crises as a significant threat to corporate environments (Mazzei et al., 2024; Vasi et al., 2024), there has been little understanding of their effects on employees. By focusing on the employees of an established firm, our study investigated changes in their entrepreneurial orientation resulting from the COVID-19 crisis. Our findings show a negative relationship between the pandemic crisis and employees' entrepreneurial orientation. This suggests that, although exogenous crises often call for proactive and entrepreneurial responses by organizations (Audretsch & Moog, 2022; Shepherd & Williams, 2020), established firms' responses could be hindered by crisis-induced rigidity, which stifles employees' entrepreneurial orientation and makes them less prone to go beyond routines and courses of action consolidated through their prior (before the crisis) background. Moreover, we found that employees with entrepreneurial exposure in their background responded differently to the COVID-19 pandemic. In other words, entrepreneurial exposure represents a key boundary condition in the relationship between exogenous crises and employees' entrepreneurial orientation. In particular, we offer a more nuanced understanding of the effects of exogenous crises on individuals indicating that employees with entrepreneurial exposure are able to even enhance their entrepreneurial orientation in contrast to those without such exposure. Our findings are grounded in and explained by threat-rigidity theory, which suggests that, in response to perceived threats, individuals tend to develop rigidity that limits their capacity to think and act entrepreneurially.

6.1 Contributions to research

Our study makes several contributions to the literature. First, we deepen the understanding of how exogenous crises, such as the COVID-19 pandemic, influence employees' entrepreneurial orientation. While previous studies have examined the effects of exogenous crises on entrepreneurship (Kuckertz & Brändle, 2022; Williams & Shepherd, 2016; Williams et al., 2017), much of this research has focused on the context of new ventures, leaving the effects of exogenous crises on entrepreneurship within established firms relatively underexplored.

By examining the impact of exogenous crises on employees' entrepreneurial orientation within established firms, we contribute to a shift in focus. Mainstream research has traditionally centered on firm-level entrepreneurial orientation and its impact on performance in noncrisis contexts (Anderson et al., 2022; Rauch et al., 2009; Van Doorn et al., 2013), as well as during crises (Cherbib, 2024; McGee & Terry, 2024). In contrast, our study contributes to the growing need to understand how entrepreneurial orientation develops and what factors influence it in the first place (Cavallo & Burgers, 2024; Kollmann et al., 2017). Furthermore, against the prevailing "upper echelon" perspective—which focuses heavily on top management as the primary driver of firm-level entrepreneurial orientation (Cavallo & Burgers, 2024; Clark et al., 2024; Covin et al., 2020)—we provide evidence that contributes to the emerging discourse by highlighting the importance of employees and their prior entrepreneurial exposure. Given that crises, such as the COVID-19 pandemic, are unfortunately not isolated events, we believe that advancing knowledge about the negative effects of exogenous crises on employees' entrepreneurial orientation, along with the related boundary condition (i.e., entrepreneurial exposure), represents a significant contribution to the broader debate on entrepreneurship and crises.

Second, we contribute to the established threat-rigidity theory. Previous research has demonstrated that crises—and threats, more generally—can trigger rigid behavioral responses, such as restricted information processing and constricted control, that are observable at various organizational levels (Hodgkinson & Wright, 2002; Staw et al., 1981). However, few studies have explored the boundary conditions through which threat-induced rigidity influences individual-level outcomes (Mazzei et al., 2024), leaving critical nuances in individual responses to exogenous crises underexamined. Our study contributes to addressing these gaps by shedding light on these nuances. Specifically, our findings indicate that the impact of crisis-induced rigidity on employees' entrepreneurial orientation is not uniform but varies based on their background, highlighting entrepreneurial exposure as a significant boundary condition. In doing so, we contribute to recent discussions suggesting that the effects of threats on rigid behavioral responses involve greater complexity than previously assumed (Huang et al., 2022; Mazzei et al., 2024; Stoker et al., 2019).

Finally, by demonstrating the beneficial role that employees' entrepreneurial exposure can play during crises, our study complements and extends previous literature on the positive implications of entrepreneurial exposure for employees' careers and employers (Braunerhjelm & Lappi, 2023; Rieger et al., 2023). Specifically, our research provides a deeper understanding of the circumstances under which such exposure proves to be advantageous. In times of crisis, being exposed to entrepreneurial role models and observing entrepreneurs in action equips employees with a repertoire of approaches that enable them to respond with enhanced—rather than reduced—entrepreneurial

orientation. This finding underscores the strategic importance of attracting and retaining employees with prior entrepreneurial exposure (Rieger et al., 2023), particularly during turbulent and uncertain times. Exogenous crises, in particular, emerge as a critical boundary condition through which the value of entrepreneurial exposure becomes especially evident, as it helps employees navigate challenges with greater innovativeness, proactiveness, and risk-taking.

Although not the core focus of our analysis, the notable gender difference that emerges from our additional results can inspire future research on the determinants of the gender gap in corporate entrepreneurship—a topic that recent studies have highlighted as requiring further investigation (e.g., Guerrero, 2022; Jennings et al., 2023; Ruiz et al., 2023b; Urbano et al., 2022). Our findings indicate that before the COVID-19 pandemic, there were no significant differences in entrepreneurial orientation between males and females. However, after the onset of the pandemic, a gender gap emerged, with male employees exhibiting a higher entrepreneurial orientation than their female counterparts. This finding suggests that while the gender gap in employees' entrepreneurial orientation might be nonsignificant during non-crisis times, consistent with studies rooted in feminist liberal theory, exogenous crises can exacerbate gender disparities in corporate entrepreneurship (Bartik et al., 2020; Kogut and Mejri, 2022; Sörensson and Ghannad, 2024; Yousef et al., 2024).

6.2 Managerial implications

Our research offers important implications for managers and firms navigating and managing exogenous crises (Doern et al., 2019; Kariv et al., 2024; Vasi et al., 2024). This study alerts firms to a key threat they may face during an exogenous crisis such as the COVID-19 pandemic. In essence, we show that employees will decrease their innovative, proactive, and risk-taking dispositions and behaviors. This may have important and negative implications for firms' performance, given that several studies have previously demonstrated that entrepreneurially oriented firms may achieve better performance (Anderson et al., 2022; Rauch et al., 2009; Van Doorn et al., 2013). Firms should thus more explicitly incentivize and reward manifestations of employees' entrepreneurial orientation in times of exogenous crises, such as proposing changes in products and processes and piloting risky projects.

Moreover, the role of entrepreneurial exposure as a boundary condition mitigating the impact of an exogenous crisis on employees' entrepreneurial orientation suggests strategies that firms can adopt to prevent decline and enhance entrepreneurial orientation among employees. Firms would be in a better position to respond to exogenous crises by exposing their employees to entrepreneurial experiences and learning opportunities. This can be achieved through initiatives such as entrepreneurial training programs, collaborative projects with relevant stakeholders (e.g., universities and partner firms), and involvement in corporate entrepreneurship initiatives. These efforts would expose employees to hands-on entrepreneurial experiences, enhancing the workforce's resilience to exogenous crises.

7 Concluding remarks

7.1 Conclusions

This study sheds light on the important relationship between exogenous crises and employees' entrepreneurial orientation, a topic that has received scant attention despite

its relevance. Our findings show that exogenous crises, such as the COVID-19 pandemic, can negatively impact employees' entrepreneurial orientation. However, our research also reveals that employees with prior entrepreneurial exposure are not susceptible to these negative effects and are able to even enhance their entrepreneurial orientation in response to exogenous crises. This suggests that entrepreneurial exposure equips individuals with the resilience and adaptability needed to reinforce their entrepreneurial orientation, even in adverse conditions. These insights extend the existing literature on entrepreneurship and exogenous crises by highlighting the importance of individual attributes, such as prior entrepreneurial exposure, as critical boundary conditions. Our study also contributes to the emerging research on employees' entrepreneurial orientation and underscores the value of fostering entrepreneurial exposure among employees as a strategic asset for firms navigating turbulent circumstances. Future research should continue to explore these dynamics, particularly in diverse organizational contexts and across different types of exogenous crises to gain a deeper understanding of how to sustain entrepreneurial orientation in the face of crises.

7.2 Limitations and future research directions

Our study has limitations that warrant future research. First, regarding the research design, the anonymity of the surveys prevented tracking the exact same individuals over time. However, this anonymity also ensured a higher level of engagement and participation. Another implication of the anonymity in our research design is that we were unable to link individual respondents directly to their immediate supervisors. This limitation restricted our ability to examine how managerial influence may shape nonmanagerial employees' entrepreneurial orientation during exogenous crises. Future research could build on our findings by exploring how managerial actions and attitudes uniquely affect nonmanagerial employees' responses to exogenous crises, particularly in terms of fostering or inhibiting entrepreneurial orientation.

Second, even though the questionnaires were administered before and after the COVID-19 pandemic, we were not able to disentangle the specific aspects of the crisis that led to a decline in entrepreneurial orientation (e.g., working from home, health fears, stress or anxiety, uncertainty). Qualitative and longitudinal studies could offer a more comprehensive approach to better illuminate these aspects.

Third, our study's generalizability is limited in two ways. First, we focused on a large system integrator firm. Although the setting was particularly suited to our study, future research could examine firms of various dimensions, sectors, and ownership (e.g., family vs. nonfamily firms) to shed further light on the boundary conditions of our findings. Second, the COVID-19 pandemic could be considered an example of an exogenous crisis with unique features, such as social distancing. It would be valuable to explore the relationship between entrepreneurial orientation and other types of exogenous crises, as discussed in the literature, each with its own distinct characteristics.

Finally, although our study provides evidence of a gender difference in entrepreneurial orientation following the COVID-19 pandemic, this finding was not the core focus of our theoretical framework. Future research could build on this initial evidence to explore the boundary conditions under which crises trigger gender differences in employees' entrepreneurial dispositions and behaviors. For instance, future studies could examine the role of individual, organizational, and national factors that influence the impact of crises on the

gender gap in corporate entrepreneurship. These factors may include individual attributes such as self-efficacy and risk-taking; organization-level differences in work-life balance and degree of autonomy (Lumpkin et al., 2009; Ruiz et al., 2023a); and country-level determinants, including cultural beliefs, social norms, and regulatory frameworks (Attah-Boakye et al., 2020; Marlow, 2020; Ruiz et al., 2023b; Turro et al., 2020).

Appendix

List of 10 questions to assess the employees' entrepreneurial orientation.

Please indicate to what extent you agree with the following statements (1 = Not at all, 5 = Absolutely yes).

1. I enjoy taking risks by venturing into something I don't know
2. I am willing to invest a lot of time and/or money in something that could lead to high returns
3. I tend to act in a "risky" way in situations where there is some risk involved
4. I often enjoy trying new and unusual activities that are not typical, but not necessarily risky
5. In general, in projects, I prefer a strong emphasis on unique approaches rather than reusing approaches already used and tested in the past
6. When I need to learn something new, I prefer to find a unique way that suits me rather than doing it the same way as others
7. When there's a problem to solve, I prefer experimentation and the use of original approaches rather than relying on methods already used for other problems
8. I usually try to anticipate problems, needs, and future changes
9. I tend to plan ahead during projects
10. I prefer to "take the lead" and move a project forward rather than wait for someone else to do it

Note: Items 1–3 refer to *risk-taking*; items 4–7 refer to *innovativeness*, items 8–10 refer to *proactiveness*.

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